

# **New Malignancies Among Cancer Survivors: SEER Cancer Registries, 1973-2000**

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*Edited by*

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# Chapter 1

## Introduction

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Survival from cancer has improved dramatically as a result of recent advances in the treatment of cancer and its detection at an early stage. In the U.S., 5-year relative survival rates for all cancers combined increased steadily, from 50% in 1975-1979 to 66% in 1996-2002 among adults, and from 61% to 79% among children (Ries et al, 2006). Moreover, 10-year survival rates are approaching 59% in adults and 75% in children. As of January 1, 2003, about 10.5 million people in the U.S. were living with cancer (Ries et al, 2006). For some, the improvements in survival have come at a cost, however, in the form of long-term physical and psychosocial consequences of the disease and its treatment. A fuller understanding of these late effects has been achieved by an expanded research and policy agenda in cancer survivorship in the U.S. (Aziz and Rowland, 2003; Hewitt et al, 2003, 2005; CDC and LAF, 2004; NCI, 2004). Among the major medical concerns for cancer survivors is the risk of developing new primary cancers. It has been estimated that among those cancer survivors alive as of January 1, 2002, at least 750,000 (nearly 8%) had more than one form of cancer diagnosed between 1975 and 2001 (Mariotto, 2006). As a result, there is a growing need for a national system of population-based statistics to monitor the risk of developing new malignancies among long-term survivors of cancer.

Twenty years have passed since the publication of the National Cancer Institute (NCI) monograph titled *Multiple Primary Cancers in Connecticut and Denmark*, a comprehensive survey of two populations with long-standing cancer registries (Boice et al, 1985). This study was useful in characterizing the site-specific risks of second cancers and suggesting clues to underlying causal factors shared by constellations of multiple cancers and to the carcinogenic potential of treatment modalities. The current monograph builds and expands on that earlier work by reporting on more contemporary patterns of multiple cancers across the U.S. population and suggesting explanations based on our current understanding of cancer causation through epidemiologic research. Herein we report on the risk of new malignancies that have arisen among cancer survivors for the 27-year period 1973 to 2000, utilizing data from NCI's Surveillance, Epidemiology and End Results (SEER) Program (NCI, 2006).

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000).*

The SEER Program represents a unique population-based resource for evaluating the risk of subsequent cancers due to its large size, long follow-up of cancer survivors, and largely representative sample covering more than 10% of the U.S. population. With chapters organized according to the initial site of cancer, this monograph reports on the risks of subsequent malignancies for more than 50 adult and 18 childhood tumors, including new data on some uncommon sites and individual histologic types. The risks of subsequent cancers are systematically examined by gender, age at diagnosis of the initial cancer, and time since diagnosis, as well as the initial treatment and histologic type of certain cancers. Whenever relevant, the differences in subsequent cancer risk are noted by racial group (black and white); a subsequent publication will examine the racial and ethnic patterns in more detail. This monograph is intended primarily to provide new incidence data, rather than a comprehensive review of the literature on multiple primary cancers (Neugut et al, 1999; van Leeuwen and Travis, 2005; Schottenfeld and Beebe-Dimmer, 2006). However, in each chapter, the patterns of multiple cancers observed are compared with findings from other studies and discussed in terms of potential risk factors and mechanisms. In addition, efforts are made to cite previous analyses of second cancers that utilized SEER data for specific tumors covered in this monograph.

### Overall Risks of Subsequent Cancers

Based on the 9 original cancer registries, the SEER Program provided data on more than 2 million cancer patients who survived at least 2 months (including nearly 390,000 patients surviving at least 10 years and 76,000 patients surviving 20 or more years), yielding close to 11 million person-years at risk over the follow-up period from 1973 to 2000. Overall, we found that cancer survivors had a 14% higher risk of developing a new malignancy than would have been expected in the general SEER population (O/E=1.14, 95% CI=1.14-1.15) (Table 1.A). A total of 185,407 new primary cancers were observed compared with 162,602 expected. (The risk of subsequent prostate cancers diagnosed following an initial prostate cancer was excluded from the analysis, since typically these second tumors are not reportable to SEER.) The

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**Table 1.A:** Risk of subsequent primary cancer after any initial cancer, by age at initial diagnosis, SEER 1973-2000.

Age at initial diagnosis	Total			Males			Females		
	O	O/E	EAR	O	O/E	EAR	O	O/E	EAR
<b>All ages</b>	<b>185,407</b>	<b>1.14*</b>	<b>21</b>	<b>100,428</b>	<b>1.11*</b>	<b>22</b>	<b>84,979</b>	<b>1.17*</b>	<b>21</b>
00–17	351	6.13*	15	176	6.44*	15	175	5.84*	15
18–29	1,401	2.92*	22	562	3.39*	22	839	2.67*	23
30–39	4,909	2.37*	39	1,530	2.88*	40	3,379	2.20*	38
40–49	13,537	1.61*	39	4,466	1.83*	52	9,071	1.52*	34
50–59	34,159	1.27*	32	15,957	1.33*	46	18,202	1.21*	24
60–69	62,286	1.13*	23	35,986	1.11*	25	26,300	1.14*	22
70–79	52,321	1.02*	4	32,419	1.00	0	19,902	1.05*	9
80–115	16,443	0.92*	-19	9,332	0.92*	-26	7,111	0.93*	-14

Notes: All first primary cancers, except for non-melanoma skin, are included in the analysis. Subsequent cancers include 2nd, 3rd, and later primaries and encompass all cancer sites, except for non-melanoma skin and subsequent prostate cancers following first primary prostate cancer. Due to their large impact on subsequent cancer risks for males, O, O/E, and EAR were adjusted by excluding observed and expected numbers of subsequent prostate cancers following an initial prostate cancer (O=44, E=15,185). The population at risk includes 2,036,597 patients who survived 2 or more months after initial diagnosis during 1973 to 2000 (1,038,089 males and 998,508 females, 9 SEER registries). Numbers of patients surviving at least 5, 10, and 20 years were 789,221, 387,436, and 75,859 patients, respectively. The age distribution at initial diagnosis was 3.4%, 14.2%, 44.2%, 25.6%, and 12.6% for age groups <30, 30-49, 50-69, 70-79, and ≥80 years, respectively. The average age at initial cancer diagnosis was 64.6 years for men and 62.5 years for women.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected numbers of subsequent cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P <0.05.

estimate of the excess absolute risk (EAR) among all patients combined was 21 excess subsequent cancer cases per 10,000 person-years. A very large proportion (93%) of the patients with multiple cancers had microscopic confirmation of each malignancy (first, second, and subsequent cancers), reflecting the high reliability of the SEER database and the low likelihood that metastatic spread from the original malignancy would be reported as a new primary cancer.

For most cancer sites, we examined the subsequent cancer risk according to age at diagnosis. As shown in Table 1.A, striking differences were observed by age, with relative risks surpassing 6-fold for survivors of childhood cancer (O/E=6.13). This finding is consistent with previous studies of childhood tumors, which have implicated initial therapy and genetic susceptibility as major risk factors for new cancers (Neglia et al, 2001; Bhatia, 2005). An age effect was further illustrated by the 2- to 3-fold increased risks for patients diagnosed as young adults (ages 18-39 years), and by the 1.2- to 1.6-fold elevated risks for those ages 40-59 years. In contrast, the observed number of new malignancies was lower than expected for survivors whose first cancer occurred at older ages (ages ≥80 years, O/E=0.92), which may be due to underreporting of second cancers among elderly patients related to competing risks from comorbid conditions and shortened life expectancies. In the combined analysis of all initial cancer sites, we found that the greatest burden of new malignancies was experienced by cancer patients initially diagnosed at ages 30 to 59 years, with EARs ranging from 32 to 39 per 10,000 person-years.

Overall, females had a slightly higher relative risk than males for all subsequent cancers combined (O/E=1.17 for females, versus 1.11 for males) (Table 1.A). However, the

risk for males consistently exceeded that for females among patients whose initial cancer occurred before age 60 years. Similar patterns by age and sex were seen in analyses that excluded gender-specific initial cancers (cancers of the breast and genital tract), with the overall relative risk of developing a new malignancy being nearly equivalent among females (O/E=1.25) and males (O/E=1.22). For all ages combined, blacks had much higher risks of developing a new malignancy when compared with whites (blacks: O/E=1.31, EAR=46; whites: O/E=1.13, EAR=20). The racial differences in risk persisted among women and men in practically all age groups, indicating the need for further analyses that take into account racial differences in stage of disease, initial treatment, and other potential confounders.

In analyses by time after initial diagnosis and calendar year, we found that risks of new cancers were highest in the first 5 years after diagnosis and tended to decline somewhat among long-term survivors (Table 1.B). Heightened medical surveillance during the early follow-up period may partly explain the early excess, while lower risks in later follow-up intervals may be influenced by underascertainment of second malignancies for cancer survivors who migrate out of SEER geographic areas, and possibly by changes in behavioral patterns. In the most recent calendar year period (initial cancers diagnosed from 1995 to 2000), there was evidence of a higher rate of new malignancies compared with earlier periods with equivalent follow-up intervals, although longer surveillance will be needed to confirm this pattern.

In each chapter of this monograph, we estimated the percentage of patients diagnosed with a first primary cancer who developed a second cancer over time. For all cancers combined, nearly 14% of SEER patients developed a second cancer by 25 years of follow-up (cumula-

**Table 1.B:** Risk of subsequent primary cancer after any initial cancer, by calendar year at initial diagnosis and time since initial diagnosis, SEER 1973-2000.

Calendar year of diagnosis	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		10-14 years		15-19 years		≥20 years		Total	
	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E
<b>Relative risks (O/E ratios)</b>														
1973–79	3,701	1.17*	12,375	1.18*	11,258	1.13*	8,861	1.08*	6,846	1.05*	4,355	1.05*	47,396	1.12*
1980–84	3,566	1.16*	12,086	1.17*	11,035	1.13*	8,429	1.14*	4,109	1.11*	87	1.03	39,312	1.14*
1985–89	4,493	1.16*	15,732	1.15*	14,208	1.13*	7,071	1.12*	167	1.21*	—	—	41,671	1.14*
1990–94	5,744	1.18*	19,320	1.13*	12,493	1.13*	295	1.24*	—	—	—	—	37,852	1.14*
1995–2000	6,512	1.28*	12,208	1.17*	456	1.29*	—	—	—	—	—	—	19,176	1.21*
<b>Absolute excess risks (EARs)</b>														
	O	EAR	O	EAR	O	EAR	O	EAR	O	EAR	O	EAR	O	EAR
1973–79	3,701	21	12,375	23	11,258	18	8,861	13	6,846	8	4,355	9	47,396	17
1980–84	3,566	22	12,086	24	11,035	20	8,429	23	4,109	19	87	6	39,312	22
1985–89	4,493	23	15,732	23	14,208	20	7,071	20	167	37	—	—	41,671	22
1990–94	5,744	28	19,320	20	12,493	21	295	42	—	—	—	—	37,852	21
1995–2000	6,512	40	12,208	25	456	45	—	—	—	—	—	—	19,176	30

Notes: All first primary cancers, except for non-melanoma skin, are included in the analysis. Subsequent cancers include 2nd, 3rd, and later primaries and encompass all cancer sites, except for non-melanoma skin and subsequent prostate cancers following first primary prostate cancer. O, O/E, and EAR were adjusted by excluding observed and expected numbers of subsequent prostate cancers following an initial prostate cancer (O=44, E=15,185). The population at risk includes 2,036,597 patients who survived 2 or more months after initial diagnosis during 1973 to 2000, 9 SEER registries.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected numbers of subsequent cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P < 0.05.

tive incidence of 5.0%, 8.4%, 10.8%, and 13.7% at 5, 10, 15, and 25 years, respectively). The cumulative incidence also varied markedly by age at initial cancer diagnosis, with the overall frequency of second cancers being highest among those diagnosed between 50 and 69 years of age (16.4% at 25 years of follow-up). Children (ages <18 years) experienced a 3.5% cumulative incidence of second cancer at 25 years, but further increases are expected as the young survivors (maximum age <45 years at the end of current follow-up) enter the period of rising cancer incidence.

## Patterns of Multiple Primary Cancers

Although a sizable fraction of multiple cancers in the SEER database represented multicentric or multifocal tumors arising in the same site or organ system, most of the tumor constellations affected diverse organ sites. Whenever an excess risk of subsequent cancer was observed, a search was made for a reciprocal association that might suggest the presence of an underlying risk factor predisposing to multiple cancers. Of course, follow-up would be insufficient to detect risks among patients initially diagnosed with cancers that are often rapidly fatal (e.g., pancreas, liver).

**Multicentric Tumors Versus Multiple Tumors of Diverse Sites**—New malignancies that occurred in the same site or organ as the first primary cancer accounted for 13.2% of the 185,407 subsequent cancers occurring among patients in SEER surviving 2 months or more, with new tumors in the female breast (O=13,428; 7.2%), colon

(O=3,630; 2.0%), lung (O=3,346; 1.8%), as well as melanoma of the skin (O=1,579; 0.9%) making up the large majority of the cases. While multicentric tumors are likely to reflect shared exposures and/or genetic predisposition, it is possible that heightened medical surveillance and mistaken diagnoses of cancer recurrence may play a role in some cases. An additional 3.8% of new malignancies originated in neighboring tissues or organs, at least partly from a “field cancerization” process whereby carcinogenic exposures and susceptibility states contribute to multicentric tumors that occur, for example, along the upper aerodigestive tract, the colon and rectum, and the lower urinary tract. Recent molecular studies of head and neck tumors and urinary tract cancers have indicated that multicentric involvement may actually result from the spread and implantation of a single clone of mutated cells (Tabor et al, 2002; Habuchi, 2005).

However, the majority of multiple primary cancers reported in the SEER database (more than 80%) arose in separate or independent organ systems. While a certain fraction of the subsequent tumors would be expected to develop at the same rate as in the general population, the patterns of excess risk that emerged are sufficiently distinctive to suggest risk factors that may be shared by the primary and subsequent tumors, or an effect of cancer therapies that are potentially carcinogenic. In interpreting the findings, however, one must consider the potential biases that may be introduced by diagnostic and reporting inaccuracies and other methodologic limitations of second cancer studies that are discussed in the next chapter.

**Table 1.C:** Risk of subsequent primary cancers following first primary cancers that are strongly related to tobacco and/or alcohol exposure (oral cavity and pharynx, esophagus, larynx, lung, and bronchus), by sex, SEER 1973-2000.

Subsequent primary cancer	Total			Males			Females		
	O	O/E	EAR	O	O/E	EAR	O	O/E	EAR
All subsequent cancers	24,688	1.64*	114	17,491	1.58*	120	7,197	1.82*	105
<b>Oral/pharynx, esophagus, larynx, and lung/bronchus</b>	11,593	3.62*	99	8,184	3.20*	105	3,409	5.33*	90
Oral/pharynx	2,510	9.04*	26	1,742	7.78*	28	768	14.29*	23
Larynx, lung/bronchus	8,084	2.95*	63	5,704	2.62*	66	2,380	4.26*	59
Esophagus	999	5.49*	10	738	4.74*	11	261	9.94*	8
<b>Bladder, renal pelvis, ureter, and kidney parenchyma</b>	1,772	1.44*	6	1,449	1.39*	8	323	1.71*	4
Bladder, renal pelvis, ureter	1,325	1.42*	5	1,116	1.38*	6	209	1.68*	3
Kidney parenchyma	447	1.48*	2	333	1.40*	2	114	1.78*	2
Pancreas	531	1.36*	2	346	1.28*	1	185	1.55*	2
Cervix uteri	60	1.16	<1	—	—	—	60	1.16	<1
Stomach	474	1.39*	2	395	1.44*	2	79	1.17	<1
All other cancers	10,258	1.05*	5	7,117	1.03*	4	3,141	1.08*	8

Notes: The population at risk includes 336,929 patients who survived 2 or more months after an initial diagnosis of cancer of the oral cavity/pharynx, esophagus, larynx, or lung/bronchus during 1973 to 2000 (221,000 males and 115,929 females, 9 SEER registries). Cancers of the oral cavity/pharynx are defined to include cancers of the tongue, tonsil, mouth/floor of mouth, oropharynx, and hypopharynx. All subsequent cancers include 2nd, 3rd, and later primaries and encompass all cancer sites, except for non-melanoma skin.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected numbers of subsequent cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P <0.05.

**Tobacco and Alcohol**—Tobacco smoking and alcohol intake are major causes of cancer in the general population and also appear to account for a sizable proportion of the new malignancies among cancer survivors (Vineis et al, 2004; Boffetta et al, 2006). More than 11,000 of the 25,000 subsequent cancers observed following initial cancers that are typically related to tobacco and/or alcohol (e.g., oral cavity/pharynx, esophagus, larynx, and lung) occurred at a variety of sites also related to these exposures (Table 1.C). In terms of absolute excess risk, tobacco/alcohol-related cancer sites accounted for about 10,000 excess subsequent cancers or more than 35% of the total excess subsequent cancers occurring in this survey (initial cancer sites with O/E>1.0). The rate of excess cancers (EAR) was estimated at 114 cases per 10,000 person-years. More detailed data provided in this monograph suggest a differential effect of tobacco or alcohol when the initial cancers are analyzed by histologic type (e.g., squamous cell carcinoma versus adenocarcinoma of the esophagus), by cancer subsite (e.g., renal pelvis versus renal parenchyma), or by earlier age at initial diagnosis (e.g., ages <70 versus ≥70 years). The impact of tobacco and alcohol on the risk of second cancers is also evident in the risk reductions that have been reported with cessation of exposures after the initial cancer diagnosis (Do et al, 2004).

**Nutrition and Hormones**—Although we could not directly measure the impact of diet, obesity, physical inactivity, reproductive, and other lifestyle risk factors on the incidence of subsequent tumors in our survey, it seems likely that these factors contributed to the excess risk of new malignancies we and others have observed

among patients with cancers of the female breast, reproductive organs, and the upper and lower digestive tract (Henderson and Feigelson, 2000; Calle et al, 2003; Key et al, 2004; Pike et al, 2004; Samanic et al, 2006). For example, along with tobacco and alcohol, low consumption of fruits and vegetables may have influenced the risk of multicentric tumors along the upper aerodigestive tract, while caloric excess, obesity, physical inactivity, and reproductive factors probably contributed to the constellation of hormone-dependent tumors (breast, uterine corpus, ovary, and prostate), as well as cancers of the large bowel.

**Infections and Immunosuppression**—There is growing awareness that certain infectious agents (e.g., human papillomavirus [HPV], human immunodeficiency virus, human herpesvirus 8, Epstein-Barr virus, hepatitis B and C, *Helicobacter pylori*) as well as altered immune regulation and inflammation may have contributed to certain combinations of tumors (Hisada and Rabkin, 2005; Morgan et al, 2006). For example, cancers of the cervix and anogenital tract were likely to occur together as a result of HPV infections and underlying immunologic defects. The combination of anal tumors and tonsillar cancers also appeared to reflect HPV infections. With lymphoproliferative tumors such as chronic lymphocytic leukemia, the accompanying immune dysfunction probably contributed to the excess risks of certain cancers, such as cutaneous melanoma, as reported also in immunosuppressed transplant recipients.

**Genetic Predisposition**—Because heritable cancers tend to present earlier in life than sporadic tumors, the detailed analyses of risk by age at diagnosis, along with the find-



ing of reciprocal associations, may point to underlying genetic susceptibility (Garber and Offit, 2005). In particular, some constellations of tumors found in our study appeared to be manifestations of a familial cancer syndrome. Following early-onset colon cancer, the excess risks of cancers of the uterine corpus, ovary, bile ducts, small intestine, and renal pelvis resemble features of hereditary nonpolyposis colon cancer (Lynch syndrome), due to inherited mismatch repair genes (Umar et al, 2004). Among younger women with breast cancer, the remarkably high risks of contralateral breast and ovarian cancer are consistent with heritable syndromes associated with germline mutations of BRCA1/2 (Thompson and Easton, 2004). In addition, the association of breast cancer, sarcomas, and certain other cancers in children and young adults may reflect the occurrence of Li-Fraumeni syndrome, related mainly to germline mutations of p53 (Hisada et al, 1998). In clarifying the role of genetic susceptibility in multiple primary cancers, special insights have come from population-based family surveys of cancer carried out in Utah (Goldgar et al, 1994) and Sweden (Hemminki and Boffetta, 2004).

**Treatment Effects**—The overall data from the monograph suggested that cancer therapy among older adults was not associated with a substantial increase in subsequent cancer risk. In contrast, children and young adults seemed to be especially prone to the carcinogenic effects of intensive radio-chemotherapy regimens (Bhatia, 2005; van Leeuwen and Travis, 2005). Children who survived 5 or more years after initial radiotherapy had the greatest risks of solid tumors, in keeping with the long latency typically seen for radiogenic solid cancers. In young adults, radiation contributed to the heightened risk for solid tumors arising in the fields of intense radiation exposure. Especially pronounced were the elevated risks of breast, lung, and other cancers among patients given radiotherapy for Hodgkin lymphoma. Although radiogenic cancers were not common following most adult-onset malignancies, excess risks were seen for cancers of the lung and esophagus, as well as sarcomas, following initial radiotherapy for breast cancer, while elevated risks were noted for acute leukemia after pelvic irradiation for cancers of the cervix and uterine corpus. Although the effects of chemotherapy and hormonal therapy were not directly assessed in our survey, markedly elevated risks of acute leukemia were observed following several cancers that have been generally treated with agents that are potentially leukemogenic. Among breast cancer patients, hormonal therapy (primarily tamoxifen) appeared to increase the incidence of cancer of the uterine corpus while decreasing the risk of contralateral breast cancer.

## Future Directions

The results from the SEER Program and other surveys reported in the literature show clearly that the burden of second cancer occurrence is not borne equally among all

cancer survivors. Instead, there are specific constellations of multiple tumors, so that it is possible to tailor strategies for primary and secondary prevention, including long-term medical surveillance aimed at the early diagnosis and treatment of subsequent tumors. The lowering of second cancer risk reported among survivors who changed their high-risk behaviors, most notably by cessation of smoking and alcohol drinking, indicates the need for behavioral research and educational programs to reinforce the importance of lifestyle changes that curtail exposure to cancer risk factors (Bellizzi et al, 2005; Pinto and Trunzo, 2005). While further work is needed to identify the causal factors underpinning some combinations of multiple cancers (e.g., thyroid and renal cancers), it seems reasonable that dietary and physical activity programs aimed at reducing excess body weight should also help lower not only the risk of a first primary cancer, but also the risk of subsequent cancers, along with increasing fruit and vegetable intake, reducing exposures to carcinogens in the workplace and environment, and limiting exposure to ultraviolet light and ionizing radiation whenever possible.

In addition to identifying the role of shared risk factors, studies of multiple primary cancers have been invaluable in detecting the late effects of cancer therapy, including leukemia and solid tumors, so that risk-benefit calculations can be made and appropriate patient groups identified for preventive interventions, including screening for new malignancies and chemopreventive strategies (van Leeuwen and Travis, 2005). The emergence of solid tumors as a late consequence of certain cancer therapies indicates the importance of long-term surveillance for subsequent cancers in SEER and other cancer registries, followed by case-control studies of tumors that occur excessively. Special emphasis should be placed on long-term follow-up of patients enrolled in clinical trials so that precise treatment details are available to monitor the potential adverse effects of specific therapies, which can then be weighed against their benefits. The results should inform clinical decision-making and the search for improved treatments that result in better survival rates as well as fewer late effects.

Several of the multiple cancer patterns presented in this monograph appear to reflect the activity of high-penetrant gene mutations that also underlie hereditary cancer syndromes (Garber and Offit, 2005). The challenge now is to identify the more common low-penetrant gene polymorphisms involved in modifying the carcinogenic risks of lifestyle and other environmental exposures, including the risks of radiation- and chemotherapy-related cancers. The recent report of an NCI workshop on cancer survivorship outlined the clinical, epidemiologic, molecular, and interdisciplinary research strategies that will enable a more complete understanding of the role of genetic predisposition in new malignancies among cancer survivors (Travis et al, 2006). Because recent advances in genomic and molecular sciences can now be incorporated into epidemiologic research, it should be possible to

illuminate the mechanisms of susceptibility to multiple cancers and provide insights into the long-term medical care and preventive interventions that will benefit the growing population of cancer survivors.

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# Chapter 2

## Methods

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The maturation of large cancer registries in the U.S. and internationally has greatly enhanced our ability to identify large numbers of patients with multiple primary cancers (Boice et al, 1985; Curtis et al, 1985; Sankila et al, 1995; Travis et al, 1996, 2005; Neugut et al, 1999; Crocetti et al, 2001; Dong and Hemminki, 2001; van Leeuwen and Travis, 2005; Mellemkjaer et al, 2006; Schottenfeld and Beebe-Dimmer, 2006). The high-quality, population-based cancer registries from the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) Program (Ries et al, 2006) provide a unique resource with which to evaluate the risk of subsequent cancers due to the extremely large number of survivors (more than 2 million), long follow-up period (since 1973), and standardized registry methods.

This current monograph utilizes the SEER database to provide a comprehensive evaluation of the risk of subsequent malignancies among patients initially diagnosed with 1 of more than 50 types of adult and 18 types of childhood primary cancer. The purpose of this chapter is to lay the foundation for subsequent chapters by describing the SEER study populations and analytic methodology used for the monograph. The presentation and interpretation of the statistical results are explained, along with the strengths and limitations of the study.

### Study Population: SEER Cancer Registries

The SEER Program was established in 1973 to collect high-quality, population-based data on cancer incidence and survival in the U.S. (Hankey et al, 1999). Areas initially included in 1973 were the states of Connecticut, Iowa, New Mexico, Utah, and Hawaii, and the metropolitan areas of Detroit and San Francisco-Oakland (Ries et al, 2006; NCI, 2006a). The 13-county Seattle-Puget Sound area was added in 1974, and the metropolitan area of Atlanta was included in 1975. Persons in the SEER geographic areas resemble the U.S. population in the proportion of persons below the poverty level or with less than a high school diploma but differ in having higher percentages of urban and foreign-born residents. The study population for the current monograph includes the nearly 2 million cancer patients reported to the 9 SEER reg-

istries from 1973 to 2000, with follow-up for subsequent cancer occurrence extending up to 27 years, in order to ensure consistency of geographic areas over the longest time period possible. Additional SEER registries that contribute to cancer incidence reporting, but are not included in the current survey, are the more recently added areas of Los Angeles and San Jose-Monterey, Kentucky, New Jersey, the remaining geographic areas in California, Louisiana, and the smaller registries of rural Georgia and Alaska natives.

The SEER registries maintain a high level of ascertainment of incident cancer cases through searches of records of hospitals and radiotherapy units, as well as private diagnostic laboratories and treatment centers. All cancers occurring among residents of the defined geographic areas are reportable to SEER; however, second or later ("subsequent") cancers diagnosed among patients who migrate out of their SEER registry area are not reportable, and migration status is not recorded in the SEER database. Information routinely collected by the registries includes patient demographics (sex, race, age, place of residence), date of cancer diagnosis, primary cancer site and morphology, diagnosis confirmation by microscopic study or other methods, extent of disease (stage), first course of cancer-directed treatment, vital status, date last known to be alive or date of death, and cause of death for those who have died. A high rate of follow-up ( $\geq 97\%$ ) for vital status (alive/dead) is achieved by actively tracing all living patients (regardless of out-migration) and by linking with state and national death registries.

The SEER rules for classifying multiple primary cancers depend on the cancer site of origin, date of diagnosis, histology, tumor behavior (i.e., *in situ* versus invasive), and laterality of paired organs (NCI, 2006b). In general, all metachronous cancers (occurring 2 or more months after initial diagnosis) are considered as separate primaries unless the medical record states that the tumor is recurrent or metastatic. Notable exceptions to this rule are multiple adenocarcinomas of the prostate and multiple transitional cell carcinomas of the bladder (histology 8120-8130), which are reported as single primaries. Multiple tumors occurring on both sides of paired organs, such as the breast and testes, are generally considered to be independent cancers. Rules for determining multiple primaries of the lymphatic and hematopoietic system are

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Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as  $[(O-E)/PYR] \times 10,000$ ).

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more complex and depend on the specific histologic types involved. International coding rules for multiple cancers are more restrictive than those used in the U.S. Cancers that occur at the same site or different sides of a paired organ are usually considered to be 1 primary under international coding rules, unless the 2 tumors belong to separate histologic categories (IARC, 2004).

The SEER Program collects data on the first course of cancer-directed therapy (surgery, radiation, chemotherapy, hormonal therapy, immunotherapy, and other therapy). Prior to 1988, the first course was defined to include all treatment administered to the patient within 4 months after the initiation of therapy (2 months for leukemias) or until disease progression, whichever was earlier. Beginning in 1988, all case reports included the entire first course of therapy, regardless of duration (NCI, 2006b). Because cancer patients commonly receive surgery and radiation therapy at hospitals or medical centers that routinely report to the central registries, these treatments are captured for the large majority of patients. Data on treatments commonly given outside the hospital setting—such as chemotherapy, hormonal therapy, and immunotherapy—are incomplete and therefore are not included in the public-use SEER database or in this monograph. The SEER Program also does not record palliative therapy or therapy given after the initial course of treatment.

## Analytic Methods

The cohort study is the most frequent epidemiologic approach used to determine if an observed number of subsequent cancers occurs more or less frequently than would be expected by chance alone. With this study design, a defined population of persons with a specific first cancer is followed over time for a number of years to examine the risk of developing a subsequent primary cancer, with the person-years at risk (PYR) allocated by age, sex, and other factors (Monson, 1974; Schoenberg and Myers, 1977). The ratio of observed to expected subsequent cancers (O/E) is then calculated by dividing the observed number of new cancers by the number expected if patients in the cohort experienced the same cancer rates as persons in the general reference population (Boice et al, 1985; Begg, 1999; van Leeuwen and Travis, 2005). The O/E ratio (or standardized incidence ratio, SIR) is frequently referred to as the “relative risk” because it compares the incidence rate of the event of interest (e.g., subsequent breast cancer) to the baseline incidence rate of that cancer (e.g., all breast cancer) in a general population of persons of comparable age, sex, and time distribution. The relative risk is generally considered a measure of the strength of an association. Another useful statistic is the excess absolute risk (EAR), which is calculated as the difference between the subsequent cancer rate in the cohort being evaluated and the rate expected in the standard population. The EAR is frequently used to measure the overall burden due to subsequent cancers.

## O/E and EAR Calculations

For the monograph, we evaluated all patients diagnosed with an invasive cancer as a first primary malignancy who were reported to 1 of 9 SEER registries between January 1, 1973, and December 31, 2000. Because heightened screening of cancer patients during the initial medical work-up tends to identify many simultaneous cancers, we excluded from the calculations the first 2 months of follow-up and the new malignancies occurring within this initial 2-month period. The PYR for each individual began at 2 months after the date of the initial cancer diagnosis and ended at the date of last known vital status, death, or the end of study (December 31, 2000), whichever occurred first. SEER cancer registry incidence files were searched for subsequent primary cancers that developed at least 2 months after the patient’s first primary diagnosis and before the study cutoff date. All second and later (third, fourth, etc.) invasive cancers were included in the observed numbers of cases to be comparable with the expected number derived from baseline SEER incidence rates, which include all multiple tumors. Non-melanoma skin cancers, with the exception of Kaposi sarcoma, were excluded because most such tumors (i.e., basal cell and squamous cell skin cancers) are not reportable to the SEER Program. For each initial cancer site grouping, the PYR and observed cases of cancer were stratified according to age at initial diagnosis (5-year groups), race (whites/unknown, blacks, other races), sex, and 5-year calendar year intervals. Cancer incidence rates were computed for the 9 SEER areas combined for each type of invasive cancer, by race, sex, age, and calendar-year group, and were multiplied by the accumulated PYR to estimate the expected number of subsequent malignancies for each stratum. The total observed and expected numbers of subsequent cancers for each stratum were then summed. The O/E ratios for each subsequent cancer site were calculated as the observed number divided by the expected number of subsequent cancer cases.

Tests on the statistical significance of the O/E ratios were performed under the assumptions that the observed number of subsequent cancers followed a Poisson distribution, and that no variation was associated with the expected number of cases. Byar’s accurate approximation to the exact Poisson distribution was used to calculate 95% confidence intervals (Breslow and Day, 1987). The O/E ratios for which the 95% confidence interval excluded 1.0 were designated as statistically significant ( $P < 0.05$ ) and are indicated in the monograph tables with an asterisk (\*).

To compute the excess absolute risk or EAR, we subtracted the expected number of subsequent cancers from the observed number of cancer cases; the difference was then divided by the PYR, and the number of excess cancer cases was expressed per 10,000 PYR,  $[(O-E)/PYR] \times 10,000$ . O/E and EAR calculations were performed using the “MP-SIR” session of SEER\*Stat, a publicly available, interactive, Windows-based program for analyzing cancer registry data (NCI, 2006c).

## Understanding Relative Versus Absolute Risks

The relative risk (O/E) provides a useful tool to test etiologic hypotheses and to screen for significantly increased or decreased risks of developing new malignancies (Begg, 1999). A sharply elevated relative risk based on a large number of subsequent cancer cases provides strong evidence of a positive association with the first primary cancer. Significantly increased risks between 2 malignancies that are bidirectional in nature (elevated risks for cancer B after cancer A, and also for cancer A after cancer B), are suggestive of shared etiologic factors, particularly when the elevation in risk persists beyond the initial follow-up period ( $\geq 5$  years) and the risk appears unrelated to initial therapy. High relative risks of subsequent cancer can sometimes be associated with low EARs, for example when the baseline cancer incidence rate in the referent population is low, as with therapy-related acute leukemia or when studying children and young adults. In contrast, modest or even small increases in the relative risk can result in high EARs of new malignancies at older ages, when the background cancer burden in the referent population is greatest. In general, the EAR is often the most useful measure of risk to assess the impact of the subsequent cancer burden in a specific population of cancer patients, or when interest centers on the potential effectiveness of screening or prevention programs.

Both relative risks and EARs of subsequent cancers can vary by age, sex, time since diagnosis, or other baseline factors. Thus, comparisons of risk for different types of second cancers or across cohorts can be misleading when patient groups being compared have different underlying distributions of one or more of these factors (Armstrong, 1995). In this case, it may be necessary to stratify the analysis to evaluate risk within homogeneous patient subgroups, for example, within similar age and time intervals. Alternatively, multivariate regression methods may be employed to adjust for differences in baseline characteristics of age and other factors and to account for confounding variables, as used in studies of treatment-related second cancers (Yasui et al, 2003; Zablotska and Neugut, 2003; Travis et al, 2005; van Leeuwen and Travis, 2005). In this monograph, we have stratified most results by sex, age, time since diagnosis, and radiation treatment, whenever possible.

## Cumulative Incidence

We calculated the cumulative incidence as the percentage of patients developing a second malignancy by a specified time (10, 15, or 25 years) after the initial cancer diagnosis, while taking into account the competing risk of death among patients who did not develop a second malignancy (Gooley et al, 1999; see Appendix 1). It is important to recognize that when the risk from competing outcomes is large, the cumulative incidence function is the more appropriate statistic to use as compared with actuarial methods of cumulative risk (e.g., Kaplan Meier methods, Kaplan and Meier, 1958), which censor patients

at the time of the competing event. The cumulative incidence is an absolute measure of second cancer incidence and, in general, tends to rise with increasing age of the cohort at risk. The measure, by itself, provides no indication of whether the second cancer incidence is higher or lower than the cancer incidence rate prevailing in the general population. Cumulative incidence calculations were performed for the monograph using a program by Gooley et al. (1999), and 95% confidence intervals by a program developed by Choudhury (2002). (See also the software program “stcmet” from StataCorp, described in Coviello and Boggess, 2004.)

## Presentation of Results

Results are presented in 16 chapters, organized by grouping of initial cancer sites. Cancer diagnoses were categorized according to the International Classification of Diseases for Oncology, second edition (ICD-O-2) (Percy et al, 1990). Definitions of the first and subsequent cancer sites, and groupings by histologic type, are given in Appendices 2.A-2.D. Each chapter provides background information for the first cancer(s) (survival statistics, usual therapy, etc.), major risk factors, and a Results and Discussion section that describes the patterns of subsequent cancer risks and discusses the findings in relation to potential risk factors and previous studies of multiple primary cancers.

Standard data tables are typically included at the end of each chapter. Initial tables provide patient characteristics by sex, race, age, first course of cancer-directed therapy (surgery and/or radiation), and PYR. The number of patients with exactly 1, 2, 3, or 4 or more cancers is tabulated. The percentage of patients developing multiple primary tumors who have their cancers confirmed by histologic or other methods are described in overlapping categories: the percentage of cases with at least the first and second primary cancers (but not necessarily later cancers) histologically confirmed; the percentage with first, second, and all later primary cancers confirmed; and the percentage with only the first primary cancer confirmed, but not second, third, or later primary cancers. Tables that follow present the risk of developing a subsequent primary cancer (O/E and EAR) by years after diagnosis of the first cancer (time since diagnosis intervals: 2 months to 1 yr; 1-4 yrs; 5-9 yrs;  $\geq 10$  yrs; and total  $\geq 2$  months) for both sexes combined, by sex, and, when numbers are sufficient, by age at initial diagnosis. For selected sites of initial cancers, results are tabulated for long-term survivors (time since diagnosis intervals: 2 months to 9 yrs; 10-14 yrs; 15-19 yrs;  $\geq 20$  yrs; and total  $\geq 2$  months), by initial treatment (any radiotherapy, no radiotherapy), and, when informative, by histologic type. The number of patients at risk at the beginning of the follow-up interval (“number starting interval”) is given, as well as the total PYR accumulated during the follow-up interval (“person-years in interval”). Note that the number of patients starting the interval decreases with each succeeding observation period (except for the total),



as patients are withdrawn from analysis due to death, loss to follow-up, or study end, whereas the sum of the PYR for each follow-up interval equals the total PYR.

The cumulative incidence (%) of developing a second cancer is provided for each initial cancer site grouping in the respective chapters, and for selected sites in line graphs within the text. Monograph Appendix 1 includes line graphs for 48 first primary cancer sites, giving the cumulative incidence of any second cancer and the cumulative probability of death from competing causes at 25 years after initial diagnosis. When the patterns of risk by age are of interest, bar graphs are included in the chapter text, displaying the O/E and EAR of subsequent cancers by age at initial cancer diagnosis.

## Methodologic Limitations

The monograph results should be viewed in light of the potential sources of ascertainment bias, as well as diagnostic and other biases inherent in studies of multiple primary cancers, and these limitations should be taken into account in evaluating the results.

**Assessment of Cancer Independence**—A key assumption in the analysis of multiple primary cancers is that the individual malignancies are biologically independent. SEER registries rely on the pathology report as to whether a new malignancy is a separate primary cancer as opposed to a metastatic lesion or local recurrence of the original cancer. Histopathologic confirmation of the new malignancy increases the confidence in the diagnosis of a subsequent primary cancer, but it may not provide definitive evidence of independence. Correct classification as a multiple primary cancer may also be problematic when new malignancies arise at the same anatomic site and with the same histology as the first tumor, particularly in paired or contiguous organs. To address this issue, the monograph tables provide separate estimates of the risk of developing a subsequent cancer of an organ different from the first. (See Appendix 2.C for cancer site definitions.) Further difficulties occur when multiple tumors arise in the same tissue in what is known as the “field cancerization” process, for example, tobacco- and/or alcohol-related tumors of the oral cavity and pharynx. While SEER registries generally consider these field-related cancers to be separate malignancies, this research area is still evolving, and recent molecular studies report that multifocal tumors in some organs, such as the lower urinary tract, are likely to originate from a single transformed molecular clone (Habuchi, 2005).

**Medical Surveillance Bias**—Cancer patients are often under closer medical surveillance than persons in the general population. This increased scrutiny may lead to an ascertainment bias in the early detection of asymptomatic cancers that otherwise might not have been clinically evident for several years (known as lead-time bias). In addition, increased cancer screening and autopsy investigations frequently uncover indolent tumors that otherwise might not have been clinically detected during the patient’s lifetime. Malignancies that are especially susceptible to detection by medical screening include cancers

of the thyroid, kidney, and prostate. Conversely, underreporting of second and later cancers may occur among cancer survivors who have metastases or other serious comorbid conditions, or among those diagnosed at older ages whose life expectancy is short. New contralateral tumors of the lung, for example, are often underreported, as they are assumed to represent spread of the original cancer (Johnson, 1998). Artificially reduced risks of subsequent cancers can also occur when surgery for the initial tumor removes one or more organs from risk, for example, when the uterus and ovaries are surgically removed during treatment for gynecologic cancers.

**Underascertainment of Subsequent Cancers Due to Out-migration**—Subsequent cancers are not recorded in the SEER database for patients who migrate from their original SEER geographic area, regardless of whether they move into another SEER area. This underascertainment of subsequent cancer cases results in conservative (negatively biased) estimates of subsequent cancer risk, as the expected number of new malignancies is based on the assumption that patients remain at risk until their date of last known vital status or death. Although the impact of out-migration on subsequent cancer risk has not been assessed, this factor is likely to be important for highly mobile metropolitan areas, for the longest follow-up observation periods (10 and 20 years after initial diagnosis), and for children and young adults.

**Radiation-related Cancers**—O/E comparisons of irradiated with nonirradiated patients may underestimate the risk of radiation-related cancers when patients classified as “without initial radiotherapy” actually received radiotherapy that was not reported to registry databases (Du et al, 1999). Moreover, subsequent cancer risks for patients treated with radiotherapy may be difficult to interpret without accounting for the carcinogenic effects of chemotherapy, particularly in the case of therapy-related leukemia.

**Interpretation of Small Numbers**—In contrast to most other SEER reports of incidence and survival, the monograph tables include results for individual cancers that are based on small numbers of observed cases (less than 5 cases) over a large number of PYR. This comprehensive approach to data reporting for all subgroups enables the monograph user to combine observed and expected numbers over several cancer sites to detect broad etiologic patterns and permits comparison of findings for uncommon cancers with those of other studies.

**Multiple Comparisons**—The monograph aimed for the presentation of subsequent cancer risks by sex, age, time since diagnosis, and other factors, resulting in a large number of multiple comparisons for each initial cancer site. Multiple testing of stratified data tends to identify a number of statistically significant risks of subsequent cancer that may have occurred by chance alone (Savitz and Olshan, 1995; Goodman, 1998). To distinguish real from chance findings, the results should be viewed in light of the biologic plausibility of the association, consistency with previous second cancer studies, and epidemiologic characteristics of the tumors involved.

## Methodologic Strengths

Notwithstanding the potential biases and caveats noted above, the SEER registry database represents a powerful analytic resource for assessing the incidence of new malignancies among cancer survivors. The SEER Program is generally considered to be the standard for quality among cancer registries around the world, with nearly complete reporting of incident cancer cases within the covered geographic areas. Because the SEER registries are population-based and are broadly representative of the U.S. population, these analyses avoid potential biases that can be introduced in hospital-based studies as a result of area referral patterns and incomplete follow-up. High rates of microscopic confirmation for new cancer cases, and the use of precise rules to ascertain and code first and later primary cancers, are key features of the SEER Program that help ensure the validity of the patterns observed.

This monograph provides the largest assessment to date of the risk of new cancers among cancer survivors. The study covers more than 2 million cancer survivors; nearly 390,000 patients were at risk for 10 or more years after the initial cancer developed, and almost 76,000 patients were at risk for 20 or more years. There were more than 11 million person-years at risk in the analysis, yielding 186,000 subsequent primary cancers. Because of these large numbers, the monograph is able to provide a wealth of new data on the risk of developing a subsequent cancer for most initial forms of cancer, including some uncommon sites. The detailed presentation in the monograph of subsequent cancer risks by time since initial diagnosis, sex, age, treatment, and histologic type provides a comprehensive resource from which causal hypotheses can be generated and tested in more focused analytic studies in the SEER Program or in other populations where second primary cancers can be evaluated (Curtis et al, 1992; Travis et al, 2000, 2002, 2003). Finally, the results presented in this monograph should be useful to clinicians in advising their cancer patients on long-term outcomes and the importance of medical supervision for prevention and early detection of new malignancies.

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# Chapter 3

## New Malignancies Following Cancer of the Buccal Cavity and Pharynx

Linda Morris Brown, Peter McCarron, D. Michal Freedman

### Synopsis

The risk of subsequent primary cancer was assessed in more than 56,000 patients diagnosed with cancers of the buccal cavity or pharynx—including lip, tongue, salivary gland, mouth, nasopharynx, tonsil, oropharynx, and hypopharynx cancers—between 1973 and 2000. The overall risk of new malignancies was significantly elevated among survivors of cancers of the lip (O/E=1.16, O=1,814, EAR=34 per 10,000 person-years), oral cavity and pharynx (tongue, tonsil, mouth, oropharynx and hypopharynx) (O/E=2.45, O=7,076, EAR=231), salivary gland (O/E=1.25, O=644, EAR=33), and nasopharynx (O/E=1.49, O=267, EAR=47). Tobacco smoking and/or alcohol consumption probably account for the excess risks of many new malignancies, including tumors of the buccal cavity and pharynx, esophagus, larynx, lung, nasal cavity, stomach, urinary bladder, pancreas, and liver. Exposure to ultraviolet radiation from sunlight exposure probably contributed to the excess risk of melanoma following cancer of the lip. In addition, Epstein-Barr virus infection may have played a role in the increase of non-Hodgkin lymphoma following nasopharyngeal cancer, and human papillomavirus infection may have been a factor in the excess of anogenital tumors following certain types of oral cancer.

### Lip Cancer

Cancer of the lip is relatively rare, accounting for less than 10% of all cancers of the buccal cavity and pharynx. More than 95% of lip cancers are squamous cell carcinomas, and most occur on the lower lip (Moore et al, 1999; Veness, 2001). Lip cancer is extremely rare in the black population, probably due to the protective effects of skin pigmentation on sun exposure (Moore et al, 1999), and it is 5 times more common in white men than women, probably because women have less occupational sun exposure and use more lip protection (de Visscher and van der Waal, 1998). Most patients present with early-stage disease; thus the 5- and 10-year relative survival rates have been high in recent years, 92.9% and 90.0%, respectively. Surgery alone, the preferred treatment for comparatively superficial disease,

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).*

is used for the majority of patients (Veness, 2001). Patients with more advanced disease often receive radiotherapy alone to avoid unacceptable disfigurement or loss of function. Adjuvant radiotherapy has been used for patients presenting with regional or nodal metastasis (Veness, 2001).

The best-documented risk factors for lip cancer are prolonged ultraviolet (UV) radiation exposure from sunlight, use of tobacco products, and fair complexion. Other suspected risk factors include genetic susceptibility, immunosuppression, low socioeconomic status, poor oral hygiene, and perhaps heavy alcohol consumption (de Visscher and van der Waal, 1998; Moore et al, 1999).

### Results and Discussion

There was a small increased risk of all new malignancies combined among the 8,188 2-month survivors of lip cancer (O/E=1.16, O=1,814, 95% CI=1.11-1.22, EAR=34 per 10,000 person-years). The cumulative incidence of developing a second cancer following lip cancer adjusting for the competing risk of death due to other causes was 26.8% at 25 years (95% CI=25.6%-28.0%). Elevated risk was limited to the first 10 years of follow-up. Patients diagnosed at younger than age 50 years had a 43% higher relative risk of new malignancies, whereas patients ages 70 years and older had a 13% increased risk. Nonetheless, the excess absolute cancer risk was more than 40% higher in the older patients compared with the younger patients. The relative risk of subsequent primary cancers was similar in males and females, but the excess absolute risk was higher in men (EAR=35) than in women (EAR=28). Significantly elevated risks of 3-fold or greater were seen for subsequent cancers of the buccal cavity (especially the lip, salivary gland, and mouth), as well as for Hodgkin lymphoma. Risks were also significantly elevated, but to a lesser extent, for cancers of the larynx and lung, as well as for melanoma of the skin. In contrast, the risk for subsequent brain cancer was significantly decreased after lip cancer. The increased risks for new malignancies of the buccal cavity

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and respiratory system were found in a previous survey of lip cancer (Winn and Blot, 1985).

Tobacco use is a risk factor for primary cancers of the lip, oral cavity, and respiratory system and likely contributes to the tendency toward multiple cancers at these sites (Day and Blot, 1992; de Visscher and van der Waal, 1998). The role of tobacco is underscored by the significant reciprocal excess of lip cancer following other cancers of the buccal cavity, although significant excesses of lip cancer were not seen following cancers of the lung in this survey.

The elevated risk of cutaneous melanoma after lip cancer, which was limited to males, is consistent with the role of UV radiation following occupational and other exposures to sunlight, especially in light-skinned individuals (de Visscher and van der Waal, 1998; Armstrong and Krickler, 2001).

In addition, an elevated risk for Hodgkin lymphoma was seen following lip cancer, although the reasons are unclear. It is interesting, however, that a significant reciprocal excess of lip cancer was noted after Hodgkin lymphoma and other lymphoproliferative malignancies, mainly non-Hodgkin lymphoma (NHL) and chronic lymphocytic leukemia. Increased risk of subsequent lip cancer has been previously observed following NHL (Brennan et al, 2000) and following transplantation (King et al, 1995; Curtis et al, 1997), suggesting the role of underlying immunologic alterations.

### Cancers of the Oral Cavity and Pharynx

Cancers of the tongue, tonsil, mouth, hypopharynx, and oropharynx are grouped for this section and hereafter referred to as cancers of the oral cavity and pharynx. Together, these primarily squamous cell cancers account for about 1% of all cancers. The 5-year relative survival rate is slightly higher for females (61.5%) than males (57.8%), and higher for whites (61.2%) than blacks (39.5%). Surgery or radiation therapy is standard treatment for early disease (Barzan et al, 1998; Forastiere et al, 2001). Advanced disease requires surgery, usually with postoperative radiotherapy. Recently, multiple-modality treatments that include chemotherapy have been employed to achieve organ preservation and improve survival (Barzan et al, 1998; Forastiere et al, 2001).

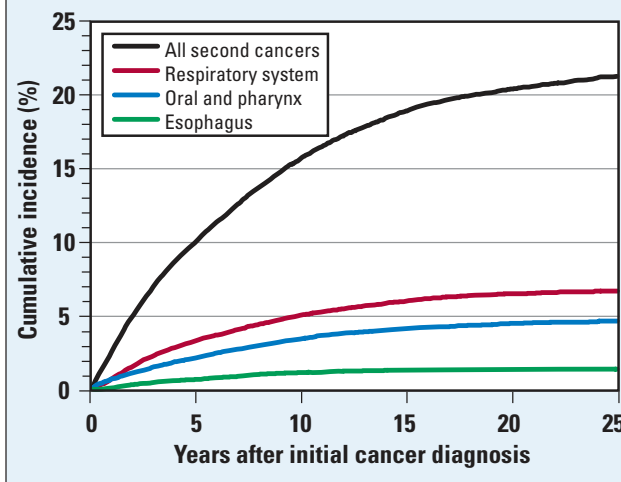
The major risk factors for oral and pharyngeal cancer are use of alcohol and tobacco, which increase risk multiplicatively when combined (Blot et al, 1988; Franceschi et al, 1999). Other factors include poor oral hygiene and dentition, poor diet with insufficient fresh fruits and vegetables, and/or low socioeconomic status, even after adjusting for other risk factors (Greenberg et al, 1991; Brown et al, 2001). Recent studies have linked human papillomavirus infection (HPV) to a subset of oral cancers, predominantly those located in the tonsillar area or oropharynx (Gillison and Shah, 2003).

### Results and Discussion

Among the 39,501 2-month survivors of cancers of the oral cavity and pharynx, 7,076 subsequent primary cancers were observed (O/E=2.45, O=7,076, 95% CI=2.39-2.51, EAR=231). The cumulative incidence of developing any second cancer was 21.4% at 25 years (95% CI=20.8%-21.9%), which includes a 4.5% incidence of second cancers of the oral cavity and pharynx (Figure 3.1). Subsequent cancer risks were elevated about 2- to 3-fold for initial cancers of the tongue, tonsil, mouth, oropharynx, and hypopharynx. Because patterns of subsequent cancers were similar across subsites of the oral cavity and pharynx, we combined them for purposes of discussion, but the data tables also show risks separately by individual sites. In the cohort of all oral cavity and pharyngeal cancers, only slight variations in subsequent cancer risks were seen across latency periods and by gender. However, susceptibility to a subsequent cancer varied substantially by age at diagnosis, with the highest relative risks (a nearly 5-fold increase) observed for patients diagnosed with oral and pharyngeal cancer at ages younger than 50 years (Figure 3.2). In contrast, absolute risks were highest in those diagnosed at ages 50 to 69 years (Figure 3.2). Blacks had a higher risk of new malignancies than whites. Although more than 60% of the patients with cancers of the oral cavity and pharynx received initial radiotherapy, this therapy did not appear to have a major effect on the risk of subsequent cancers arising in the radiotherapy field or in sites receiving scatter radiation.

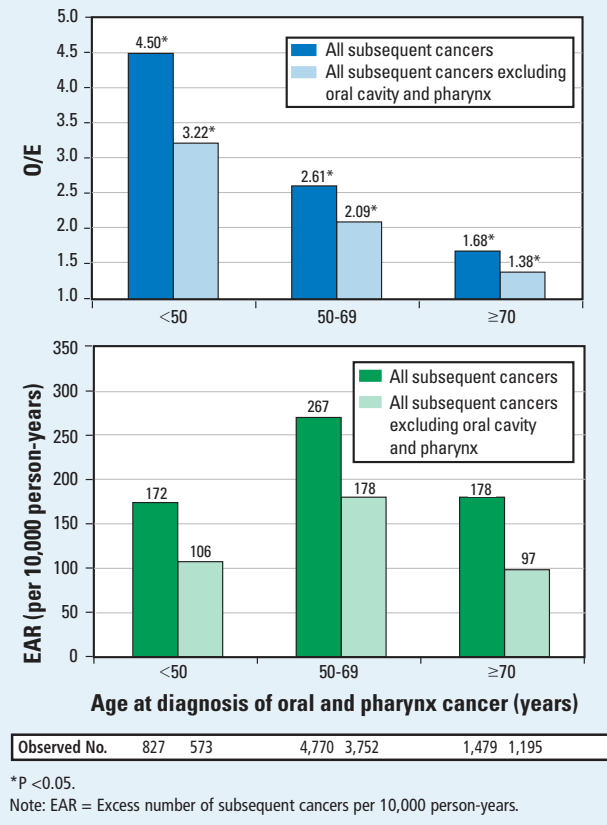
For all oral and pharyngeal cancers combined, the increased risks of subsequent subsites of oral/pharyngeal cancer and esophageal cancer were very high, ranging from 16- to 33-fold. In addition, risks were significantly elevated, but to a lesser extent (4- to 7-fold), for new cancers of the lip, salivary glands, and nasopharynx. Risks were also significantly elevated for subsequent

**Figure 3.1:** Cumulative incidence of developing a second cancer among patients with cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, SEER 1973-2000.





**Figure 3.2:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after cancer of the oral cavity and pharynx, both sexes, SEER 1973-2000.



malignancies of the nasal cavity, larynx, and lung (4- to 6-fold); for malignancies of the colon, rectum, stomach, liver, pancreas, and urinary bladder (1.2- to 3-fold); and for non-melanoma eye cancer (5-fold). In addition, significant or borderline significant elevated risks were found for new malignancies of the anogenital region (anus, cervix, vagina, vulva, and penis). Taken together, these findings resemble other studies of oral and pharyngeal cancers indicating elevated risks for subsequent oral, esophageal, respiratory, digestive, and anogenital cancers (Tepperman and Fitzpatrick, 1981; Schou et al, 1985; Winn and Blot, 1985; Day and Blot, 1992; Day et al, 1994; Macfarlane et al, 1995; Crosher

and McIlroy, 1998; Hemminki et al, 2001; Rafferty and O'Dwyer, 2001).

Tobacco and/or alcohol consumption, the major causes of oral/pharynx cancer, probably account for much of the increased risk of subsequent oral/pharynx and esophageal cancers (La Vecchia et al, 1997), in addition to contributing to new malignancies of the larynx, liver, nasal cavity, lung, stomach, urinary bladder, and pancreas (Day and Blot, 1992). The modestly elevated risks of colon (O/E=1.17) and rectal (O/E=1.32) cancers may also reflect alcohol consumption, smoking, and possibly dietary deficiencies (e.g., folic acid) (Potter, 1999; Giovannucci, 2002). The tendency toward multicentric cancers of the upper aerodigestive system appears to involve "field cancerization" mechanisms resulting from the interplay of smoking, alcohol, dietary factors, and genetic alterations.

The elevated risk of anogenital tumors following oral and pharyngeal cancer may be attributed in part to HPV infection, especially because significant reciprocal excesses of oral cancer were seen following cancers of the anus, cervix, vulva, and penis (Table 3.A). Several recent studies have suggested that HPV infection, the major risk factor for cancers of the anogenital tract, is also involved in certain subsites of oral cancer, particularly the tonsils and the base of the tongue (Gillison and Shah, 2003; Herrero et al, 2003). Smoking may also be involved, as it is a risk factor for cervical as well as oral cancers. Finally, the 5-fold elevated risk of non-melanoma eye cancer, based on 4 cases of squamous cell carcinoma of the conjunctiva and lacrimal ducts, deserves further study, in light of the possible role of HPV infection in conjunctival squamous cell carcinomas (Gillison and Shah, 2003).

### Salivary Gland Cancers

Malignant tumors of the salivary gland are a heterogeneous and uncommon group, constituting somewhat more than 10% of all buccal cavity and pharyngeal cancers. Standard treatment is surgical excision (Shrestha et al, 1996) and prognosis is generally good, with 5- and 10-year relative survival rates of 75.3% and 70.5%, respectively. Approximately 50% of SEER patients received adjuvant radiation therapy to minimize

**Table 3.A:** Risk of a subsequent oral and pharyngeal cancer following a primary anogenital cancer.

First primary anogenital cancer site	Subsequent primary oral and pharyngeal cancer site											
	Tonsil		Tongue		Mouth		Hypopharynx		Oropharynx		All buccal cavity and pharynx	
	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E
Anus	7	8.1*	9	4.6*	5	1.9	1	1.2	0	0.0	24	2.6*
Cervix uteri	13	3.9*	10	1.3	20	1.8*	8	3.4*	1	1.2	65	1.9*
Vulva	1	1.6	7	3.8*	9	3.1*	2	4.0	0	0.0	21	2.5*
Penis	2	3.0	5	3.7*	4	2.3	2	2.5	0	0.0	17	2.3*

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers.

\*P < 0.05 (95% confidence interval does not include 1.0).

disfigurement and recurrence, while chemotherapy was reserved for advanced and recurrent disease (Shrestha et al, 1996).

The only well-established risk factor for salivary gland cancer is ionizing radiation (Land et al, 1996; Saku et al, 1997; Modan et al, 1998). Positive associations, however, have been reported in certain industries, including rubber manufacturing and woodworking in the automobile industry, and also with occupational exposure to nickel and radioactive materials (Horn-Ross et al, 1997; Swanson and Burns, 1997; Sun et al, 1999). There is uncertainty about the possible role of smoking, alcohol, and UV exposures (Horn-Ross et al, 1997; Muscat and Wynder, 1998; Hayes et al, 1999).

### Results and Discussion

Of the 5,551 individuals who survived at least 2 months after a diagnosis of salivary gland cancer, 644 new malignancies were observed (O/E=1.25, O=644, 95% CI=1.16-1.35, EAR=33). The estimated cumulative incidence of second cancer was 17.3% at 25 years (95% CI=15.8%-18.8%). A 37% increased risk of subsequent cancer was observed for the period 1 to 5 years after salivary gland cancer diagnosis, but the increased risk declined to 11% among long-term survivors ( $\geq 10$  years). The overall risk was similar in younger (ages <60 years) and older patients ( $\geq 60$  years), but it was slightly higher in males compared with females. No significant excess of subsequent primary cancer was observed in the small proportion of black patients. Significantly elevated risks were observed for subsequent cancers of the buccal cavity (i.e., salivary gland, lip, tongue, and mouth), respiratory system (particularly lung and bronchus), male breast, and thyroid gland. These findings are generally consistent with previous population-based surveys of salivary gland cancers in Connecticut (Winn and Blot, 1985) and in the SEER Program through 1992 (Sun et al, 1999).

The risk of subsequent buccal cavity cancer was elevated by 3-fold or greater and may be related in part to diagnostic surveillance. The risk of subsequent lung cancer was increased about 60% for reasons that are unclear, although radiotherapy and smoking may have played a role. However, the risk of subsequent thyroid cancer was increased about 3-fold following salivary gland cancer, and a 2.8-fold increased risk of subsequent salivary gland cancer was seen after an initial thyroid cancer. This reciprocal association may be related in part to heightened medical screening of the head and neck area, radiotherapy, or earlier radiation exposures affecting both of these radiosensitive organs. The excess of male breast cancer, based on 3 cases, occurred in men treated with initial radiotherapy, but the short latency period for 2 of the cases appeared inconsistent with a radiation effect. Although salivary gland tumors have been linked to female breast cancer in some previous studies (Horn-Ross et al, 1999), no relationship was seen in this survey, except for a nonsignificant 51%

excess for those younger than 35 years of age, based on only 4 cases.

### Nasopharyngeal Cancer

Nasopharyngeal cancer (NPC) is relatively rare in the U.S., constituting less than 10% of cancers of the buccal cavity and pharynx. The incidence rate is greater in men than women, and in blacks than whites. The highest rates are seen in Asian populations, especially Chinese (Hildesheim and Levine, 1993). The overall 5-year relative survival rate is about 57.5%. The main histologic types of NPC are squamous cell, nonkeratinizing, and undifferentiated carcinomas (McDermott et al, 2001). Radiation therapy has been the treatment of choice, although in recent years it has been combined with chemotherapy for more advanced tumors (Forastiere et al, 2001).

The causal factors for this tumor include immunogenetic predisposition, Epstein-Barr virus (EBV) infection, and consumption of preserved foods or salted fish containing nitrosamines (Lu et al, 1990; Hildesheim and Levine, 1993; McDermott et al, 2001). Long-term smoking and occupational exposure to wood and formaldehyde may also increase risk, but eating fruit appears protective (Hildesheim and Levine, 1993; Vaughan et al, 1996; Farrow et al, 1998).

### Results and Discussion

Among the 3,651 individuals who survived at least 2 months following nasopharyngeal cancer, 267 subsequent primary cancers were observed, resulting in a significant 49% excess (O/E=1.49, O=267, 95% CI=1.31-1.68, EAR=47). Approximately 10% of patients with NPC developed a second cancer within 20 years of follow-up (cumulative incidence=10.1%, 95% CI=8.8%-11.4%). Subsequent primary cancer risks were substantially higher for short-term (<10 years) than long-term survivors ( $\geq 10$  years). Patients younger than 60 years of age at initial diagnosis had a substantially greater relative risk of new malignancies than older patients, but a lower excess absolute risk. Risks did not differ substantially by sex or race. About 90% of patients received radiotherapy, which limited our ability to compare subsequent primary cancer risks with the non-irradiated group. Risks were significantly increased for subsequent cancers of the buccal cavity and pharynx (especially the tongue and nasopharynx), esophagus, lung, nasal cavities and sinuses, and bone and joints, as well as for NHL. A previous survey of NPC revealed elevated risks for second cancers of the head and neck (Wang et al, 2000), but not for other sites with excess rates in our study.

The reasons for the associations observed are unclear, but tobacco use (Vaughan et al, 1996; McDermott et al, 2001) may have contributed to the excess risks of cancers of the buccal cavity, esophagus, and lung. However, it is possible that tumors arising close to the pharynx may

have been initially misclassified as NPC. In addition, radiotherapy probably contributed to the excess of bone tumors, which arose in irradiated fields involving the head in the 2 patients receiving initial radiotherapy. EBV infection, which has been etiologically linked to NPC (Hildesheim and Levine, 1993; McDermott et al, 2001) and NHL, may have contributed to this combination of multiple cancers.

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**Table 3.1.1:** Characteristics of patients with an initial cancer of the lip, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	7,077	100.0	1,111	100.0	8,188	100.0
<b>Initial treatment</b>						
Any radiation	428	6.0	97	8.7	525	6.4
With surgery	242	3.4	60	5.4	302	3.7
Without surgery	186	2.6	37	3.3	223	2.7
No radiation	6,649	94.0	1,014	91.3	7,663	93.6
With surgery	6,116	86.4	914	82.3	7,030	85.9
Without surgery	533	7.5	100	9.0	633	7.7
<b>Race</b>						
White	6,925	97.9	1,055	95.0	7,980	97.5
Black	24	0.3	19	1.7	43	0.5
Other	40	0.6	16	1.4	56	0.7
Unknown	88	1.2	21	1.9	109	1.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	77	1.1	15	1.4	92	1.1
30–49	926	13.1	128	11.5	1,054	12.9
50–69	3,333	47.1	374	33.7	3,707	45.3
70–79	1,780	25.2	309	27.8	2,089	25.5
≥ 80	961	13.6	285	25.7	1,246	15.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	5,610	79.3	969	87.2	6,579	80.3
1st and 2nd cancers	1,292	18.3	132	11.9	1,424	17.4
1st, 2nd, and 3rd cancers	161	2.3	10	0.9	171	2.1
1st, 2nd, 3rd, and additional cancers	14	0.2	0	0.0	14	0.2
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	66.4	—	71.5	—	67.0	—
Median year of 1st cancer diagnosis	1984.1	—	1987.9	—	1984.6	—
Median person-years at risk	7.6	—	6.2	—	7.5	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.0	—	90.8	—	93.7
1st, 2nd, and additional cancers	—	92.8	—	90.8	—	92.7
1st cancer only	—	5.3	—	8.5	—	5.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



**Lip**  
**Both Sexes**

**Table 3.1.2:** Risk of subsequent primary cancers after cancer of the lip, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	8,188		7,689		5,374		3,156		8,188			
Number starting interval	6,607		25,889		20,897		20,240		73,634			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	131	1.09	645	1.29*	532	1.19*	506	1.02	1,814	1,562.42	1.16*	34.17
All excluding same site	126	1.06	616	1.24*	512	1.16*	485	0.98	1,739	1,553.50	1.12*	25.19
<b>Buccal cavity, pharynx</b>	15	4.07*	65	4.42*	44	3.62*	34	2.83*	158	42.59	3.71*	15.67
Lip	5	6.09*	29	9.10*	20	7.87*	21	8.85*	75	8.92	8.41*	8.97
Tongue	0	0.00	5	1.88	6	2.67	1	0.43	12	7.86	1.53	0.56
Salivary gland	1	3.41	9	7.33*	5	4.53*	4	3.14	19	3.90	4.87*	2.05
Mouth	9	10.04*	18	5.04*	8	2.75*	8	2.88*	43	10.15	4.24*	4.46
Nasopharynx	0	0.00	0	0.00	1	2.76	0	0.00	1	1.27	0.78	-0.04
Tonsil	0	0.00	2	1.60	2	1.96	0	0.00	4	3.58	1.12	0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.13	0.00	-0.15
Hypopharynx	0	0.00	2	1.33	2	1.61	0	0.00	4	4.31	0.93	-0.04
<b>Digestive system</b>	18	0.65	111	0.98	106	1.07	97	0.93	332	344.49	0.96	-1.70
Esophagus	2	1.45	6	1.05	6	1.18	7	1.19	21	18.06	1.16	0.40
Stomach	2	0.64	15	1.20	9	0.86	9	0.85	35	36.71	0.95	-0.23
Small intestine	0	0.00	2	1.44	0	0.00	2	1.34	4	4.46	0.90	-0.06
Colon	7	0.56	42	0.82	53	1.17	48	1.00	150	156.81	0.96	-0.92
Rectum, rectosigmoid junction	5	0.97	26	1.24	19	1.07	14	0.78	64	61.67	1.04	0.32
Anus, anal canal	1	5.35	1	1.30	1	1.48	3	4.12	6	2.36	2.54	0.49
Liver	1	1.19	1	0.28	2	0.63	6	1.56	10	11.39	0.88	-0.19
Gallbladder	0	0.00	2	1.66	1	1.01	1	1.04	4	3.46	1.16	0.07
Bile ducts, other biliary	0	0.00	3	1.27	3	1.40	3	1.16	9	7.66	1.18	0.18
Pancreas	0	0.00	11	0.84	12	1.08	4	0.34*	27	39.12	0.69	-1.65
<b>Respiratory system</b>	26	1.14	158	1.68*	148	1.81*	123	1.41*	455	285.25	1.60*	23.05
Nose, nasal cavity, ear	1	5.37	1	1.32	1	1.54	3	4.35	6	2.29	2.62	0.50
Larynx	3	1.71	15	2.11*	12	2.01*	9	1.53	39	20.70	1.88*	2.49
Lung, bronchus	22	1.06	141	1.65*	135	1.80*	111	1.38*	409	261.52	1.56*	20.03
<b>Female breast</b>	4	1.27	14	1.15	11	1.12	11	1.24	40	34.03	1.18	6.75
<b>Female genital system</b>	3	2.10	4	0.74	4	0.96	1	0.28	12	14.58	0.82	-2.92
Cervix uteri	0	0.00	1	1.85	0	0.00	0	0.00	1	1.35	0.74	-0.40
Corpus uteri	1	1.40	3	1.11	3	1.46	0	0.00	7	7.28	0.96	-0.32
Ovary	1	2.37	0	0.00	0	0.00	1	0.88	2	4.46	0.45	-2.78
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.28
Vulva	0	0.00	0	0.00	1	3.92	0	0.00	1	0.87	1.15	0.15
<b>Male genital system</b>	30	0.97	139	1.04	111	0.88	125	0.81*	405	446.32	0.91	-6.38
Prostate	29	0.95	138	1.04	110	0.88	124	0.81*	401	441.87	0.91	-6.31
Testis	0	0.00	0	0.00	0	0.00	1	3.14	1	1.46	0.69	-0.07
<b>Urinary system</b>	7	0.59	65	1.32*	46	1.05	39	0.78	157	154.67	1.02	0.32
Urinary bladder	6	0.69	46	1.27	37	1.14	31	0.84	120	114.23	1.05	0.78
Kidney parenchyma	0	0.00	12	1.21	6	0.67	6	0.58	24	31.45	0.76	-1.01
Renal pelvis, other urinary	1	1.36	7	2.32	3	1.17	2	0.75	13	8.99	1.45	0.54
Ureter	0	0.00	1	0.97	1	1.13	2	2.19	4	3.08	1.30	0.12
<b>Bone, joints</b>	0	0.00	1	2.33	1	2.83	0	0.00	2	1.25	1.60	0.10
<b>Soft tissue including heart</b>	0	0.00	2	1.05	0	0.00	2	1.04	4	5.94	0.67	-0.26
<b>Kaposi sarcoma</b>	1	5.30	1	1.29	0	0.00	0	0.00	2	2.28	0.88	-0.04
<b>Melanoma of skin</b>	5	1.99	18	1.66	8	0.78	22	1.68*	53	36.81	1.44*	2.20
<b>Eye, orbit</b>	0	0.00	2	2.60	0	0.00	0	0.00	2	2.30	0.87	-0.04
<b>Brain, central nervous system</b>	1	0.83	0	0.00*	1	0.23	2	0.43	4	15.05	0.27*	-1.50
<b>Thyroid</b>	0	0.00	3	1.78	1	0.70	1	0.67	5	5.03	0.99	0.00
<b>Lymphatic, hematopoietic</b>	15	1.66	44	1.17	40	1.19	39	1.03	138	118.14	1.17	2.70
Hodgkin lymphoma	3	9.34*	6	4.86*	2	2.07	1	1.08	12	3.45	3.48*	1.16
Non-Hodgkin lymphoma	9	2.44*	23	1.48	15	1.05	13	0.77	60	50.56	1.19	1.28
Myeloma	1	0.68	1	0.16*	6	1.11	9	1.47	17	19.09	0.89	-0.28
Leukemia	2	0.56	14	0.95	17	1.32	16	1.15	49	45.04	1.09	0.54
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.14	0.00	-0.16
Chronic lymphocytic	0	0.00	8	1.32	4	0.75	7	1.25	19	18.46	1.03	0.07
Acute non-lymphocytic	1	0.87	3	0.63	7	1.68	6	1.30	17	14.68	1.16	0.31
Chronic myeloid	1	2.10	2	1.03	4	2.37	2	1.06	9	6.00	1.50	0.41

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,839 PYR and for male cancers on 64,795 PYR.

**Table 3.1.3:** Risk of subsequent primary cancers after cancer of the lip, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	1,111 886		1,026 3,348		670 2,526		366 2,079		1,111 8,839			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	18	1.52	61	1.33*	44	1.20	29	0.89	152	126.88	1.20*	28.42
All excluding same site	17	1.44	58	1.27	42	1.14	29	0.89	146	126.69	1.15	21.84
<b>Buccal cavity, pharynx</b>	2	9.64*	5	6.27*	7	11.12*	1	1.84	15	2.18	6.88*	14.50
Lip	1	56.63	3	44.54*	2	37.09*	0	0.00	6	0.19	32.36*	6.58
Tongue	0	0.00	0	0.00	2	14.42*	0	0.00	2	0.48	4.19	1.72
Salivary gland	0	0.00	0	0.00	0	0.00	1	15.24	1	0.26	3.90	0.84
Mouth	1	13.50	2	6.99	3	13.29*	0	0.00	6	0.78	7.69*	5.91
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.14
<b>Digestive system</b>	4	1.28	14	1.17	10	1.05	8	1.01	36	32.61	1.10	3.84
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.93
Stomach	0	0.00	2	2.14	0	0.00	1	1.80	3	2.46	1.22	0.62
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.48
Colon	1	0.62	7	1.13	6	1.21	2	0.49	16	16.88	0.95	-1.00
Rectum, rectosigmoid junction	2	4.13	3	1.63	2	1.42	1	0.88	8	4.87	1.64	3.54
Rectum	2	6.29	3	2.48	1	1.08	1	1.31	7	3.22	2.17	4.27
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.44
Liver	1	17.77	0	0.00	0	0.00	2	12.44*	3	0.61	4.90	2.70
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.84
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	5.06	1	0.75	1.33	0.28
Pancreas	0	0.00	1	0.65	2	1.61	1	0.94	4	4.24	0.94	-0.27
<b>Respiratory system</b>	3	2.21	11	2.03*	9	1.96	4	0.88	27	15.89	1.70*	12.57
Nose, nasal cavity, ear	1	62.02	0	0.00	0	0.00	0	0.00	1	0.18	5.71	0.93
Larynx	1	24.14	0	0.00	0	0.00	0	0.00	1	0.45	2.24	0.63
Lung, bronchus	1	0.77	11	2.12*	9	2.05	4	0.92	25	15.22	1.64*	11.06
<b>Female breast</b>	4	1.27	14	1.15	11	1.12	11	1.24	40	34.03	1.18	6.75
<b>Female genital system</b>	3	2.10	4	0.74	4	0.96	1	0.28	12	14.58	0.82	-2.92
Cervix uteri	0	0.00	1	1.85	0	0.00	0	0.00	1	1.35	0.74	-0.40
Corpus uteri	1	1.40	3	1.11	3	1.46	0	0.00	7	7.28	0.96	-0.32
Ovary	1	2.37	0	0.00	0	0.00	1	0.88	2	4.46	0.45	-2.78
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.28
Vulva	0	0.00	0	0.00	1	3.92	0	0.00	1	0.87	1.15	0.15
<b>Urinary system</b>	1	1.67	1	0.43	2	1.06	2	1.18	6	6.53	0.92	-0.60
Urinary bladder	1	2.67	1	0.69	2	1.70	1	0.97	5	4.04	1.24	1.09
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	1.89	1	1.94	0.52	-1.06
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.63
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.20
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.13
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.57
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.08
<b>Melanoma of skin</b>	0	0.00	3	3.50	0	0.00	0	0.00	3	2.45	1.22	0.62
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.21
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.22	0.00	-1.38
<b>Thyroid</b>	0	0.00	2	5.94	0	0.00	0	0.00	2	0.90	2.22	1.24
<b>Lymphatic, hematopoietic</b>	1	1.04	6	1.60	1	0.33	2	0.74	10	10.45	0.96	-0.50
Hodgkin lymphoma	0	0.00	1	9.50	0	0.00	0	0.00	1	0.27	3.64	0.82
Non-Hodgkin lymphoma	0	0.00	3	1.72	1	0.69	1	0.75	5	4.97	1.01	0.03
Myeloma	1	6.29	0	0.00	0	0.00	0	0.00	1	1.70	0.59	-0.80
Leukemia	0	0.00	2	1.56	0	0.00	1	1.15	3	3.50	0.86	-0.56
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.37	0.00	-1.55
Acute non-lymphocytic	0	0.00	1	2.29	0	0.00	1	3.27	2	1.20	1.66	0.90
Chronic myeloid	0	0.00	1	5.70	0	0.00	0	0.00	1	0.48	2.09	0.59

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 3.1.4:** Risk of subsequent primary cancers after cancer of the lip, males, SEER 1973-2000.

Number starting interval Person-years in interval Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	7,077		6,663		4,704		2,790		7,077			
	5,722		22,541		18,371		18,161		64,795			
<b>All subsequent cancers</b>	113	1.05	584	1.29*	488	1.19*	477	1.03	1,662	1,435.54	1.16*	34.95
All excluding same site	109	1.02	558	1.24*	470	1.16*	456	0.99	1,593	1,426.81	1.12*	25.65
<b>Buccal cavity, pharynx</b>	13	3.74*	60	4.31*	37	3.21*	33	2.87*	143	40.41	3.54*	15.83
Lip	4	4.98*	26	8.34*	18	7.24*	21	9.03*	69	8.73	7.90*	9.30
Tongue	0	0.00	5	2.02	4	1.90	1	0.46	10	7.39	1.35	0.40
Salivary gland	1	3.72	9	7.93*	5	4.86*	3	2.48	18	3.64	4.94*	2.22
Mouth	8	9.73*	16	4.87*	5	1.86	8	3.10*	37	9.37	3.95*	4.26
Nasopharynx	0	0.00	0	0.00	1	2.92	0	0.00	1	1.20	0.83	-0.03
Tonsil	0	0.00	2	1.68	2	2.05	0	0.00	4	3.42	1.17	0.09
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.08	0.00	-0.17
Hypopharynx	0	0.00	2	1.38	2	1.66	0	0.00	4	4.18	0.96	-0.03
<b>Digestive system</b>	14	0.57*	97	0.95	96	1.08	89	0.92	296	311.88	0.95	-2.45
Esophagus	2	1.53	6	1.11	6	1.24	7	1.23	21	17.24	1.22	0.58
Stomach	2	0.69	13	1.12	9	0.92	8	0.80	32	34.25	0.93	-0.35
Small intestine	0	0.00	2	1.61	0	0.00	2	1.46	4	4.04	0.99	-0.01
Colon	6	0.55	35	0.77	47	1.17	46	1.05	134	139.92	0.96	-0.91
Rectum, rectosigmoid junction	3	0.64	23	1.21	17	1.04	13	0.78	56	56.79	0.99	-0.12
Anus, anal canal	1	6.62	1	1.58	1	1.78	3	4.80	6	1.97	3.05*	0.62
Liver	0	0.00	1	0.30	2	0.66	4	1.09	7	10.78	0.65	-0.58
Gallbladder	0	0.00	2	2.18	1	1.30	1	1.26	4	2.71	1.48	0.20
Bile ducts, other biliary	0	0.00	3	1.43	3	1.56	2	0.84	8	6.90	1.16	0.17
Pancreas	0	0.00	10	0.87	10	1.01	3	0.28*	23	34.88	0.66*	-1.83
<b>Respiratory system</b>	23	1.08	147	1.66*	139	1.80*	119	1.44*	428	269.36	1.59*	24.48
Nose, nasal cavity, ear	0	0.00	1	1.43	1	1.67	3	4.65	5	2.11	2.37	0.45
Larynx	2	1.16	15	2.16*	12	2.06*	9	1.56	38	20.25	1.88*	2.74
Lung, bronchus	21	1.08	130	1.61*	126	1.79*	107	1.41*	384	246.30	1.56*	21.25
<b>Male breast</b>	0	0.00	1	1.19	1	1.34	0	0.00	2	2.66	0.75	-0.10
<b>Male genital system</b>	30	0.97	139	1.04	111	0.88	125	0.81*	405	446.32	0.91	-6.38
Prostate	29	0.95	138	1.04	110	0.88	124	0.81*	401	441.87	0.91	-6.31
Testis	0	0.00	0	0.00	0	0.00	1	3.14	1	1.46	0.69	-0.07
<b>Urinary system</b>	6	0.54	64	1.37*	44	1.05	37	0.77	151	148.15	1.02	0.44
Urinary bladder	5	0.60	45	1.29	35	1.12	30	0.84	115	110.19	1.04	0.74
Kidney parenchyma	0	0.00	12	1.30	6	0.71	5	0.51	23	29.52	0.78	-1.01
Renal pelvis, other urinary	1	1.47	7	2.49	3	1.25	2	0.79	13	8.44	1.54	0.70
Ureter	0	0.00	1	1.04	1	1.20	2	2.29	4	2.91	1.38	0.17
<b>Bone, joints</b>	0	0.00	1	2.58	1	3.11	0	0.00	2	1.14	1.76	0.13
<b>Soft tissue including heart</b>	0	0.00	2	1.16	0	0.00	2	1.12	4	5.43	0.74	-0.22
<b>Kaposi sarcoma</b>	1	5.48	1	1.33	0	0.00	0	0.00	2	2.22	0.90	-0.03
<b>Melanoma of skin</b>	5	2.17	15	1.50	8	0.83	22	1.76*	50	34.36	1.46*	2.41
<b>Eye, orbit</b>	0	0.00	2	2.86	0	0.00	0	0.00	2	2.12	0.95	-0.02
<b>Brain, central nervous system</b>	1	0.92	0	0.00*	1	0.25	2	0.47	4	13.83	0.29*	-1.52
<b>Thyroid</b>	0	0.00	1	0.74	1	0.86	1	0.78	3	4.12	0.73	-0.17
<b>Lymphatic, hematopoietic</b>	14	1.73	38	1.12	39	1.28	37	1.05	128	107.69	1.19	3.13
Hodgkin lymphoma	3	10.25*	5	4.43*	2	2.24	1	1.16	11	3.17	3.47*	1.21
Non-Hodgkin lymphoma	9	2.78*	20	1.45	14	1.09	12	0.77	55	45.59	1.21	1.45
Myeloma	0	0.00	1	0.18	6	1.22	9	1.58	16	17.39	0.92	-0.21
Leukemia	2	0.61	12	0.89	17	1.44	15	1.15	46	41.54	1.11	0.69
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.16
Chronic lymphocytic	0	0.00	8	1.44	4	0.82	7	1.32	19	17.09	1.11	0.30
Acute non-lymphocytic	1	0.97	2	0.46	7	1.83	5	1.16	15	13.48	1.11	0.23
Chronic myeloid	1	2.32	1	0.56	4	2.58	2	1.13	8	5.52	1.45	0.38

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



**Table 3.1.5:** Risk of subsequent primary cancers after cancer of the lip, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	1,146 936		1,102 3,994		901 3,866		655 5,584		1,146 14,380			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	5	2.80	17	1.68	31	1.89*	78	1.23	131	91.53	1.43*	27.45
All excluding same site	4	2.26	15	1.49	27	1.66*	74	1.18	120	91.03	1.32*	20.15
<b>Buccal cavity, pharynx</b>	2	20.63*	2	3.53	7	8.00*	8	3.61*	19	3.75	5.06*	10.60
Lip	1	56.46	2	22.59*	4	34.74*	4	14.19*	11	0.50	21.86*	7.30
Tongue	0	0.00	0	0.00	1	5.26	0	0.00	1	0.83	1.20	0.12
Salivary gland	0	0.00	0	0.00	0	0.00	1	6.15	1	0.27	3.69	0.51
Mouth	1	42.58	0	0.00	1	4.43	3	5.67*	5	0.92	5.44*	2.84
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.32
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.08
Hypopharynx	0	0.00	0	0.00	1	11.73	0	0.00	1	0.37	2.67	0.44
<b>Digestive system</b>	0	0.00	3	1.69	6	1.94	13	1.14	22	16.59	1.33	3.76
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.86
Stomach	0	0.00	2	9.39*	1	2.95	2	1.83	5	1.68	2.97	2.31
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.23
Colon	0	0.00	0	0.00	3	2.63	5	1.11	8	6.37	1.26	1.13
Rectum, rectosigmoid junction	0	0.00	1	2.65	0	0.00	4	1.71	5	3.46	1.45	1.07
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	7.30	1	0.22	4.49	0.54
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.52
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.07
Bile ducts, other biliary	0	0.00	0	0.00	1	17.62	0	0.00	1	0.34	2.98	0.46
Pancreas	0	0.00	0	0.00	1	2.71	1	0.76	2	1.95	1.03	0.04
<b>Respiratory system</b>	2	6.83	1	0.53	10	2.96*	29	2.42*	42	17.55	2.39*	17.00
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	2	19.46*	2	0.17	11.51*	1.27
Larynx	0	0.00	0	0.00	3	7.65*	2	1.78	5	1.78	2.81	2.24
Lung, bronchus	2	8.03	1	0.62	7	2.39	25	2.33*	35	15.54	2.25*	13.53
<b>Female breast</b>	0	0.00	2	2.95	0	0.00	2	1.36	4	3.09	1.29	5.99
<b>Female genital system</b>	0	0.00	1	3.59	0	0.00	0	0.00	1	1.25	0.80	-1.64
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-1.42
Corpus uteri	0	0.00	1	9.41	0	0.00	0	0.00	1	0.58	1.73	2.80
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-2.56
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.24
<b>Male genital system</b>	0	0.00	0	0.00	1	0.47	10	0.53*	11	21.81	0.50*	-8.40
Prostate	0	0.00	0	0.00	1	0.54	9	0.49*	10	20.94	0.48*	-8.50
Testis	0	0.00	0	0.00	0	0.00	1	5.70	1	0.70	1.42	0.23
<b>Urinary system</b>	0	0.00	1	1.07	1	0.63	4	0.68	6	8.57	0.70	-1.79
Urinary bladder	0	0.00	1	1.83	0	0.00	3	0.78	4	5.47	0.73	-1.02
Kidney parenchyma	0	0.00	0	0.00	1	1.80	1	0.57	2	2.72	0.73	-0.50
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.26
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.08
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	3.68	1	0.50	1.99	0.35
<b>Kaposi sarcoma</b>	0	0.00	1	3.91	0	0.00	0	0.00	1	0.82	1.23	0.13
<b>Melanoma of skin</b>	1	6.24	2	2.53	1	0.99	5	1.99	9	4.47	2.01	3.15
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.14
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-1.11
<b>Thyroid</b>	0	0.00	0	0.00	1	4.52	1	2.42	2	0.89	2.25	0.77
<b>Lymphatic, hematopoietic</b>	0	0.00	4	3.40	4	2.42	3	0.63	11	7.83	1.40	2.20
Hodgkin lymphoma	0	0.00	1	6.84	0	0.00	0	0.00	1	0.53	1.88	0.33
Non-Hodgkin lymphoma	0	0.00	3	4.92	2	2.35	2	0.84	7	3.97	1.76	2.11
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.99	0.00	-0.69
Leukemia	0	0.00	0	0.00	2	4.23	1	0.67	3	2.35	1.28	0.45
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.08
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	1.58	1	0.92	1.09	0.05
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.51
Chronic myeloid	0	0.00	0	0.00	1	14.21	0	0.00	1	0.34	2.98	0.46

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,513 PYR and for male cancers on 12,868 PYR.

**Lip**  
**50-69 Years of Age**

**Table 3.1.6:** Risk of subsequent primary cancers after cancer of the lip, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	3,707		3,566		2,786		1,827		3,707			
Number starting interval	3,028		12,702		11,466		12,144		39,341			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	54	1.34*	269	1.31*	300	1.22*	349	1.00	972	840.12	1.16*	33.52
All excluding same site	53	1.33	261	1.28*	290	1.19*	334	0.96	938	835.51	1.12*	26.05
<b>Buccal cavity, pharynx</b>	5	2.98	27	3.56*	22	2.97*	23	2.83*	77	24.81	3.10*	13.27
Lip	1	3.43	8	6.01*	10	7.35*	15	9.24*	34	4.61	7.38*	7.47
Tongue	0	0.00	3	2.01	3	2.06	1	0.64	7	4.84	1.45	0.55
Salivary gland	0	0.00	2	4.28	3	5.61*	2	2.43	7	1.92	3.65*	1.29
Mouth	4	9.37*	11	5.81*	3	1.67	5	2.69	23	5.97	3.85*	4.33
Nasopharynx	0	0.00	0	0.00	1	4.26	0	0.00	1	0.78	1.28	0.06
Tonsil	0	0.00	2	2.69	2	2.94	0	0.00	4	2.25	1.78	0.45
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.19
Hypopharynx	0	0.00	1	1.11	0	0.00	0	0.00	1	2.81	0.36	-0.46
<b>Digestive system</b>	4	0.47	37	0.87	58	1.16	64	0.90	163	172.85	0.94	-2.50
Esophagus	0	0.00	1	0.37	5	1.65	6	1.45	12	10.44	1.15	0.40
Stomach	0	0.00	4	0.88	4	0.77	6	0.84	14	17.81	0.79	-0.97
Small intestine	0	0.00	1	1.69	0	0.00	2	1.95	3	2.43	1.23	0.14
Colon	1	0.29	13	0.73	28	1.29	30	0.92	72	75.44	0.95	-0.87
Rectum, rectosigmoid junction	2	1.11	11	1.25	11	1.12	8	0.64	32	32.84	0.97	-0.21
Anus, anal canal	0	0.00	1	2.83	1	2.63	2	4.25	4	1.28	3.13	0.69
Liver	1	3.33	0	0.00	1	0.55	3	1.10	5	6.34	0.79	-0.34
Gallbladder	0	0.00	0	0.00	1	2.39	1	1.59	2	1.47	1.36	0.14
Bile ducts, other biliary	0	0.00	2	2.49	0	0.00	3	1.75	5	3.66	1.37	0.34
Pancreas	0	0.00	4	0.80	7	1.22	3	0.37	14	19.81	0.71	-1.48
<b>Respiratory system</b>	15	1.62	91	2.01*	88	1.76*	83	1.32*	277	167.63	1.65*	27.80
Nose, nasal cavity, ear	0	0.00	1	3.02	1	2.87	1	2.16	3	1.21	2.47	0.45
Larynx	3	3.37	12	2.97*	6	1.50	6	1.44	27	13.09	2.06*	3.53
Lung, bronchus	12	1.45	77	1.89*	81	1.78*	76	1.30*	246	152.92	1.61*	23.66
<b>Female breast</b>	0	0.00	5	1.12	8	1.76	8	1.47	21	15.43	1.36	14.57
<b>Female genital system</b>	2	3.97	0	0.00	1	0.49	1	0.45	4	6.93	0.58	-7.67
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-1.56
Corpus uteri	0	0.00	0	0.00	1	0.89	0	0.00	1	3.80	0.26	-7.32
Ovary	1	7.22	0	0.00	0	0.00	1	1.44	2	2.04	0.98	-0.10
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.24
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.72
<b>Male genital system</b>	9	0.99	40	0.76	68	0.95	96	0.85	213	246.33	0.86*	-9.38
Prostate	9	1.00	40	0.77	68	0.95	96	0.86	213	244.28	0.87*	-8.81
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.16
<b>Urinary system</b>	3	0.77	27	1.37	23	0.97	26	0.75	79	82.07	0.96	-0.78
Urinary bladder	3	1.12	20	1.45	20	1.18	22	0.85	65	59.24	1.10	1.46
Kidney parenchyma	0	0.00	6	1.27	2	0.38	3	0.42	11	18.13	0.61	-1.81
Renal pelvis, other urinary	0	0.00	1	0.84	1	0.73	1	0.53	3	4.70	0.64	-0.43
Ureter	0	0.00	0	0.00	1	2.06	1	1.51	2	1.64	1.22	0.09
<b>Bone, joints</b>	0	0.00	1	5.08	1	4.90	0	0.00	2	0.68	2.96	0.34
<b>Soft tissue including heart</b>	0	0.00	2	2.68	0	0.00	1	0.79	3	3.01	1.00	0.00
<b>Kaposi sarcoma</b>	1	21.86	0	0.00	0	0.00	0	0.00	1	0.71	1.41	0.07
<b>Melanoma of skin</b>	4	3.80*	8	1.57	3	0.52	13	1.50	28	20.60	1.36	1.88
<b>Eye, orbit</b>	0	0.00	1	2.82	0	0.00	0	0.00	1	1.28	0.78	-0.07
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	0.38	2	0.63	3	8.89	0.34*	-1.50
<b>Thyroid</b>	0	0.00	3	3.52	0	0.00	0	0.00	3	2.81	1.07	0.05
<b>Lymphatic, hematopoietic</b>	9	3.11*	20	1.38	22	1.28	25	0.97	76	60.42	1.26	3.96
Hodgkin lymphoma	2	15.05*	1	1.76	1	1.89	1	1.69	5	1.82	2.75	0.81
Non-Hodgkin lymphoma	6	4.71*	12	1.89	9	1.18	7	0.60	34	26.86	1.27	1.81
Myeloma	0	0.00	1	0.43	2	0.71	8	1.87	11	9.86	1.12	0.29
Leukemia	1	0.97	6	1.15	10	1.59	9	0.96	26	21.88	1.19	1.05
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.14
Chronic lymphocytic	0	0.00	4	1.76	2	0.75	4	1.06	10	9.20	1.09	0.20
Acute non-lymphocytic	1	3.18	1	0.61	5	2.44	3	0.94	10	7.21	1.39	0.71
Chronic myeloid	0	0.00	0	0.00	2	2.56	1	0.79	3	2.82	1.06	0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,821 PYR and for male cancers on 35,520 PYR.

**Table 3.1.7:** Risk of subsequent primary cancers after cancer of the lip, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	3,335		3,021		1,687		674		3,335			
Number starting interval	Person-years in interval		2,643		9,193		5,565		2,512		19,913	
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	72	0.92	359	1.26*	201	1.09	79	0.93	711	630.77	1.13*	40.29
All excluding same site	69	0.89	340	1.20*	195	1.07	77	0.91	681	626.96	1.09*	27.14
<b>Buccal cavity, pharynx</b>	8	4.20*	36	5.49*	15	3.88*	3	1.77	62	14.03	4.42*	24.09
Lip	3	5.86*	19	10.76*	6	5.64*	2	4.28	30	3.81	7.88*	13.15
Tongue	0	0.00	2	1.92	2	3.34	0	0.00	4	2.19	1.83	0.91
Salivary gland	1	5.25	7	9.75*	2	3.91	1	3.46	11	1.71	6.44*	4.67
Mouth	4	8.97*	7	4.56*	4	4.50*	0	0.00	15	3.26	4.61*	5.90
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.17
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-0.44
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.14
Hypopharynx	0	0.00	1	1.79	1	3.43	0	0.00	2	1.13	1.77	0.44
<b>Digestive system</b>	14	0.74	71	1.03	42	0.92	20	0.93	147	155.04	0.95	-4.04
Esophagus	2	2.47	5	1.73	1	0.55	1	1.15	9	6.39	1.41	1.31
Stomach	2	0.92	9	1.17	4	0.81	1	0.42	16	17.21	0.93	-0.61
Small intestine	0	0.00	1	1.33	0	0.00	0	0.00	1	1.70	0.59	-0.35
Colon	6	0.67	29	0.88	22	0.98	13	1.21	70	75.00	0.93	-2.51
Rectum, rectosigmoid junction	3	0.91	14	1.20	8	1.11	2	0.64	27	25.37	1.06	0.82
Anus, anal canal	1	9.29	0	0.00	0	0.00	0	0.00	1	0.86	1.16	0.07
Liver	0	0.00	1	0.52	1	0.80	3	5.09*	5	4.30	1.16	0.35
Gallbladder	0	0.00	2	2.37	0	0.00	0	0.00	2	1.88	1.06	0.06
Bile ducts, other biliary	0	0.00	1	0.65	2	1.81	0	0.00	3	3.66	0.82	-0.33
Pancreas	0	0.00	7	0.90	4	0.79	0	0.00	11	17.37	0.63	-3.20
<b>Respiratory system</b>	9	0.68	66	1.41*	50	1.77*	11	0.92	136	100.07	1.36*	18.04
Nose, nasal cavity, ear	1	9.12	0	0.00	0	0.00	0	0.00	1	0.90	1.11	0.05
Larynx	0	0.00	3	1.06	3	1.91	1	1.70	7	5.83	1.20	0.59
Lung, bronchus	8	0.66	63	1.45*	47	1.78*	10	0.90	128	93.06	1.38*	17.55
<b>Female breast</b>	4	1.99	7	0.99	3	0.67	1	0.52	15	15.50	0.97	-1.43
<b>Female genital system</b>	1	1.15	3	1.01	3	1.67	0	0.00	7	6.40	1.09	1.71
Cervix uteri	0	0.00	1	3.86	0	0.00	0	0.00	1	0.54	1.85	1.31
Corpus uteri	1	2.41	2	1.44	2	2.52	0	0.00	5	2.91	1.72	5.97
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	2.03	0.00	-5.80
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.42
Vulva	0	0.00	0	0.00	1	5.92	0	0.00	1	0.56	1.79	1.26
<b>Male genital system</b>	21	0.97	99	1.23*	42	0.80	19	0.81	181	178.19	1.02	1.72
Prostate	20	0.93	98	1.23	41	0.79	19	0.82	178	176.65	1.01	0.82
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.12
<b>Urinary system</b>	4	0.52	37	1.30	22	1.17	9	0.99	72	64.04	1.12	4.00
Urinary bladder	3	0.51	25	1.14	17	1.16	6	0.84	51	49.52	1.03	0.74
Kidney parenchyma	0	0.00	6	1.25	3	0.98	2	1.43	11	10.60	1.04	0.20
Renal pelvis, other urinary	1	2.02	6	3.37*	2	1.79	1	1.93	10	3.91	2.56*	3.06
Ureter	0	0.00	1	1.64	0	0.00	1	6.05	2	1.33	1.51	0.34
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.22
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.42	0.00	-1.22
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.38
<b>Melanoma of skin</b>	0	0.00	8	1.62	4	1.14	4	2.02	16	11.75	1.36	2.13
<b>Eye, orbit</b>	0	0.00	1	2.63	0	0.00	0	0.00	1	0.83	1.21	0.09
<b>Brain, central nervous system</b>	1	1.71	0	0.00	0	0.00	0	0.00	1	4.56	0.22	-1.79
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.32	0.00	-0.66
<b>Lymphatic, hematopoietic</b>	6	1.01	20	0.91	14	0.95	11	1.52	51	49.88	1.02	0.56
Hodgkin lymphoma	1	6.51	4	7.67*	1	3.37	0	0.00	6	1.09	5.48*	2.46
Non-Hodgkin lymphoma	3	1.31	8	0.93	4	0.68	4	1.36	19	19.73	0.96	-0.37
Myeloma	1	1.01	0	0.00	4	1.65	1	0.85	6	8.25	0.73	-1.13
Leukemia	1	0.40	8	0.87	5	0.82	6	2.00	20	20.81	0.96	-0.41
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.25
Chronic lymphocytic	0	0.00	4	1.09	2	0.82	2	1.66	8	8.34	0.96	-0.17
Acute non-lymphocytic	0	0.00	2	0.67	2	1.01	3	3.18	7	6.73	1.04	0.13
Chronic myeloid	1	2.99	2	1.61	1	1.19	1	2.37	5	2.84	1.76	1.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,505 PYR and for male cancers on 16,408 PYR.

## Oral and Pharynx Both Sexes

**Table 3.2.1:** Characteristics of patients with an initial cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	26,258	100.0	13,243	100.0	39,501	100.0
<b>Initial treatment</b>						
Any radiation	17,261	65.7	7,348	55.5	24,609	62.3
With surgery	8,568	32.6	3,524	26.6	12,092	30.6
Without surgery	8,693	33.1	3,824	28.9	12,517	31.7
No radiation	8,997	34.3	5,895	44.5	14,892	37.7
With surgery	7,255	27.6	5,055	38.2	12,310	31.2
Without surgery	1,742	6.6	840	6.3	2,582	6.5
<b>Race</b>						
White	21,665	82.5	11,358	85.8	33,023	83.6
Black	3,448	13.1	1,240	9.4	4,688	11.9
Other	1,096	4.2	567	4.3	1,663	4.2
Unknown	49	0.2	78	0.6	127	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	204	0.8	228	1.7	432	1.1
30–49	4,202	16.0	1,645	12.4	5,847	14.8
50–69	15,823	60.3	6,925	52.3	22,748	57.6
70–79	4,589	17.5	2,883	21.8	7,472	18.9
≥ 80	1,440	5.5	1,562	11.8	3,002	7.6
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	22,113	84.2	11,315	85.4	33,428	84.6
1st and 2nd cancers	3,592	13.7	1,642	12.4	5,234	13.3
1st, 2nd, and 3rd cancers	478	1.8	236	1.8	714	1.8
1st, 2nd, 3rd, and additional cancers	75	0.3	50	0.4	125	0.3
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	61.4	—	64.3	—	62.3	—
Median year of 1st cancer diagnosis	1987.4	—	1987.1	—	1987.3	—
Median person-years at risk	2.1	—	3.0	—	2.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.2	—	95.0	—	95.1
1st, 2nd, and additional cancers	—	94.5	—	94.3	—	94.5
1st cancer only	—	4.4	—	4.6	—	4.4

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 3.2.2:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis												
	<1 year		1-4 years		5-9 years		≥10 years		Total				
	39,501		29,707		13,108		6,132		39,501				
Number starting interval	Person-years in interval		28,564		75,465		45,956		31,319		181,304		EAR
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E		
<b>All subsequent cancers</b>	902	2.30*	2,981	2.71*	1,934	2.50*	1,259	2.02*	7,076	2,891.21	2.45*	230.82	
All excluding same site	722	1.88*	2,364	2.19*	1,471	1.93*	963	1.57*	5,520	2,835.93	1.95*	148.04	
<b>Buccal cavity, pharynx</b>	201	16.19*	701	21.46*	507	24.89*	324	23.23*	1,733	79.40	21.83*	91.21	
Lip	8	4.37*	21	4.39*	11	3.67*	9	4.35*	49	11.68	4.20*	2.06	
Tongue	47	19.14*	206	31.58*	149	36.18*	91	32.01*	493	15.94	30.92*	26.31	
Salivary gland	2	2.25	13	5.26*	7	4.09*	2	1.43	24	6.46	3.71*	0.97	
Mouth	91	27.82*	265	30.92*	195	36.81*	127	35.25*	678	20.74	32.69*	36.25	
Nasopharynx	2	4.07	13	10.28*	5	6.59*	2	3.96	22	3.02	7.28*	1.05	
Tonsil	23	17.99*	56	17.02*	48	24.54*	25	20.24*	152	7.76	19.59*	7.96	
Oropharynx	5	13.47*	20	20.53*	14	23.29*	18	45.27*	57	2.34	24.32*	3.01	
Hypopharynx	14	10.19*	70	19.58*	57	26.27*	35	25.44*	176	8.49	20.72*	9.24	
<b>Digestive system</b>	201	2.29*	565	2.33*	386	2.30*	221	1.66*	1,373	631.29	2.17*	40.91	
Esophagus	88	17.31*	234	17.33*	166	18.56*	71	10.39*	559	34.36	16.27*	28.94	
Stomach	14	1.47	47	1.86*	22	1.30	14	1.09	97	64.62	1.50*	1.79	
Small intestine	2	1.67	3	0.89	3	1.25	4	1.98	12	8.99	1.33	0.17	
Colon	47	1.24	133	1.25*	91	1.20	58	0.94	329	282.34	1.17*	2.57	
Rectum, rectosigmoid junction	14	0.89	60	1.38*	43	1.48*	28	1.29	145	109.96	1.32*	1.93	
Anus, anal canal	3	3.81	6	2.69	1	0.65	2	1.66	12	5.77	2.08*	0.34	
Liver	13	4.21*	28	3.31*	21	3.60*	11	2.26*	73	22.26	3.28*	2.80	
Gallbladder	2	1.81	2	0.65	2	0.94	0	0.00	6	7.99	0.75	-0.11	
Bile ducts, other biliary	2	1.15	10	2.04	7	1.95	7	2.18	26	13.44	1.93*	0.69	
Pancreas	16	1.52	41	1.42*	30	1.49*	24	1.48	111	75.74	1.47*	1.94	
<b>Respiratory system</b>	228	3.06*	1,042	5.10*	597	4.31*	362	3.42*	2,229	522.76	4.26*	94.11	
Nose, nasal cavity, ear	2	3.21	8	4.74*	6	5.36*	1	1.17	17	4.28	3.97*	0.70	
Larynx	28	4.82*	109	7.14*	62	6.53*	40	6.35*	239	36.87	6.48*	11.15	
Lung, bronchus	197	2.91*	919	4.92*	525	4.12*	319	3.24*	1,960	480.30	4.08*	81.61	
<b>Female breast</b>	43	1.38	102	1.09	64	0.93	60	1.04	269	251.57	1.07	2.45	
<b>Female genital system</b>	19	1.27	41	0.94	26	0.86	18	0.76	104	112.41	0.93	-1.18	
Cervix uteri	6	3.33*	9	1.83	2	0.65	2	0.93	19	11.97	1.59	0.99	
Corpus uteri	7	0.90	12	0.53*	8	0.52	6	0.50	33	58.05	0.57*	-3.52	
Ovary	3	0.71	9	0.72	13	1.45	8	1.09	33	33.05	1.00	-0.01	
Vagina	2	9.19*	4	6.28*	1	2.16	0	0.00	7	1.70	4.11*	0.74	
Vulva	1	1.62	6	3.23*	2	1.42	1	0.78	10	5.16	1.94	0.68	
<b>Male genital system</b>	83	1.03	229	1.00	146	0.86	119	0.83*	577	620.87	0.93	-3.98	
Prostate	80	1.01	226	1.00	145	0.86	118	0.83*	569	614.32	0.93	-4.11	
Testis	0	0.00	0	0.00	0	0.00	1	3.28	1	2.58	0.39	-0.14	
<b>Urinary system</b>	35	1.09	91	1.02	88	1.40*	54	1.06	268	235.35	1.14*	1.80	
Urinary bladder	24	1.09	63	1.02	64	1.47*	38	1.07	189	162.47	1.16*	1.46	
Kidney parenchyma	10	1.24	22	0.98	21	1.35	13	1.05	66	58.52	1.13	0.41	
Renal pelvis, other urinary	1	0.50	6	1.08	3	0.79	3	1.01	13	14.36	0.91	-0.07	
Ureter	0	0.00	2	1.09	2	1.57	1	1.02	5	4.76	1.05	0.01	
<b>Bone, joints</b>	0	0.00	2	2.01	3	4.70	1	2.15	6	2.47	2.43	0.19	
<b>Soft tissue including heart</b>	0	0.00	5	1.18	7	2.41	1	0.42	13	11.07	1.17	0.11	
<b>Kaposi sarcoma</b>	1	1.50	4	2.37	1	1.03	0	0.00	6	3.92	1.53	0.11	
<b>Melanoma of skin</b>	16	1.90*	20	0.82	14	0.81	17	1.18	67	64.53	1.04	0.14	
<b>Eye, orbit</b>	1	1.68	3	1.83	1	0.92	2	2.45	7	4.14	1.69	0.16	
<b>Brain, central nervous system</b>	7	1.64	8	0.68	2	0.26*	6	1.03	23	29.69	0.77	-0.37	
<b>Thyroid</b>	12	5.78*	7	1.21	2	0.53	2	0.71	23	14.44	1.59*	0.47	
<b>Lymphatic, hematopoietic</b>	28	0.97	75	0.93	50	0.88	28	0.60*	181	213.29	0.85*	-1.78	
Hodgkin lymphoma	0	0.00	1	0.35	3	1.73	0	0.00	4	6.87	0.58	-0.16	
Non-Hodgkin lymphoma	17	1.36	36	1.00	24	0.93	19	0.87	96	95.92	1.00	0.00	
Myeloma	2	0.40	9	0.65	9	0.92	5	0.62	25	36.79	0.68	-0.65	
Leukemia	9	0.89	29	1.03	14	0.71	4	0.25*	56	73.71	0.76*	-0.98	
Acute lymphocytic	0	0.00	1	1.26	0	0.00	0	0.00	1	2.04	0.49	-0.06	
Chronic lymphocytic	1	0.24	6	0.52	3	0.37	0	0.00*	10	29.88	0.33*	-1.10	
Acute non-lymphocytic	6	1.81	17	1.83*	4	0.61	1	0.18	28	24.62	1.14	0.19	
Chronic myeloid	1	0.73	4	1.06	4	1.52	1	0.46	10	9.94	1.01	0.00	

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 71,137 PYR and for male cancers on 110,166 PYR.

## Oral and Pharynx Both Sexes, Long-term Follow-up

**Table 3.2.3:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis										EAR	
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E		
<b>Number starting interval</b>	39,501		6,132		2,583		879		39,501			
<b>Person-years in interval</b>	149,984		20,816		8,018		2,485		181,304			
<b>All subsequent cancers</b>	5,817	2.56*	895	2.22*	281	1.68*	83	1.59*	7,076	2,891.21	2.45*	230.82
All excluding same site	4,557	2.05*	684	1.72*	215	1.31*	64	1.25	5,520	2,835.93	1.95*	148.04
<b>Buccal cavity, pharynx</b>	1,409	21.53*	232	24.85*	71	20.02*	21	19.67*	1,733	79.40	21.83*	91.21
Lip	40	4.16*	8	5.79*	1	1.90	0	0.00	49	11.68	4.20*	2.06
Tongue	402	30.69*	65	34.26*	23	31.72*	3	13.58*	493	15.94	30.92*	26.31
Salivary gland	22	4.34*	1	1.12	1	2.66	0	0.00	24	6.46	3.71*	0.97
Mouth	551	32.15*	87	36.14*	27	29.38*	13	47.07*	678	20.74	32.69*	36.25
Nasopharynx	20	7.95*	2	5.91	0	0.00	0	0.00	22	3.02	7.28*	1.05
Tonsil	127	19.46*	17	20.16*	7	23.06*	1	11.33	152	7.76	19.59*	7.96
Oropharynx	39	20.04*	14	52.01*	3	30.30*	1	33.97	57	2.34	24.32*	3.01
Hypopharynx	141	19.81*	28	29.58*	6	17.88*	1	10.67	176	8.49	20.72*	9.24
<b>Digestive system</b>	1,152	2.31*	152	1.76*	51	1.43*	18	1.57	1,373	631.29	2.17*	40.91
Esophagus	488	17.73*	54	12.10*	11	6.10*	6	10.53*	559	34.36	16.27*	28.94
Stomach	83	1.60*	11	1.31	3	0.88	0	0.00	97	64.62	1.50*	1.79
Small intestine	8	1.15	3	2.33	1	1.81	0	0.00	12	8.99	1.33	0.17
Colon	271	1.23*	36	0.91	16	0.97	6	1.12	329	282.34	1.17*	2.57
Rectum, rectosigmoid junction	117	1.33*	15	1.05	9	1.59	4	2.28	145	109.96	1.32*	1.93
Anus, anal canal	10	2.19*	1	1.28	1	3.08	0	0.00	12	5.77	2.08*	0.34
Liver	62	3.57*	8	2.59*	3	2.25	0	0.00	73	22.26	3.28*	2.80
Gallbladder	6	0.95	0	0.00	0	0.00	0	0.00	6	7.99	0.75	-0.11
Bile ducts, other biliary	19	1.86*	5	2.51	1	1.10	1	3.25	26	13.44	1.93*	0.69
Pancreas	87	1.46*	17	1.63	6	1.38	1	0.71	111	75.74	1.47*	1.94
<b>Respiratory system</b>	1,867	4.48*	252	3.64*	91	3.26*	19	2.20*	2,229	522.76	4.26*	94.11
Nose, nasal cavity, ear	16	4.66*	1	1.81	0	0.00	0	0.00	17	4.28	3.97*	0.70
Larynx	199	6.51*	28	6.51*	12	7.72*	0	0.00	239	36.87	6.48*	11.15
Lung, bronchus	1,641	4.30*	221	3.44*	79	3.03*	19	2.34*	1,960	480.30	4.08*	81.61
<b>Female breast</b>	209	1.08	45	1.23	11	0.69	4	0.77	269	251.57	1.07	2.45
<b>Female genital system</b>	86	0.97	12	0.79	4	0.62	2	0.97	104	112.41	0.93	-1.18
Cervix uteri	17	1.73*	2	1.41	0	0.00	0	0.00	19	11.97	1.59	0.99
Corpus uteri	27	0.59*	5	0.65	1	0.31	0	0.00	33	58.05	0.57*	-3.52
Ovary	25	0.97	5	1.07	2	1.00	1	1.55	33	33.05	1.00	-0.01
Vagina	7	5.31*	0	0.00	0	0.00	0	0.00	7	1.70	4.11*	0.74
Vulva	9	2.32*	0	0.00	1	2.77	0	0.00	10	5.16	1.94	0.68
<b>Male genital system</b>	458	0.96	88	0.94	24	0.63*	7	0.64	577	620.87	0.93	-3.98
Prostate	451	0.95	87	0.94	24	0.63*	7	0.65	569	614.32	0.93	-4.11
Testis	0	0.00	1	4.63	0	0.00	0	0.00	1	2.58	0.39	-0.14
<b>Urinary system</b>	214	1.16*	37	1.13	13	0.95	4	0.90	268	235.35	1.14*	1.80
Urinary bladder	151	1.19*	27	1.18	9	0.94	2	0.64	189	162.47	1.16*	1.46
Kidney parenchyma	53	1.15	8	1.00	4	1.21	1	0.95	66	58.52	1.13	0.41
Renal pelvis, other urinary	10	0.88	2	1.04	0	0.00	1	3.92	13	14.36	0.91	-0.07
Ureter	4	1.06	1	1.56	0	0.00	0	0.00	5	4.76	1.05	0.01
<b>Bone, joints</b>	5	2.50	1	3.30	0	0.00	0	0.00	6	2.47	2.43	0.19
<b>Soft tissue including heart</b>	12	1.38	1	0.66	0	0.00	0	0.00	13	11.07	1.17	0.11
<b>Kaposi sarcoma</b>	6	1.81	0	0.00	0	0.00	0	0.00	6	3.92	1.53	0.11
<b>Melanoma of skin</b>	50	1.00	14	1.54	1	0.25	2	1.47	67	64.53	1.04	0.14
<b>Eye, orbit</b>	5	1.50	1	1.88	1	4.60	0	0.00	7	4.14	1.69	0.16
<b>Brain, central nervous system</b>	17	0.71	4	1.05	1	0.66	1	2.09	23	29.69	0.77	-0.37
<b>Thyroid</b>	21	1.81*	2	1.09	0	0.00	0	0.00	23	14.44	1.59*	0.47
<b>Lymphatic, hematopoietic</b>	153	0.92	21	0.70	6	0.47	1	0.24	181	213.29	0.85*	-1.78
Hodgkin lymphoma	4	0.70	0	0.00	0	0.00	0	0.00	4	6.87	0.58	-0.16
Non-Hodgkin lymphoma	77	1.04	13	0.94	5	0.84	1	0.50	96	95.92	1.00	0.00
Myeloma	20	0.70	4	0.77	1	0.46	0	0.00	25	36.79	0.68	-0.65
Leukemia	52	0.90	4	0.39	0	0.00*	0	0.00	56	73.71	0.76*	-0.98
Acute lymphocytic	1	0.61	0	0.00	0	0.00	0	0.00	1	2.04	0.49	-0.06
Chronic lymphocytic	10	0.42*	0	0.00*	0	0.00	0	0.00	10	29.88	0.33*	-1.10
Acute non-lymphocytic	27	1.41	1	0.29	0	0.00	0	0.00	28	24.62	1.14	0.19
Chronic myeloid	9	1.16	1	0.72	0	0.00	0	0.00	10	9.94	1.01	0.00

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 71,137 PYR and for male cancers on 110,166 PYR.

**Table 3.2.4:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	13,243 9,746		10,326 28,162		5,239 18,932		2,643 14,298		13,243 71,137			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	268	2.45*	903	2.75*	628	2.58*	477	2.29*	2,276	890.42	2.56*	194.78
All excluding same site	208	1.93*	686	2.12*	471	1.96*	360	1.75*	1,725	878.26	1.96*	119.03
<b>Buccal cavity, pharynx</b>	70	33.39*	240	38.81*	168	38.24*	134	38.33*	612	16.17	37.85*	83.76
Lip	4	31.30*	4	10.40*	3	10.29*	6	22.99*	17	1.06	15.96*	2.24
Tongue	19	41.24*	72	52.90*	50	51.15*	32	41.35*	173	3.57	48.42*	23.82
Salivary gland	2	9.28*	4	6.23*	0	0.00	1	2.49	7	1.72	4.06*	0.74
Mouth	35	48.30*	109	51.09*	72	47.53*	61	49.95*	277	5.59	49.52*	38.15
Nasopharynx	0	0.00	3	12.31*	2	11.70*	2	14.69*	7	0.63	11.03*	0.89
Tonsil	4	19.72*	14	24.08*	17	43.88*	9	33.36*	44	1.44	30.53*	5.98
Oropharynx	0	0.00	5	30.65*	5	43.63*	7	84.32*	17	0.41	40.98*	2.33
Hypopharynx	2	13.17*	17	37.95*	13	42.28*	8	35.55*	40	1.13	35.33*	5.46
<b>Digestive system</b>	50	1.98*	157	2.09*	131	2.32*	80	1.63*	418	206.05	2.03*	29.79
Esophagus	23	31.70*	55	25.47*	56	34.70*	29	21.04*	163	5.88	27.73*	22.09
Stomach	1	0.50	12	2.05*	8	1.87	0	0.00	21	15.81	1.33	0.73
Small intestine	1	2.93	1	0.96	2	2.48	0	0.00	4	2.95	1.36	0.15
Colon	16	1.28	43	1.15	35	1.24	23	0.93	117	103.03	1.14	1.96
Rectum, rectosigmoid junction	4	0.98	17	1.40	12	1.37	12	1.68	45	32.15	1.40*	1.81
Rectum	4	1.50	13	1.65	11	1.92	7	1.47	35	21.03	1.66*	1.96
Anus, anal canal	0	0.00	2	1.97	1	1.32	0	0.00	3	2.76	1.09	0.03
Liver	1	1.92	6	3.82*	2	1.64	3	2.58	12	4.48	2.68*	1.06
Gallbladder	1	1.69	2	1.16	1	0.80	0	0.00	4	4.58	0.87	-0.08
Bile ducts, other biliary	0	0.00	4	2.51	3	2.39	1	0.84	8	4.57	1.75	0.48
Pancreas	3	0.92	15	1.53	11	1.47	11	1.65	40	27.19	1.47*	1.80
<b>Respiratory system</b>	58	4.11*	264	6.02*	185	5.45*	135	4.44*	642	122.32	5.25*	73.05
Nose, nasal cavity, ear	1	6.64	1	2.23	2	6.02	0	0.00	4	1.22	3.28	0.39
Larynx	4	7.91*	19	12.58*	14	13.02*	17	20.70*	54	3.91	13.80*	7.04
Lung, bronchus	53	3.95*	243	5.81*	168	5.17*	118	4.04*	582	116.88	4.98*	65.38
<b>Female breast</b>	43	1.38	102	1.09	64	0.93	60	1.04	269	251.57	1.07	2.45
<b>Female genital system</b>	19	1.27	41	0.94	26	0.86	18	0.76	104	112.41	0.93	-1.18
Cervix uteri	6	3.33*	9	1.83	2	0.65	2	0.93	19	11.97	1.59	0.99
Corpus uteri	7	0.90	12	0.53*	8	0.52	6	0.50	33	58.05	0.57*	-3.52
Ovary	3	0.71	9	0.72	13	1.45	8	1.09	33	33.05	1.00	-0.01
Vagina	2	9.19*	4	6.28*	1	2.16	0	0.00	7	1.70	4.11*	0.74
Vulva	1	1.62	6	3.23*	2	1.42	1	0.78	10	5.16	1.94	0.68
<b>Urinary system</b>	7	1.37	22	1.42	15	1.27	12	1.14	56	42.98	1.30	1.83
Urinary bladder	5	1.65	15	1.64	8	1.15	6	0.97	34	25.33	1.34	1.22
Kidney parenchyma	2	1.21	5	0.99	7	1.80	4	1.15	18	14.09	1.28	0.55
Renal pelvis, other urinary	0	0.00	2	1.53	0	0.00	2	2.37	4	3.56	1.12	0.06
Ureter	0	0.00	1	2.49	0	0.00	0	0.00	1	1.10	0.91	-0.01
<b>Bone, joints</b>	0	0.00	0	0.00	1	4.67	0	0.00	1	0.80	1.25	0.03
<b>Soft tissue including heart</b>	0	0.00	2	1.57	2	2.12	0	0.00	4	3.48	1.15	0.07
<b>Kaposi sarcoma</b>	0	0.00	1	8.78	0	0.00	0	0.00	1	0.32	3.09	0.10
<b>Melanoma of skin</b>	2	0.98	5	0.80	3	0.65	6	1.48	16	16.99	0.94	-0.14
<b>Eye, orbit</b>	0	0.00	2	4.01	0	0.00	0	0.00	2	1.29	1.55	0.10
<b>Brain, central nervous system</b>	2	1.74	3	0.86	0	0.00	2	0.97	7	9.21	0.76	-0.31
<b>Thyroid</b>	3	3.04	3	1.04	1	0.50	0	0.00	7	7.48	0.94	-0.07
<b>Lymphatic, hematopoietic</b>	9	1.11	32	1.30	19	1.01	10	0.60	70	68.34	1.02	0.23
Hodgkin lymphoma	0	0.00	1	1.27	1	1.84	0	0.00	2	2.02	0.99	0.00
Non-Hodgkin lymphoma	6	1.56	17	1.44	8	0.87	5	0.60	36	33.12	1.09	0.40
Myeloma	1	0.70	4	0.93	3	0.92	3	1.04	11	11.90	0.92	-0.13
Leukemia	2	0.77	10	1.29	7	1.20	2	0.39	21	21.30	0.99	-0.04
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.09
Chronic lymphocytic	1	0.99	4	1.32	3	1.31	0	0.00	8	8.31	0.96	-0.04
Acute non-lymphocytic	0	0.00	5	1.83	0	0.00	1	0.54	6	7.53	0.80	-0.21
Chronic myeloid	1	2.78	1	0.94	1	1.25	1	1.43	4	2.92	1.37	0.15

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Oral and Pharynx Males

**Table 3.2.5:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	26,258 18,818		19,381 47,303		7,869 27,024		3,489 17,022		26,258 110,166			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	634	2.24*	2,078	2.69*	1,306	2.46*	782	1.89*	4,800	2,000.79	2.40*	254.09
All excluding same site	514	1.86*	1,678	2.23*	1,000	1.92*	603	1.48*	3,795	1,957.67	1.94*	166.78
<b>Buccal cavity, pharynx</b>	131	12.69*	461	17.41*	339	21.22*	190	18.18*	1,121	63.23	17.73*	96.02
Lip	4	2.35	17	3.87*	8	2.96*	3	1.66	32	10.61	3.02*	1.94
Tongue	28	14.03*	134	25.95*	99	31.52*	59	28.52*	320	12.37	25.87*	27.92
Salivary gland	0	0.00	9	4.92*	7	5.63*	1	1.00	17	4.74	3.59*	1.11
Mouth	56	21.99*	156	24.23*	123	32.51*	66	27.72*	401	15.15	26.47*	35.02
Nasopharynx	2	4.90	10	9.79*	3	5.10*	0	0.00	15	2.39	6.29*	1.15
Tonsil	19	17.66*	42	15.50*	31	19.76*	16	16.58*	108	6.32	17.09*	9.23
Oropharynx	5	15.77*	15	18.49*	9	18.50*	11	34.97*	40	1.93	20.73*	3.46
Hypopharynx	12	9.82*	53	16.95*	44	23.63*	27	23.46*	136	7.36	18.47*	11.68
<b>Digestive system</b>	151	2.42*	408	2.45*	255	2.28*	141	1.67*	955	425.25	2.25*	48.09
Esophagus	65	14.91*	179	15.78*	110	15.01*	42	7.70*	396	28.48	13.90*	33.36
Stomach	13	1.73	35	1.80*	14	1.11	14	1.52	76	48.81	1.56*	2.47
Small intestine	1	1.17	2	0.86	1	0.63	4	3.17	8	6.04	1.32	0.18
Colon	31	1.21	90	1.30*	56	1.17	35	0.95	212	179.31	1.18*	2.97
Rectum, rectosigmoid junction	10	0.85	43	1.38	31	1.52*	16	1.10	100	77.80	1.29*	2.01
Anus, anal canal	3	6.65*	4	3.30	0	0.00	2	3.55	9	3.01	2.99*	0.54
Liver	12	4.67*	22	3.19*	19	4.12*	8	2.16	61	17.78	3.43*	3.92
Gallbladder	1	1.96	0	0.00	1	1.13	0	0.00	2	3.41	0.59	-0.13
Bile ducts, other biliary	2	1.66	6	1.81	4	1.71	6	2.98*	18	8.87	2.03*	0.83
Pancreas	13	1.79	26	1.36	19	1.51	13	1.37	71	48.55	1.46*	2.04
<b>Respiratory system</b>	170	2.82*	778	4.85*	412	3.94*	227	3.01*	1,587	400.44	3.96*	107.71
Nose, nasal cavity, ear	1	2.11	7	5.65*	4	5.08*	1	1.76	13	3.07	4.24*	0.90
Larynx	24	4.52*	90	6.54*	48	5.70*	23	4.20*	185	32.96	5.61*	13.80
Lung, bronchus	144	2.65*	676	4.67*	357	3.76*	201	2.91*	1,378	363.42	3.79*	92.10
<b>Male breast</b>	0	0.00	2	1.36	1	1.01	1	1.29	4	3.79	1.05	0.02
<b>Male genital system</b>	83	1.03	229	1.00	146	0.86	119	0.83*	577	620.87	0.93	-3.98
Prostate	80	1.01	226	1.00	145	0.86	118	0.83*	569	614.32	0.93	-4.11
Testis	0	0.00	0	0.00	0	0.00	1	3.28	1	2.58	0.39	-0.14
<b>Urinary system</b>	28	1.04	69	0.93	73	1.43*	42	1.04	212	192.36	1.10	1.78
Urinary bladder	19	1.00	48	0.92	56	1.54*	32	1.09	155	137.14	1.13	1.62
Kidney parenchyma	8	1.25	17	0.97	14	1.20	9	1.02	48	44.43	1.08	0.32
Renal pelvis, other urinary	1	0.63	4	0.94	3	1.06	1	0.47	9	10.79	0.83	-0.16
Ureter	0	0.00	1	0.70	2	2.06	1	1.38	4	3.66	1.09	0.03
<b>Bone, joints</b>	0	0.00	2	2.89	2	4.71	1	3.46	5	1.67	3.00	0.30
<b>Soft tissue including heart</b>	0	0.00	3	1.01	5	2.56	1	0.65	9	7.60	1.18	0.13
<b>Kaposi sarcoma</b>	1	1.59	3	1.91	1	1.14	0	0.00	5	3.59	1.39	0.13
<b>Melanoma of skin</b>	14	2.19*	15	0.83	11	0.87	11	1.06	51	47.54	1.07	0.31
<b>Eye, orbit</b>	1	2.34	1	0.87	1	1.35	2	3.73	5	2.85	1.76	0.20
<b>Brain, central nervous system</b>	5	1.60	5	0.60	2	0.38	4	1.07	16	20.48	0.78	-0.41
<b>Thyroid</b>	9	8.26*	4	1.39	1	0.56	2	1.65	16	6.96	2.30*	0.82
<b>Lymphatic, hematopoietic</b>	19	0.92	43	0.77	31	0.81	18	0.60*	111	144.95	0.77*	-3.08
Hodgkin lymphoma	0	0.00	0	0.00	2	1.68	0	0.00	2	4.85	0.41	-0.26
Non-Hodgkin lymphoma	11	1.26	19	0.79	16	0.96	14	1.04	60	62.80	0.96	-0.25
Myeloma	1	0.28	5	0.52	6	0.92	2	0.39	14	24.88	0.56*	-0.99
Leukemia	7	0.93	19	0.93	7	0.51	2	0.19*	35	52.41	0.67*	-1.58
Acute lymphocytic	0	0.00	1	1.78	0	0.00	0	0.00	1	1.41	0.71	-0.04
Chronic lymphocytic	0	0.00	2	0.24*	0	0.00*	0	0.00*	2	21.57	0.09*	-1.78
Acute non-lymphocytic	6	2.49	12	1.83	4	0.89	0	0.00	22	17.09	1.29	0.45
Chronic myeloid	0	0.00	3	1.11	3	1.64	0	0.00	6	7.02	0.86	-0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



**Table 3.2.6:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	6,279		5,062		2,626		1,435		6,279			
Number starting interval	4,739		13,896		9,924		8,831		37,391			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	79	6.68*	291	6.71*	242	5.16*	215	2.64*	827	183.62	4.50*	172.07
All excluding same site	51	4.50*	210	5.03*	156	3.44*	156	1.96*	573	178.03	3.22*	105.63
<b>Buccal cavity, pharynx</b>	32	50.11*	91	42.28*	93	44.80*	63	24.76*	279	7.41	37.65*	72.63
Lip	3	55.35*	1	5.47	0	0.00	1	4.46	5	0.63	7.96*	1.17
Tongue	6	42.53*	27	55.68*	33	69.81*	19	32.95*	85	1.68	50.74*	22.28
Salivary gland	0	0.00	0	0.00	3	21.56*	0	0.00	3	0.53	5.65*	0.66
Mouth	15	90.23*	30	54.69*	33	62.08*	22	34.30*	100	1.89	52.97*	26.24
Nasopharynx	0	0.00	4	30.40*	2	17.35*	1	7.79	7	0.42	16.85*	1.76
Tonsil	5	50.64*	9	27.74*	12	39.61*	10	30.73*	36	1.05	34.24*	9.35
Oropharynx	1	53.15	3	46.74*	3	47.90*	0	0.00	7	0.23	30.62*	1.81
Hypopharynx	1	17.58	12	58.86*	5	23.12*	8	29.12*	26	0.75	34.58*	6.75
<b>Digestive system</b>	21	10.81*	51	7.08*	43	5.31*	35	2.47*	150	31.43	4.77*	31.71
Esophagus	16	86.91*	32	50.22*	24	35.10*	15	14.51*	87	2.54	34.27*	22.59
Stomach	0	0.00	2	2.50	1	1.22	4	3.05	7	3.17	2.21	1.03
Small intestine	0	0.00	0	0.00	0	0.00	1	3.45	1	0.71	1.41	0.08
Colon	4	6.13*	4	1.59	7	2.36	7	1.25	22	11.74	1.87*	2.74
Rectum, rectosigmoid junction	0	0.00	6	4.29*	3	1.87	4	1.48	13	6.06	2.14*	1.86
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.15
Liver	1	8.27	4	9.64*	4	9.37*	0	0.00	9	1.68	5.37*	1.96
Gallbladder	0	0.00	1	17.96	1	14.71	0	0.00	2	0.28	7.23	0.46
Bile ducts, other biliary	0	0.00	0	0.00	2	13.85*	1	3.45	3	0.59	5.07*	0.64
Pancreas	0	0.00	2	2.37	1	1.04	3	1.76	6	3.74	1.60	0.60
<b>Respiratory system</b>	7	3.76*	104	14.80*	69	8.48*	58	4.06*	238	31.32	7.60*	55.28
Nose, nasal cavity, ear	0	0.00	0	0.00	1	10.66	0	0.00	1	0.35	2.88	0.17
Larynx	2	9.36*	11	14.22*	16	19.17*	12	10.22*	41	3.00	13.68*	10.16
Lung, bronchus	5	3.11*	92	15.03*	52	7.24*	46	3.55*	195	27.87	7.00*	44.70
<b>Female breast</b>	3	1.66	7	1.03	9	1.30	15	1.43	34	26.09	1.30	5.66
<b>Female genital system</b>	1	1.39	2	0.72	3	1.08	5	1.18	11	10.50	1.05	0.36
Cervix uteri	1	4.22	2	2.64	0	0.00	0	0.00	3	2.19	1.37	0.58
Corpus uteri	0	0.00	0	0.00	2	1.68	0	0.00	2	4.55	0.44	-1.82
Ovary	0	0.00	0	0.00	1	1.18	4	3.14	5	3.15	1.58	1.32
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.22
<b>Male genital system</b>	3	4.06	5	1.45	8	1.39	14	0.83	30	26.82	1.12	1.36
Prostate	2	3.93	5	1.77	8	1.49	14	0.84	29	25.34	1.14	1.57
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.52
<b>Urinary system</b>	1	1.25	3	1.00	7	2.10	7	1.21	18	12.91	1.39	1.36
Urinary bladder	1	2.46	1	0.63	2	1.08	3	0.86	7	7.34	0.95	-0.09
Kidney parenchyma	0	0.00	2	1.56	4	2.99	4	1.97	10	5.01	2.00	1.33
Renal pelvis, other urinary	0	0.00	0	0.00	1	7.31	0	0.00	1	0.56	1.78	0.12
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.04
<b>Bone, joints</b>	0	0.00	1	10.34	2	25.79*	0	0.00	3	0.30	10.16*	0.72
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	2.79	1	1.11	0.90	-0.03
<b>Kaposi sarcoma</b>	1	3.58	2	2.78	1	2.47	0	0.00	4	1.63	2.45	0.63
<b>Melanoma of skin</b>	1	1.36	4	1.59	1	0.45	4	1.46	10	8.24	1.21	0.47
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.09
<b>Brain, central nervous system</b>	0	0.00	2	2.16	0	0.00	4	4.00*	6	3.02	1.99	0.80
<b>Thyroid</b>	3	10.56*	2	2.13	0	0.00	1	1.20	6	2.82	2.13	0.85
<b>Lymphatic, hematopoietic</b>	1	0.81	7	1.69	2	0.51	3	0.52	13	15.00	0.87	-0.54
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.15	0.00	-0.31
Non-Hodgkin lymphoma	1	1.55	4	1.85	2	1.00	3	1.05	10	7.66	1.30	0.62
Myeloma	0	0.00	2	4.24	0	0.00	0	0.00	2	2.07	0.97	-0.02
Leukemia	0	0.00	1	0.92	0	0.00	0	0.00	1	4.12	0.24	-0.84
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.06
Chronic lymphocytic	0	0.00	1	3.14	0	0.00	0	0.00	1	1.43	0.70	-0.12
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.36	0.00	-0.36
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.18

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 13,982 PYR and for male cancers on 23,409 PYR.

## Oral and Pharynx Both Sexes, 50-69 Years of Age

**Table 3.2.7:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	22,748		17,545		7,944		3,881		22,748			
Number starting interval	16,714		45,245		28,430		19,700		110,089			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	532	2.64*	1,968	3.08*	1,361	2.60*	909	1.95*	4,770	1,829.69	2.61*	267.09
All excluding same site	427	2.18*	1,570	2.52*	1,054	2.05*	701	1.53*	3,752	1,791.15	2.09*	178.12
<b>Buccal cavity, pharynx</b>	116	14.90*	458	21.10*	335	23.31*	232	23.14*	1,141	53.89	21.17*	98.75
Lip	3	3.11	13	4.65*	7	3.51*	8	5.18*	31	7.29	4.25*	2.15
Tongue	34	21.42*	137	30.86*	94	31.93*	67	32.95*	332	11.00	30.17*	29.16
Salivary gland	0	0.00	11	7.94*	3	2.78	2	2.03	16	3.90	4.10*	1.10
Mouth	45	21.70*	162	28.36*	124	33.37*	85	32.95*	416	14.08	29.54*	36.51
Nasopharynx	1	3.08	9	10.39*	3	5.62*	1	2.94	14	2.06	6.78*	1.08
Tonsil	14	15.74*	37	15.68*	31	21.85*	14	16.60*	96	5.51	17.42*	8.22
Oropharynx	4	15.53*	12	16.99*	10	21.93*	16	54.98*	42	1.71	24.55*	3.66
Hypopharynx	8	8.49*	50	19.25*	48	28.78*	26	25.38*	132	6.23	21.18*	11.42
<b>Digestive system</b>	117	2.82*	355	2.73*	272	2.56*	158	1.61*	902	375.98	2.40*	47.78
Esophagus	57	18.73*	159	18.25*	124	19.58*	49	9.61*	389	23.19	16.77*	33.23
Stomach	6	1.36	25	1.87*	12	1.15	7	0.75	50	37.59	1.33	1.13
Small intestine	1	1.60	1	0.51	2	1.25	3	2.02	7	5.67	1.24	0.12
Colon	21	1.27	76	1.41*	64	1.38*	42	0.93	203	162.22	1.25*	3.70
Rectum, rectosigmoid junction	8	0.98	35	1.39	32	1.64*	20	1.24	95	68.86	1.38*	2.37
Anus, anal canal	3	6.87*	4	2.98	1	0.97	2	2.34	10	3.66	2.73*	0.58
Liver	9	5.49*	18	3.63*	13	3.30*	11	3.04*	51	14.16	3.60*	3.35
Gallbladder	2	4.81	1	0.72	0	0.00	0	0.00	3	4.24	0.71	-0.11
Bile ducts, other biliary	0	0.00	8	3.35*	3	1.43	5	2.16	16	7.53	2.12*	0.77
Pancreas	10	1.98	27	1.72*	21	1.64*	18	1.51	76	45.45	1.67*	2.77
<b>Respiratory system</b>	156	3.62*	755	5.77*	450	4.47*	276	3.37*	1,637	356.38	4.59*	116.33
Nose, nasal cavity, ear	2	5.76	6	6.00*	3	4.13	0	0.00	11	2.69	4.09*	0.75
Larynx	21	5.39*	86	7.89*	43	5.93*	26	5.50*	176	26.78	6.57*	13.55
Lung, bronchus	132	3.41*	661	5.58*	401	4.34*	248	3.25*	1,442	326.07	4.42*	101.37
<b>Female breast</b>	27	1.67*	61	1.15	42	0.95	37	0.91	167	154.12	1.08	3.15
<b>Female genital system</b>	11	1.30	31	1.17	20	0.99	10	0.60	72	71.78	1.00	0.05
Cervix uteri	3	2.96	7	2.44	2	1.06	2	1.53	14	7.07	1.98*	1.69
Corpus uteri	4	0.85	10	0.68	5	0.45	4	0.45	23	39.27	0.59*	-3.98
Ovary	3	1.33	7	0.96	11	1.88	3	0.58	24	20.52	1.17	0.85
Vagina	0	0.00	2	6.50	1	3.74	0	0.00	3	0.94	3.19	0.50
Vulva	1	4.56	4	5.19*	1	1.38	1	1.16	7	2.58	2.71*	1.08
<b>Male genital system</b>	39	1.01	133	1.00	104	0.85	88	0.79*	364	405.73	0.90*	-6.03
Prostate	39	1.02	131	1.00	103	0.85	87	0.78*	360	402.14	0.90*	-6.09
Testis	0	0.00	0	0.00	0	0.00	1	7.87	1	1.15	0.87	-0.02
<b>Urinary system</b>	13	0.81	52	1.02	61	1.46*	38	0.99	164	147.22	1.11	1.52
Urinary bladder	8	0.76	35	1.04	44	1.55*	28	1.04	115	99.67	1.15	1.39
Kidney parenchyma	5	1.08	15	1.06	15	1.38	7	0.77	42	38.78	1.08	0.29
Renal pelvis, other urinary	0	0.00	2	0.66	2	0.80	3	1.32	7	8.77	0.80	-0.16
Ureter	0	0.00	1	1.01	2	2.37	1	1.31	4	2.90	1.38	0.10
<b>Bone, joints</b>	0	0.00	1	1.69	1	2.37	1	3.09	3	1.54	1.95	0.13
<b>Soft tissue including heart</b>	0	0.00	4	1.70	5	2.77	0	0.00	9	6.63	1.36	0.22
<b>Kaposi sarcoma</b>	0	0.00	1	1.64	0	0.00	0	0.00	1	1.48	0.67	-0.04
<b>Melanoma of skin</b>	10	2.09	7	0.47*	8	0.70	9	0.89	34	41.05	0.83	-0.64
<b>Eye, orbit</b>	0	0.00	2	2.00	1	1.36	1	1.66	4	2.67	1.50	0.12
<b>Brain, central nervous system</b>	4	1.57	4	0.53	2	0.37	2	0.47	12	19.79	0.61	-0.71
<b>Thyroid</b>	7	5.75*	3	0.85	0	0.00	1	0.57	11	8.90	1.24	0.19
<b>Lymphatic, hematopoietic</b>	15	1.08	39	0.89	34	0.94	22	0.64*	110	128.56	0.86	-1.69
Hodgkin lymphoma	0	0.00	1	0.60	2	1.83	0	0.00	3	4.16	0.72	-0.11
Non-Hodgkin lymphoma	9	1.44	20	1.01	14	0.85	13	0.81	56	58.74	0.95	-0.25
Myeloma	1	0.40	4	0.52	8	1.25	5	0.83	18	22.64	0.80	-0.42
Leukemia	5	1.08	14	0.96	10	0.82	4	0.34*	33	43.02	0.77	-0.91
Acute lymphocytic	0	0.00	1	2.38	0	0.00	0	0.00	1	1.17	0.85	-0.02
Chronic lymphocytic	0	0.00	2	0.32	2	0.39	0	0.00*	4	18.02	0.22*	-1.27
Acute non-lymphocytic	4	2.77	8	1.71	3	0.74	1	0.25	16	14.26	1.12	0.16
Chronic myeloid	0	0.00	3	1.58	3	1.92	1	0.64	7	5.65	1.24	0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 40,888 PYR and for male cancers on 69,200 PYR.

**Table 3.2.8:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis										EAR	
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E		
<b>Number starting interval</b>	10,474		7,100		2,538		816		10,474			
<b>Person-years in interval</b>	7,110		16,324		7,602		2,788		33,824			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	291	1.63*	722	1.72*	331	1.62*	135	1.80*	1,479	877.90	1.68*	177.71
All excluding same site	244	1.38*	584	1.41*	261	1.29*	106	1.43*	1,195	866.75	1.38*	97.05
<b>Buccal cavity, pharynx</b>	53	13.28*	152	17.27*	79	20.16*	29	21.06*	313	18.09	17.30*	87.19
Lip	2	2.46	7	3.87*	4	4.80*	0	0.00	13	3.75	3.46*	2.73
Tongue	7	9.61*	42	26.25*	22	31.35*	5	21.44*	76	3.26	23.29*	21.50
Salivary gland	2	5.10	2	2.14	1	2.03	0	0.00	5	2.04	2.46	0.88
Mouth	31	30.05*	73	31.61*	38	36.19*	20	52.38*	162	4.77	33.94*	46.48
Nasopharynx	1	7.92	0	0.00	0	0.00	0	0.00	1	0.54	1.85	0.14
Tonsil	4	13.78*	10	16.48*	5	21.33*	1	15.12	20	1.20	16.70*	5.56
Oropharynx	0	0.00	5	24.57*	1	12.15	2	84.89*	8	0.40	19.79*	2.25
Hypopharynx	5	13.32*	8	10.35*	4	14.01*	1	13.01	18	1.51	11.91*	4.88
<b>Digestive system</b>	63	1.42*	159	1.52*	71	1.32*	28	1.34	321	223.89	1.43*	28.71
Esophagus	15	8.08*	43	10.36*	18	9.34*	7	9.99*	83	8.63	9.61*	21.99
Stomach	8	1.64	20	1.79*	9	1.61	3	1.36	40	23.86	1.68*	4.77
Small intestine	1	1.92	2	1.63	1	1.62	0	0.00	4	2.61	1.53	0.41
Colon	22	1.06	53	1.05	20	0.75	9	0.85	104	108.37	0.96	-1.29
Rectum, rectosigmoid junction	6	0.82	19	1.13	8	1.00	4	1.40	37	35.04	1.06	0.58
Anus, anal canal	0	0.00	2	2.72	0	0.00	0	0.00	2	1.56	1.28	0.13
Liver	3	2.26	6	1.94	4	2.72	0	0.00	13	6.42	2.02*	1.95
Gallbladder	0	0.00	0	0.00	1	1.18	0	0.00	1	3.47	0.29	-0.73
Bile ducts, other biliary	2	2.07	2	0.83	2	1.48	1	1.67	7	5.32	1.32	0.50
Pancreas	6	1.14	12	0.97	8	1.26	3	1.19	29	26.55	1.09	0.72
<b>Respiratory system</b>	65	2.21*	183	2.76*	78	2.63*	28	2.91*	354	135.06	2.62*	64.73
Nose, nasal cavity, ear	0	0.00	2	3.39	2	6.69	1	8.88	5	1.25	4.00*	1.11
Larynx	5	2.94	12	3.34*	3	2.13	2	4.97	22	7.10	3.10*	4.40
Lung, bronchus	60	2.19*	166	2.68*	72	2.58*	25	2.76*	323	126.36	2.56*	58.14
<b>Female breast</b>	13	0.99	34	1.01	13	0.73	8	1.19	68	71.36	0.95	-2.07
<b>Female genital system</b>	7	1.21	8	0.55	3	0.42	3	1.11	21	30.13	0.70	-5.61
Cervix uteri	2	3.62	0	0.00	0	0.00	0	0.00	2	2.71	0.74	-0.44
Corpus uteri	3	1.05	2	0.29	1	0.30	2	1.79	8	14.23	0.56	-3.83
Ovary	0	0.00	2	0.45	1	0.44	1	1.12	4	9.38	0.43	-3.31
Vagina	2	17.08*	2	6.60	0	0.00	0	0.00	4	0.66	6.10*	2.06
Vulva	0	0.00	2	1.99	1	1.66	0	0.00	3	2.27	1.32	0.45
<b>Male genital system</b>	41	1.01	91	0.99	34	0.81	17	1.23	183	188.32	0.97	-3.03
Prostate	39	0.96	90	0.99	34	0.82	17	1.24	180	186.84	0.96	-3.90
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.11
<b>Urinary system</b>	21	1.38	36	1.01	20	1.13	9	1.36	86	75.21	1.14	3.19
Urinary bladder	15	1.35	27	1.03	18	1.37	7	1.40	67	55.45	1.21	3.41
Kidney parenchyma	5	1.63	5	0.70	2	0.59	2	1.70	14	14.73	0.95	-0.22
Renal pelvis, other urinary	1	0.97	4	1.66	0	0.00	0	0.00	5	5.03	0.99	-0.01
Ureter	0	0.00	1	1.22	0	0.00	0	0.00	1	1.71	0.59	-0.21
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.19
<b>Soft tissue including heart</b>	0	0.00	1	0.64	2	2.49	0	0.00	3	3.34	0.90	-0.10
<b>Kaposi sarcoma</b>	0	0.00	1	2.79	0	0.00	0	0.00	1	0.80	1.24	0.06
<b>Melanoma of skin</b>	5	1.72	9	1.26	5	1.36	4	2.60	23	15.24	1.51	2.29
<b>Eye, orbit</b>	1	4.22	1	1.84	0	0.00	1	10.93	3	1.13	2.66	0.55
<b>Brain, central nervous system</b>	3	2.08	2	0.59	0	0.00	0	0.00	5	6.88	0.73	-0.55
<b>Thyroid</b>	2	3.48	2	1.50	2	3.31	0	0.00	6	2.72	2.20	0.97
<b>Lymphatic, hematopoietic</b>	12	0.88	29	0.89	14	0.83	3	0.46	58	69.73	0.83	-3.47
Hodgkin lymphoma	0	0.00	0	0.00	1	2.93	0	0.00	1	1.57	0.64	-0.17
Non-Hodgkin lymphoma	7	1.24	12	0.87	8	1.11	3	1.08	30	29.52	1.02	0.14
Myeloma	1	0.42	3	0.53	1	0.35	0	0.00	5	12.08	0.41*	-2.09
Leukemia	4	0.77	14	1.13	4	0.63	0	0.00	22	26.57	0.83	-1.35
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.19
Chronic lymphocytic	1	0.48	3	0.61	1	0.40	0	0.00	5	10.43	0.48	-1.60
Acute non-lymphocytic	2	1.13	9	2.13	1	0.46	0	0.00	12	8.99	1.33	0.89
Chronic myeloid	1	1.45	1	0.60	1	1.12	0	0.00	3	3.62	0.83	-0.18

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 16,268 PYR and for male cancers on 17,556 PYR.

## Oral and Pharynx Both Sexes, Radiotherapy

**Table 3.2.9:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	24,609		17,568		6,472		2,686		24,609			
Number starting interval	Person-years in interval		17,546		40,322		21,557		12,846		92,270	
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	537	2.22*	1,669	2.82*	983	2.67*	566	2.14*	3,755	1,466.29	2.56*	248.04
All excluding same site	448	1.89*	1,374	2.38*	774	2.14*	440	1.69*	3,036	1,436.89	2.11*	173.31
<b>Buccal cavity, pharynx</b>	97	12.31*	334	18.47*	227	22.79*	141	23.29*	799	41.97	19.04*	82.04
Lip	2	1.74	7	2.68*	1	0.69	6	6.71*	16	6.11	2.62*	1.07
Tongue	28	17.91*	111	30.61*	81	40.16*	38	30.80*	258	8.44	30.57*	27.05
Salivary gland	0	0.00	5	3.77*	3	3.70	1	1.70	9	3.27	2.75*	0.62
Mouth	44	21.38*	119	25.40*	83	32.42*	53	34.39*	299	10.84	27.57*	31.23
Nasopharynx	2	6.37	7	9.92*	5	13.33*	0	0.00	14	1.62	8.65*	1.34
Tonsil	8	9.65*	26	13.88*	16	16.34*	11	20.06*	61	4.23	14.42*	6.15
Oropharynx	1	4.17	8	14.53*	5	16.62*	9	50.89*	23	1.27	18.13*	2.36
Hypopharynx	8	8.99*	31	15.35*	24	22.07*	15	24.32*	78	4.61	16.90*	7.95
<b>Digestive system</b>	131	2.45*	322	2.52*	207	2.63*	95	1.69*	755	316.47	2.39*	47.53
Esophagus	63	19.26*	142	18.78*	101	22.96*	38	12.71*	344	18.22	18.88*	35.31
Stomach	9	1.52	26	1.92*	12	1.50	4	0.73	51	32.97	1.55*	1.95
Small intestine	0	0.00	2	1.10	0	0.00	2	2.34	4	4.57	0.88	-0.06
Colon	29	1.27	73	1.31*	44	1.25	22	0.86	168	139.19	1.21*	3.12
Rectum, rectosigmoid junction	10	1.03	34	1.47*	15	1.09	10	1.08	69	55.89	1.23	1.42
Anus, anal canal	2	4.18	4	3.40	0	0.00	1	2.01	7	2.87	2.44	0.45
Liver	6	3.05*	15	3.18*	11	3.85*	5	2.36	37	11.67	3.17*	2.75
Gallbladder	2	3.14	1	0.66	2	2.11	0	0.00	5	3.79	1.32	0.13
Bile ducts, other biliary	2	1.92	5	1.95	4	2.41	0	0.00	11	6.60	1.67	0.48
Pancreas	8	1.25	20	1.31	18	1.92*	12	1.77	58	37.88	1.53*	2.18
<b>Respiratory system</b>	142	3.03*	654	5.84*	330	4.91*	178	3.87*	1,304	272.09	4.79*	111.84
Nose, nasal cavity, ear	1	2.59	3	3.29	2	3.75	0	0.00	6	2.19	2.74	0.41
Larynx	13	3.46*	56	6.50*	26	5.46*	20	7.08*	115	19.96	5.76*	10.30
Lung, bronchus	128	3.00*	590	5.78*	300	4.85*	157	3.68*	1,175	249.26	4.71*	100.33
<b>Female breast</b>	29	1.70*	47	1.06	31	1.06	25	1.14	132	112.61	1.17	6.13
<b>Female genital system</b>	8	0.97	18	0.87	11	0.85	3	0.33*	40	50.93	0.79	-3.45
Cervix uteri	4	3.99*	6	2.55	2	1.53	1	1.25	13	5.47	2.38*	2.38
Corpus uteri	1	0.23	3	0.28*	4	0.60	1	0.21	9	26.59	0.34*	-5.56
Ovary	1	0.43	2	0.34	4	1.05	0	0.00	7	14.82	0.47*	-2.47
Vagina	1	8.51	2	6.81	1	5.19	0	0.00	4	0.75	5.32*	1.03
Vulva	1	3.08	4	4.79*	0	0.00	1	2.14	6	2.20	2.73	1.20
<b>Male genital system</b>	46	0.88	129	0.99	68	0.80	56	0.87	299	331.52	0.90	-5.36
Prostate	45	0.87	126	0.98	67	0.80	55	0.86	293	328.01	0.89	-5.78
Testis	0	0.00	0	0.00	0	0.00	1	8.03	1	1.39	0.72	-0.06
<b>Urinary system</b>	25	1.25	52	1.07	45	1.49*	26	1.19	148	120.91	1.22*	2.94
Urinary bladder	15	1.10	32	0.96	35	1.68*	19	1.24	101	83.25	1.21	1.92
Kidney parenchyma	9	1.77	16	1.29	9	1.19	6	1.13	40	30.38	1.32	1.04
Renal pelvis, other urinary	1	0.81	4	1.35	1	0.55	1	0.79	7	7.28	0.96	-0.03
Ureter	0	0.00	1	1.02	1	1.65	0	0.00	2	2.40	0.83	-0.04
<b>Bone, joints</b>	0	0.00	1	1.87	2	6.61	1	5.16	4	1.26	3.18	0.30
<b>Soft tissue including heart</b>	0	0.00	1	0.44	6	4.39*	0	0.00	7	5.60	1.25	0.15
<b>Kaposi sarcoma</b>	0	0.00	3	3.22	1	2.20	0	0.00	4	2.05	1.95	0.21
<b>Melanoma of skin</b>	7	1.34	10	0.75	9	1.09	7	1.16	33	32.79	1.01	0.02
<b>Eye, orbit</b>	1	2.74	2	2.28	1	1.94	0	0.00	4	2.10	1.90	0.21
<b>Brain, central nervous system</b>	3	1.14	6	0.94	1	0.27	2	0.81	12	15.20	0.79	-0.35
<b>Thyroid</b>	8	6.41*	4	1.32	2	1.15	1	0.89	15	7.13	2.10*	0.85
<b>Lymphatic, hematopoietic</b>	19	1.08	43	1.00	26	0.97	13	0.66	101	106.97	0.94	-0.65
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.53	0.00	-0.38
Non-Hodgkin lymphoma	11	1.44	21	1.10	15	1.24	10	1.10	57	47.92	1.19	0.98
Myeloma	1	0.32	5	0.67	4	0.86	1	0.29	11	18.63	0.59	-0.83
Leukemia	7	1.13	17	1.14	7	0.76	2	0.30	33	36.90	0.89	-0.42
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.02	0.00	-0.11
Chronic lymphocytic	1	0.40	3	0.49	1	0.27	0	0.00	5	15.03	0.33*	-1.09
Acute non-lymphocytic	5	2.48	10	2.04	2	0.65	0	0.00	17	12.27	1.39	0.51
Chronic myeloid	0	0.00	3	1.50	3	2.45	1	1.10	7	4.97	1.41	0.22

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 31,656 PYR and for male cancers on 60,614 PYR.

**Table 3.2.10:** Risk of subsequent primary cancers after cancer of the oral cavity or pharynx (tongue, mouth, tonsil, oropharynx, hypopharynx), both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis												
	<1 year		1-4 years		5-9 years		≥10 years		Total				
	14,892		12,139		6,636		3,446		14,892				
Number starting interval	Person-years in interval		11,018		35,143		24,399		18,473		89,033		
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR	
<b>All subsequent cancers</b>	365	2.43*	1,312	2.57*	951	2.34*	693	1.94*	3,321	1,424.92	2.33*	212.96	
All excluding same site	274	1.86*	990	1.98*	697	1.74*	523	1.48*	2,484	1,399.03	1.78*	121.86	
<b>Buccal cavity, pharynx</b>	104	22.92*	367	25.17*	280	26.90*	183	23.18*	934	37.42	24.96*	100.70	
Lip	6	8.77*	14	6.46*	10	6.49*	3	2.56	33	5.57	5.93*	3.08	
Tongue	19	21.27*	95	32.78*	68	32.36*	53	32.94*	235	7.50	31.33*	25.55	
Salivary gland	2	5.86	8	7.00*	4	4.45*	1	1.24	15	3.19	4.70*	1.33	
Mouth	47	38.73*	146	37.58*	112	40.91*	74	35.90*	379	9.90	38.29*	41.46	
Nasopharynx	0	0.00	6	10.73*	0	0.00	2	7.11	8	1.40	5.71*	0.74	
Tonsil	15	33.35*	30	21.17*	32	32.75*	14	20.39*	91	3.53	25.78*	9.82	
Oropharynx	4	30.49*	12	28.34*	9	29.99*	9	40.77*	34	1.08	31.61*	3.70	
Hypopharynx	6	12.40*	39	25.09*	33	30.50*	20	26.35*	98	3.88	25.26*	10.57	
<b>Digestive system</b>	70	2.05*	243	2.13*	179	2.00*	126	1.63*	618	314.82	1.96*	34.05	
Esophagus	25	13.80*	92	15.49*	65	14.30*	33	8.58*	215	16.14	13.32*	22.34	
Stomach	5	1.38	21	1.79*	10	1.13	10	1.36	46	31.65	1.45*	1.61	
Small intestine	2	4.41	1	0.65	3	2.39	2	1.72	8	4.42	1.81	0.40	
Colon	18	1.19	60	1.17	47	1.15	36	1.00	161	143.15	1.12	2.01	
Rectum, rectosigmoid junction	4	0.66	26	1.29	28	1.83*	18	1.44	76	54.07	1.41*	2.46	
Anus, anal canal	1	3.24	2	1.90	1	1.21	1	1.41	5	2.90	1.73	0.24	
Liver	7	6.24*	13	3.47*	10	3.36*	6	2.19	36	10.59	3.40*	2.85	
Gallbladder	0	0.00	1	0.65	0	0.00	0	0.00	1	4.20	0.24	-0.36	
Bile ducts, other biliary	0	0.00	5	2.14	3	1.55	7	3.72*	15	6.84	2.19*	0.92	
Pancreas	8	1.95	21	1.54	12	1.12	12	1.28	53	37.87	1.40*	1.70	
<b>Respiratory system</b>	86	3.13*	388	4.21*	267	3.75*	184	3.08*	925	250.67	3.69*	75.74	
Nose, nasal cavity, ear	1	4.21	5	6.43*	4	6.83*	1	2.03	11	2.09	5.26*	1.00	
Larynx	15	7.28*	53	7.98*	36	7.60*	20	5.75*	124	16.91	7.33*	12.03	
Lung, bronchus	69	2.75*	329	3.89*	225	3.42*	162	2.91*	785	231.04	3.40*	62.22	
<b>Female breast</b>	14	0.99	55	1.11	33	0.83	35	0.98	137	138.96	0.99	-0.50	
<b>Female genital system</b>	11	1.63	23	1.01	15	0.87	15	1.02	64	61.48	1.04	0.64	
Cervix uteri	2	2.50	3	1.17	0	0.00	1	0.75	6	6.50	0.92	-0.13	
Corpus uteri	6	1.72	9	0.76	4	0.46	5	0.68	24	31.46	0.76	-1.89	
Ovary	2	1.05	7	1.06	9	1.74	8	1.76	26	18.23	1.43	1.97	
Vagina	1	9.98	2	5.82	0	0.00	0	0.00	3	0.95	3.15	0.52	
Vulva	0	0.00	2	1.96	2	2.40	0	0.00	4	2.96	1.35	0.26	
<b>Male genital system</b>	37	1.32	100	1.02	78	0.92	63	0.80	278	289.35	0.96	-2.29	
Prostate	35	1.27	100	1.03	78	0.93	63	0.81	276	286.31	0.96	-2.08	
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-0.24	
<b>Urinary system</b>	10	0.83	39	0.96	43	1.32	28	0.97	120	114.44	1.05	0.62	
Urinary bladder	9	1.08	31	1.10	29	1.29	19	0.94	88	79.22	1.11	0.99	
Kidney parenchyma	1	0.34	6	0.59	12	1.50	7	1.00	26	28.14	0.92	-0.24	
Renal pelvis, other urinary	0	0.00	2	0.77	2	1.00	2	1.17	6	7.08	0.85	-0.12	
Ureter	0	0.00	1	1.16	1	1.49	1	1.78	3	2.35	1.28	0.07	
<b>Bone, joints</b>	0	0.00	1	2.17	1	2.98	0	0.00	2	1.21	1.65	0.09	
<b>Soft tissue including heart</b>	0	0.00	4	2.03	1	0.65	1	0.72	6	5.48	1.10	0.06	
<b>Kaposi sarcoma</b>	1	4.15	1	1.33	0	0.00	0	0.00	2	1.87	1.07	0.01	
<b>Melanoma of skin</b>	9	2.80*	10	0.90	5	0.55	10	1.19	34	31.74	1.07	0.25	
<b>Eye, orbit</b>	0	0.00	1	1.31	0	0.00	2	4.23	3	2.04	1.47	0.11	
<b>Brain, central nervous system</b>	4	2.46	2	0.37	1	0.25	4	1.20	11	14.49	0.76	-0.39	
<b>Thyroid</b>	4	4.83*	3	1.09	0	0.00	1	0.59	8	7.31	1.09	0.08	
<b>Lymphatic, hematopoietic</b>	9	0.81	32	0.85	24	0.80	15	0.55*	80	106.32	0.75*	-2.96	
Hodgkin lymphoma	0	0.00	1	0.76	3	3.30	0	0.00	4	3.34	1.20	0.07	
Non-Hodgkin lymphoma	6	1.23	15	0.89	9	0.66	9	0.71	39	48.01	0.81	-1.01	
Myeloma	1	0.52	4	0.62	5	0.97	4	0.86	14	18.15	0.77	-0.47	
Leukemia	2	0.51	12	0.91	7	0.67	2	0.22*	23	36.81	0.62*	-1.55	
Acute lymphocytic	0	0.00	1	2.69	0	0.00	0	0.00	1	1.01	0.99	0.00	
Chronic lymphocytic	0	0.00	3	0.56	2	0.47	0	0.00	5	14.85	0.34*	-1.11	
Acute non-lymphocytic	1	0.77	7	1.60	2	0.57	1	0.31	11	12.35	0.89	-0.15	
Chronic myeloid	1	1.87	1	0.56	1	0.71	0	0.00	3	4.97	0.60	-0.22	

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 39,481 PYR and for male cancers on 49,552 PYR.

## Tongue Both Sexes

**Table 3.3.1:** Characteristics of patients with an initial cancer of the tongue, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	7,733	100.0	3,950	100.0	11,683	100.0
<b>Initial treatment</b>						
Any radiation	4,848	62.7	2,077	52.6	6,925	59.3
With surgery	2,302	29.8	1,081	27.4	3,383	29.0
Without surgery	2,546	32.9	996	25.2	3,542	30.3
No radiation	2,885	37.3	1,873	47.4	4,758	40.7
With surgery	2,362	30.5	1,631	41.3	3,993	34.2
Without surgery	523	6.8	242	6.1	765	6.5
<b>Race</b>						
White	6,501	84.1	3,388	85.8	9,889	84.6
Black	861	11.1	309	7.8	1,170	10.0
Other	354	4.6	227	5.7	581	5.0
Unknown	17	0.2	26	0.7	43	0.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	99	1.3	88	2.2	187	1.6
30–49	1,415	18.3	559	14.2	1,974	16.9
50–69	4,473	57.8	1,970	49.9	6,443	55.1
70–79	1,337	17.3	846	21.4	2,183	18.7
≥ 80	409	5.3	487	12.3	896	7.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	6,652	86.0	3,431	86.9	10,083	86.3
1st and 2nd cancers	951	12.3	451	11.4	1,402	12.0
1st, 2nd, and 3rd cancers	106	1.4	60	1.5	166	1.4
1st, 2nd, 3rd, and additional cancers	24	0.3	8	0.2	32	0.3
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	60.8	—	64.2	—	61.8	—
Median year of 1st cancer diagnosis	1988.3	—	1988.0	—	1988.2	—
Median person-years at risk	2.0	—	2.7	—	2.2	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.2	—	95.2	—	95.2
1st, 2nd, and additional cancers	—	94.8	—	93.6	—	94.4
1st cancer only	—	4.5	—	4.6	—	4.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



**Table 3.3.2:** Risk of subsequent primary cancers after cancer of the tongue, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	11,683		8,750		3,802		1,811		11,683			
Number starting interval	Person-years in interval		Person-years in interval		Person-years in interval		Person-years in interval		Person-years in interval			
	8,439		21,905		13,388		9,445		53,177			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	252	2.23*	749	2.41*	506	2.28*	328	1.81*	1,835	826.02	2.22*	189.74
All excluding same site	247	2.20*	716	2.32*	477	2.17*	306	1.70*	1,746	821.47	2.13*	173.86
<b>Buccal cavity, pharynx</b>	53	15.14*	167	18.40*	148	25.64*	84	20.49*	452	22.45	20.14*	80.78
Lip	4	7.71*	6	4.52*	0	0.00	2	3.27	12	3.31	3.62*	1.63
Tongue	5	7.10*	33	18.04*	29	24.72*	22	26.04*	89	4.55	19.55*	15.88
Salivary gland	1	3.89	5	7.12*	1	2.03	0	0.00	7	1.86	3.76*	0.97
Mouth	30	32.85*	65	27.49*	65	43.67*	32	30.60*	192	5.81	33.04*	35.01
Nasopharynx	0	0.00	1	2.71	0	0.00	0	0.00	1	0.90	1.11	0.02
Tonsil	4	11.20*	18	19.80*	22	40.00*	11	30.38*	55	2.18	25.25*	9.93
Oropharynx	1	9.68	5	18.61*	4	23.60*	7	61.06*	17	0.66	25.91*	3.07
Hypopharynx	4	10.54*	21	21.50*	21	34.74*	10	25.02*	56	2.36	23.72*	10.09
<b>Digestive system</b>	56	2.24*	143	2.09*	101	2.09*	57	1.45*	357	180.93	1.97*	33.11
Esophagus	21	14.75*	48	12.86*	47	18.57*	17	8.50*	133	9.68	13.73*	23.19
Stomach	1	0.37	18	2.52*	5	1.02	5	1.30	29	18.62	1.56*	1.95
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	2.56	0.00	-0.48
Colon	21	1.93*	42	1.39*	19	0.87	18	1.00	100	80.85	1.24*	3.60
Rectum, rectosigmoid junction	3	0.67	13	1.07	13	1.56	5	0.78	34	31.43	1.08	0.48
Anus, anal canal	1	4.38	2	3.15	0	0.00	0	0.00	3	1.65	1.82	0.25
Liver	4	4.48*	10	4.10*	5	2.89	2	1.33	21	6.56	3.20*	2.72
Gallbladder	0	0.00	0	0.00	1	1.62	0	0.00	1	2.30	0.43	-0.24
Bile ducts, other biliary	2	3.96	2	1.41	3	2.81	3	3.12	10	3.96	2.53*	1.14
Pancreas	3	1.00	8	0.98	8	1.39	6	1.27	25	21.63	1.16	0.63
<b>Respiratory system</b>	62	2.95*	252	4.44*	134	3.43*	75	2.45*	523	147.44	3.55*	70.63
Nose, nasal cavity, ear	1	5.62	1	2.10	1	3.09	0	0.00	3	1.23	2.44	0.33
Larynx	10	6.16*	23	5.49*	14	5.26*	6	3.28*	53	10.30	5.14*	8.03
Lung, bronchus	51	2.66*	227	4.37*	116	3.22*	69	2.43*	463	135.54	3.42*	61.58
<b>Female breast</b>	8	0.88	31	1.16	20	1.05	18	1.13	77	70.89	1.09	3.01
<b>Female genital system</b>	2	0.46	12	0.98	6	0.73	7	1.07	27	31.36	0.86	-2.15
Cervix uteri	0	0.00	1	0.72	1	1.18	1	1.65	3	3.36	0.89	-0.18
Corpus uteri	1	0.45	4	0.63	0	0.00*	2	0.61	7	16.03	0.44*	-4.44
Ovary	0	0.00	3	0.84	5	2.01	3	1.48	11	9.29	1.18	0.84
Vagina	1	15.81	2	10.97*	0	0.00	0	0.00	3	0.49	6.18*	1.24
Vulva	0	0.00	2	3.68	0	0.00	1	2.77	3	1.50	2.00	0.74
<b>Male genital system</b>	27	1.17	64	0.99	36	0.73	36	0.86	163	178.42	0.91	-4.69
Prostate	26	1.14	64	1.01	36	0.74	36	0.87	162	176.42	0.92	-4.39
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-0.26
<b>Urinary system</b>	14	1.51	23	0.91	24	1.33	20	1.33	81	67.71	1.20	2.50
Urinary bladder	10	1.58	14	0.81	19	1.52	14	1.33	57	46.78	1.22	1.92
Kidney parenchyma	4	1.72	7	1.09	4	0.89	5	1.38	20	16.83	1.19	0.60
Renal pelvis, other urinary	0	0.00	2	1.28	1	0.91	1	1.15	4	4.10	0.98	-0.02
Ureter	0	0.00	1	1.93	1	2.71	0	0.00	2	1.37	1.46	0.12
<b>Bone, joints</b>	0	0.00	1	3.51	1	5.43	0	0.00	2	0.71	2.81	0.24
<b>Soft tissue including heart</b>	0	0.00	2	1.64	3	3.57	0	0.00	5	3.22	1.55	0.33
<b>Kaposi sarcoma</b>	1	4.77	1	1.87	1	3.20	0	0.00	3	1.26	2.38	0.33
<b>Melanoma of skin</b>	7	2.76*	4	0.56	6	1.18	7	1.61	24	19.16	1.25	0.91
<b>Eye, orbit</b>	1	5.78	0	0.00	0	0.00	1	4.16	2	1.19	1.68	0.15
<b>Brain, central nervous system</b>	2	1.62	3	0.89	1	0.45	4	2.34	10	8.54	1.17	0.27
<b>Thyroid</b>	4	6.41*	2	1.17	0	0.00	0	0.00	6	4.29	1.40	0.32
<b>Lymphatic, hematopoietic</b>	8	0.96	26	1.13	14	0.85	8	0.58	56	61.53	0.91	-1.04
Hodgkin lymphoma	0	0.00	1	1.21	0	0.00	0	0.00	1	2.00	0.50	-0.19
Non-Hodgkin lymphoma	5	1.36	11	1.06	9	1.20	7	1.09	32	27.97	1.14	0.76
Myeloma	0	0.00	4	1.03	3	1.08	1	0.43	8	10.41	0.77	-0.45
Leukemia	3	1.03	10	1.26	2	0.35	0	0.00*	15	21.16	0.71	-1.16
Acute lymphocytic	0	0.00	1	4.32	0	0.00	0	0.00	1	0.60	1.67	0.08
Chronic lymphocytic	0	0.00	0	0.00	1	0.44	0	0.00	1	8.50	0.12*	-1.41
Acute non-lymphocytic	2	2.09	6	2.27	1	0.53	0	0.00	9	7.11	1.27	0.35
Chronic myeloid	0	0.00	2	1.87	0	0.00	0	0.00	2	2.86	0.70	-0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 20,315 PYR and for male cancers on 32,861 PYR.

## Gum and Mouth Both Sexes

**Table 3.4.1:** Characteristics of patients with an initial cancer of the gum or mouth, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	9,287	100.0	6,014	100.0	15,301	100.0
<b>Initial treatment</b>						
Any radiation	4,798	51.7	2,632	43.8	7,430	48.6
With surgery	2,708	29.2	1,393	23.2	4,101	26.8
Without surgery	2,090	22.5	1,239	20.6	3,329	21.8
No radiation	4,489	48.3	3,382	56.2	7,871	51.4
With surgery	3,909	42.1	3,027	50.3	6,936	45.3
Without surgery	580	6.2	355	5.9	935	6.1
<b>Race</b>						
White	7,760	83.6	5,206	86.6	12,966	84.7
Black	1,159	12.5	527	8.8	1,686	11.0
Other	345	3.7	239	4.0	584	3.8
Unknown	23	0.2	42	0.7	65	0.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	87	0.9	125	2.1	212	1.4
30–49	1,383	14.9	673	11.2	2,056	13.4
50–69	5,553	59.8	2,933	48.8	8,486	55.5
70–79	1,655	17.8	1,404	23.3	3,059	20.0
≥ 80	609	6.6	879	14.6	1,488	9.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	7,480	80.5	5,040	83.8	12,520	81.8
1st and 2nd cancers	1,529	16.5	817	13.6	2,346	15.3
1st, 2nd, and 3rd cancers	239	2.6	129	2.1	368	2.4
1st, 2nd, 3rd, and additional cancers	39	0.4	28	0.5	67	0.4
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	61.8	—	65.7	—	63.2	—
Median year of 1st cancer diagnosis	1986.1	—	1986.9	—	1986.4	—
Median person-years at risk	2.9	—	4.0	—	3.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.1	—	94.7	—	95.0
1st, 2nd, and additional cancers	—	94.4	—	94.3	—	94.4
1st cancer only	—	4.2	—	5.0	—	4.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 3.4.2:** Risk of subsequent primary cancers after cancer of the gum or mouth, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	15,301		12,248		6,203		3,088		15,301			
Number starting interval	Person-years in interval		Person-years in interval		Person-years in interval		Person-years in interval		Person-years in interval			
	11,407		33,704		22,375		16,073		83,559			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	371	2.34*	1,328	2.67*	946	2.53*	667	2.10*	3,312	1,347.46	2.46*	235.11
All excluding same site	331	2.10*	1,193	2.42*	853	2.29*	588	1.86*	2,965	1,337.89	2.22*	194.73
<b>Buccal cavity, pharynx</b>	89	18.28*	350	24.28*	242	24.95*	181	25.86*	862	35.98	23.96*	98.85
Lip	3	4.10	13	6.05*	10	7.05*	7	6.87*	33	5.32	6.21*	3.31
Tongue	21	22.07*	105	36.84*	64	32.74*	46	32.34*	236	7.18	32.88*	27.38
Salivary gland	1	2.79	5	4.51*	4	4.86*	2	2.82	12	3.00	4.00*	1.08
Mouth	40	30.46*	135	35.05*	93	36.27*	79	42.93*	347	9.57	36.26*	40.38
Nasopharynx	0	0.00	7	12.95*	2	5.69	2	8.16	11	1.33	8.30*	1.16
Tonsil	13	26.84*	27	19.13*	21	22.80*	8	13.01*	69	3.43	20.11*	7.85
Oropharynx	4	28.16*	11	26.08*	5	17.67*	8	40.20*	28	1.05	26.77*	3.23
Hypopharynx	4	7.64*	33	21.32*	30	29.34*	20	29.25*	87	3.78	23.03*	9.96
<b>Digestive system</b>	72	1.99*	241	2.17*	192	2.34*	112	1.64*	617	297.64	2.07*	38.22
Esophagus	35	17.88*	96	16.35*	76	18.03*	36	10.55*	243	15.46	15.72*	27.23
Stomach	5	1.29	14	1.22	11	1.35	4	0.62	34	29.97	1.13	0.48
Small intestine	2	4.16	2	1.33	3	2.59	4	3.85*	11	4.18	2.63*	0.82
Colon	17	1.06	59	1.19	50	1.34	29	0.91	155	134.99	1.15	2.40
Rectum, rectosigmoid junction	4	0.62	31	1.57*	22	1.56	17	1.55	74	51.34	1.44*	2.71
Anus, anal canal	1	3.07	2	1.96	1	1.31	1	1.58	5	2.75	1.82	0.27
Liver	5	4.21*	9	2.47*	11	4.06*	6	2.51	31	9.92	3.12*	2.52
Gallbladder	0	0.00	1	0.67	1	0.92	0	0.00	2	3.98	0.50	-0.24
Bile ducts, other biliary	0	0.00	6	2.67	4	2.30	3	1.83	13	6.34	2.05*	0.80
Pancreas	3	0.69	20	1.50	13	1.32	11	1.32	47	35.92	1.31	1.33
<b>Respiratory system</b>	103	3.51*	416	4.59*	291	4.40*	199	3.72*	1,009	239.43	4.21*	92.10
Nose, nasal cavity, ear	1	3.98	2	2.63	3	5.57*	0	0.00	6	1.98	3.03*	0.48
Larynx	13	5.85*	60	9.08*	39	8.78*	24	7.70*	136	16.39	8.30*	14.31
Lung, bronchus	88	3.29*	353	4.26*	248	4.07*	175	3.52*	864	220.46	3.92*	77.02
<b>Female breast</b>	22	1.50	48	1.01	30	0.81	33	1.02	133	131.68	1.01	0.36
<b>Female genital system</b>	11	1.56	24	1.08	18	1.11	11	0.82	64	58.79	1.09	1.41
Cervix uteri	3	3.60	5	2.01	1	0.59	1	0.83	10	6.21	1.61	1.02
Corpus uteri	5	1.37	8	0.70	7	0.84	4	0.59	24	30.29	0.79	-1.70
Ovary	2	1.01	4	0.63	7	1.44	5	1.21	18	17.32	1.04	0.18
Vagina	1	9.45	2	6.07	1	3.98	0	0.00	4	0.90	4.43*	0.84
Vulva	0	0.00	4	4.13*	2	2.62	0	0.00	6	2.76	2.17	0.88
<b>Male genital system</b>	29	0.97	102	1.06	80	1.04	55	0.80	266	272.22	0.98	-1.34
Prostate	28	0.95	100	1.06	79	1.03	55	0.80	262	269.44	0.97	-1.60
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.02	0.00	-0.22
<b>Urinary system</b>	8	0.63	45	1.13	41	1.38	24	0.95	118	107.61	1.10	1.24
Urinary bladder	4	0.46	33	1.20	30	1.46	17	0.96	84	74.30	1.13	1.16
Kidney parenchyma	4	1.27	10	1.01	10	1.35	6	0.97	30	26.62	1.13	0.40
Renal pelvis, other urinary	0	0.00	2	0.79	1	0.55	1	0.67	4	6.69	0.60	-0.32
Ureter	0	0.00	0	0.00	0	0.00	1	2.03	1	2.21	0.45	-0.14
<b>Bone, joints</b>	0	0.00	0	0.00	2	6.48	0	0.00	2	1.14	1.75	0.10
<b>Soft tissue including heart</b>	0	0.00	1	0.53	4	2.86	1	0.83	6	5.14	1.17	0.10
<b>Kaposi sarcoma</b>	0	0.00	3	4.37	0	0.00	0	0.00	3	1.65	1.82	0.16
<b>Melanoma of skin</b>	7	2.13	12	1.13	6	0.74	8	1.11	33	29.25	1.13	0.45
<b>Eye, orbit</b>	0	0.00	1	1.34	0	0.00	1	2.42	2	1.92	1.04	0.01
<b>Brain, central nervous system</b>	3	1.76	2	0.38	1	0.27	2	0.68	8	13.68	0.58	-0.68
<b>Thyroid</b>	7	8.31*	4	1.54	1	0.54	2	1.37	14	6.77	2.07*	0.87
<b>Lymphatic, hematopoietic</b>	9	0.77	32	0.87	20	0.72	14	0.59*	75	99.89	0.75*	-2.98
Hodgkin lymphoma	0	0.00	0	0.00	2	2.39	0	0.00	2	3.15	0.63	-0.14
Non-Hodgkin lymphoma	5	0.98	17	1.05	7	0.56	7	0.63	36	44.79	0.80	-1.05
Myeloma	0	0.00	3	0.47	4	0.84	3	0.72	10	17.29	0.58	-0.87
Leukemia	4	0.96	12	0.93	7	0.73	4	0.50	27	34.66	0.78	-0.92
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.95	0.00	-0.11
Chronic lymphocytic	0	0.00	4	0.76	1	0.26	0	0.00	5	14.06	0.36*	-1.08
Acute non-lymphocytic	3	2.19	8	1.88	3	0.94	1	0.36	15	11.58	1.30	0.41
Chronic myeloid	1	1.77	0	0.00	1	0.78	1	0.91	3	4.67	0.64	-0.20

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 37,019 PYR and for male cancers on 46,540 PYR.

## Tonsil Both Sexes

**Table 3.5.1:** Characteristics of patients with an initial cancer of the tonsil, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	4,178	100.0	1,710	100.0	5,888	100.0
<b>Initial treatment</b>						
Any radiation	3,501	83.8	1,389	81.2	4,890	83.1
With surgery	1,687	40.4	537	31.4	2,224	37.8
Without surgery	1,814	43.4	852	49.8	2,666	45.3
No radiation	677	16.2	321	18.8	998	16.9
With surgery	444	10.6	218	12.7	662	11.2
Without surgery	233	5.6	103	6.0	336	5.7
<b>Race</b>						
White	3,400	81.4	1,429	83.6	4,829	82.0
Black	643	15.4	218	12.7	861	14.6
Other	129	3.1	54	3.2	183	3.1
Unknown	6	0.1	9	0.5	15	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	11	0.3	9	0.5	20	0.3
30–49	888	21.3	257	15.0	1,145	19.4
50–69	2,518	60.3	1,050	61.4	3,568	60.6
70–79	601	14.4	297	17.4	898	15.3
≥ 80	160	3.8	97	5.7	257	4.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	3,612	86.5	1,458	85.3	5,070	86.1
1st and 2nd cancers	500	12.0	210	12.3	710	12.1
1st, 2nd, and 3rd cancers	58	1.4	32	1.9	90	1.5
1st, 2nd, 3rd, and additional cancers	8	0.2	10	0.6	18	0.3
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	59.1	—	61.7	—	59.9	—
Median year of 1st cancer diagnosis	1988.8	—	1986.4	—	1988.1	—
Median person-years at risk	2.0	—	2.6	—	2.1	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.9	—	96.0	—	95.2
1st, 2nd, and additional cancers	—	94.2	—	95.2	—	94.5
1st cancer only	—	4.8	—	3.6	—	4.4

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 3.5.2:** Risk of subsequent primary cancers after cancer of the tonsil, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	5,888		4,388		1,757		707		5,888			
Number starting interval	4,251		10,723		5,820		3,346		24,140			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	133	2.50*	421	2.92*	249	2.66*	144	2.16*	947	357.64	2.65*	244.14
All excluding same site	129	2.43*	417	2.90*	246	2.63*	140	2.11*	932	356.53	2.61*	238.39
<b>Buccal cavity, pharynx</b>	30	16.76*	97	21.37*	74	28.43*	32	20.87*	233	10.47	22.26*	92.19
Lip	1	4.04	1	1.60	0	0.00	0	0.00	2	1.46	1.37	0.22
Tongue	9	25.00*	36	38.87*	37	69.02*	13	40.94*	95	2.14	44.39*	38.47
Salivary gland	0	0.00	1	3.05	2	9.57*	0	0.00	3	0.80	3.73	0.91
Mouth	11	23.66*	36	30.71*	21	31.48*	10	25.56*	78	2.70	28.94*	31.20
Nasopharynx	0	0.00	1	5.73	3	31.09*	0	0.00	4	0.40	10.06*	1.49
Tonsil	4	19.74*	4	8.06*	3	11.30*	4	28.28*	15	1.11	13.57*	5.76
Oropharynx	0	0.00	4	28.64*	4	50.51*	0	0.00	8	0.32	25.08*	3.18
Hypopharynx	3	14.86*	10	19.72*	4	14.07*	1	6.41	18	1.15	15.66*	6.98
<b>Digestive system</b>	30	2.62*	73	2.39*	45	2.29*	23	1.66*	171	75.54	2.26*	39.54
Esophagus	10	13.55*	30	15.88*	17	14.86*	8	10.79*	65	4.51	14.41*	25.06
Stomach	4	3.19	9	2.80*	3	1.52	1	0.77	17	7.74	2.20*	3.84
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	1.13	0.00	-0.47
Colon	2	0.41	14	1.07	14	1.61	4	0.63	34	32.94	1.03	0.44
Rectum, rectosigmoid junction	4	1.91	5	0.90	4	1.15	3	1.30	16	13.45	1.19	1.06
Anus, anal canal	1	9.12	1	3.35	0	0.00	1	7.74	3	0.73	4.13	0.94
Liver	3	6.98*	6	5.22*	4	5.48*	2	3.80	15	2.83	5.29*	5.04
Gallbladder	1	7.70	1	2.84	0	0.00	0	0.00	2	0.88	2.28	0.47
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.56	0.00	-0.65
Pancreas	5	3.61*	7	1.91	3	1.28	4	2.39	19	9.08	2.09*	4.11
<b>Respiratory system</b>	29	2.80*	167	6.09*	82	4.76*	53	4.59*	331	66.56	4.97*	109.54
Nose, nasal cavity, ear	0	0.00	3	13.41*	1	7.32	1	11.03	5	0.54	9.31*	1.85
Larynx	2	2.35	20	9.27*	6	4.83*	7	9.85*	35	4.96	7.06*	12.44
Lung, bronchus	27	2.88*	143	5.72*	75	4.75*	44	4.10*	289	60.90	4.75*	94.49
<b>Female breast</b>	8	2.07	15	1.34	11	1.45	5	0.84	39	28.59	1.36	12.65
<b>Female genital system</b>	4	2.09	4	0.75	1	0.30	0	0.00	9	13.02	0.69	-4.88
Cervix uteri	2	8.10	3	4.73	0	0.00	0	0.00	5	1.44	3.47*	4.33
Corpus uteri	1	0.99	0	0.00	1	0.57	0	0.00	2	6.84	0.29	-5.89
Ovary	1	1.90	1	0.67	0	0.00	0	0.00	2	3.76	0.53	-2.14
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.23
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.63
<b>Male genital system</b>	10	0.89	32	1.02	13	0.61	16	1.01	71	79.92	0.89	-5.61
Prostate	10	0.90	32	1.03	13	0.61	15	0.96	70	79.00	0.89	-5.66
Testis	0	0.00	0	0.00	0	0.00	1	30.22	1	0.41	2.45	0.37
<b>Urinary system</b>	9	2.06	8	0.68	9	1.17	7	1.28	33	29.32	1.13	1.53
Urinary bladder	7	2.38	6	0.75	5	0.95	5	1.31	23	20.00	1.15	1.24
Kidney parenchyma	2	1.74	1	0.32	4	2.03	1	0.74	8	7.59	1.05	0.17
Renal pelvis, other urinary	0	0.00	1	1.43	0	0.00	1	3.19	2	1.73	1.16	0.11
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.23
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	19.85	1	0.32	3.17	0.28
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.39	0.00	-0.58
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.24
<b>Melanoma of skin</b>	1	0.82	2	0.58	0	0.00	1	0.63	4	8.46	0.47	-1.85
<b>Eye, orbit</b>	0	0.00	0	0.00	1	7.45	0	0.00	1	0.52	1.91	0.20
<b>Brain, central nervous system</b>	0	0.00	3	1.86	0	0.00	0	0.00	3	3.84	0.78	-0.35
<b>Thyroid</b>	0	0.00	0	0.00	1	2.13	0	0.00	1	1.86	0.54	-0.36
<b>Lymphatic, hematopoietic</b>	5	1.29	10	0.95	10	1.47	4	0.81	29	26.13	1.11	1.19
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.90	0.00	-0.37
Non-Hodgkin lymphoma	5	2.93	4	0.85	5	1.61	3	1.30	17	11.85	1.43	2.13
Myeloma	0	0.00	1	0.55	2	1.70	1	1.18	4	4.52	0.89	-0.21
Leukemia	0	0.00	5	1.40	3	1.30	0	0.00	8	8.86	0.90	-0.36
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.11
Chronic lymphocytic	0	0.00	2	1.37	1	1.06	0	0.00	3	3.62	0.83	-0.26
Acute non-lymphocytic	0	0.00	2	1.71	0	0.00	0	0.00	2	2.94	0.68	-0.39
Chronic myeloid	0	0.00	1	2.08	2	6.51	0	0.00	3	1.20	2.51	0.75

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,223 PYR and for male cancers on 15,917 PYR.

## Oropharynx Both Sexes

**Table 3.6.1:** Characteristics of patients with an initial cancer of the oropharynx, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	1,064	100.0	414	100.0	1,478	100.0
<b>Initial treatment</b>						
Any radiation	855	80.4	330	79.7	1,185	80.2
With surgery	287	27.0	92	22.2	379	25.6
Without surgery	568	53.4	238	57.5	806	54.5
No radiation	209	19.6	84	20.3	293	19.8
With surgery	108	10.2	46	11.1	154	10.4
Without surgery	101	9.5	38	9.2	139	9.4
<b>Race</b>						
White	868	81.6	358	86.5	1,226	82.9
Black	168	15.8	41	9.9	209	14.1
Other	27	2.5	15	3.6	42	2.8
Unknown	1	0.1	0	0.0	1	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	2	0.2	4	1.0	6	0.4
30–49	139	13.1	43	10.4	182	12.3
50–69	691	64.9	243	58.7	934	63.2
70–79	183	17.2	94	22.7	277	18.7
≥ 80	49	4.6	30	7.2	79	5.3
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	921	86.6	361	87.2	1,282	86.7
1st and 2nd cancers	125	11.7	45	10.9	170	11.5
1st, 2nd, and 3rd cancers	17	1.6	8	1.9	25	1.7
1st, 2nd, 3rd, and additional cancers	1	0.1	0	0.0	1	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	62.3	—	63.7	—	62.6	—
Median year of 1st cancer diagnosis	1987.5	—	1987.1	—	1987.4	—
Median person-years at risk	1.3	—	1.5	—	1.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	97.2	—	94.3	—	96.4
1st, 2nd, and additional cancers	—	95.8	—	94.3	—	95.4
1st cancer only	—	2.8	—	5.7	—	3.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



**Table 3.6.2:** Risk of subsequent primary cancers after cancer of the oropharynx, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	1,478 988		957 2,110		309 1,029		133 684		1,478 4,812			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	42	2.99*	110	3.50*	42	2.38*	29	1.98*	223	77.73	2.87*	301.90
All excluding same site	42	3.00*	110	3.50*	42	2.39*	28	1.91*	222	77.66	2.86*	299.97
<b>Buccal cavity, pharynx</b>	11	23.82*	27	27.42*	4	8.28*	11	32.53*	53	2.27	23.37*	105.43
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.71
Tongue	4	43.58*	13	65.47*	2	20.42*	5	74.36*	24	0.46	52.68*	48.93
Salivary gland	0	0.00	1	14.27	0	0.00	0	0.00	1	0.17	5.73	1.72
Mouth	4	33.31*	8	31.74*	0	0.00	3	35.65*	15	0.58	25.89*	29.97
Nasopharynx	0	0.00	1	27.60	0	0.00	0	0.00	1	0.08	12.25	1.91
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.47
Oropharynx	0	0.00	0	0.00	0	0.00	1	105.27*	1	0.07	14.10	1.93
Hypopharynx	3	56.80*	3	26.81*	2	38.09*	1	29.95	9	0.25	35.91*	18.18
<b>Digestive system</b>	9	2.96*	22	3.35*	9	2.46*	8	2.60*	48	16.36	2.93*	65.76
Esophagus	5	26.13*	10	24.45*	5	24.11*	3	18.68*	23	0.97	23.75*	45.79
Stomach	1	3.02	2	2.95	1	2.80	1	3.48	5	1.66	3.02	6.95
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.50
Colon	0	0.00	4	1.42	1	0.61	3	2.10	8	7.17	1.12	1.71
Rectum, rectosigmoid junction	2	3.57	3	2.46	1	1.52	1	1.92	7	2.96	2.37	8.40
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.31
Liver	0	0.00	1	4.06	0	0.00	0	0.00	1	0.60	1.67	0.83
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.38
Bile ducts, other biliary	0	0.00	1	7.73	0	0.00	0	0.00	1	0.34	2.97	1.38
Pancreas	1	2.74	1	1.28	1	2.30	0	0.00	3	1.95	1.54	2.19
<b>Respiratory system</b>	10	3.60*	38	6.18*	18	5.44*	5	1.95	71	14.80	4.80*	116.79
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.24
Larynx	3	13.26*	3	6.17*	1	4.26	1	6.39	8	1.10	7.25*	14.33
Lung, bronchus	7	2.78*	34	6.07*	17	5.59*	4	1.68	62	13.54	4.58*	100.70
<b>Female breast</b>	4	4.39*	3	1.40	1	0.71	1	0.87	9	5.61	1.60	21.70
<b>Female genital system</b>	1	2.27	0	0.00	0	0.00	0	0.00	1	2.52	0.40	-9.72
Cervix uteri	1	19.38	0	0.00	0	0.00	0	0.00	1	0.25	3.94	4.78
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.34	0.00	-8.58
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-4.71
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.22
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.65
<b>Male genital system</b>	6	1.92	5	0.69	3	0.74	3	0.84	17	17.97	0.95	-2.99
Prostate	6	1.94	5	0.70	3	0.75	3	0.85	17	17.79	0.96	-2.42
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.22
<b>Urinary system</b>	0	0.00	4	1.52	2	1.35	0	0.00	6	6.57	0.91	-1.19
Urinary bladder	0	0.00	3	1.66	1	0.98	0	0.00	4	4.54	0.88	-1.13
Kidney parenchyma	0	0.00	1	1.48	1	2.70	0	0.00	2	1.64	1.22	0.75
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.81
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.27
<b>Bone, joints</b>	0	0.00	1	35.02	0	0.00	0	0.00	1	0.07	14.81	1.94
<b>Soft tissue including heart</b>	0	0.00	1	8.42	0	0.00	0	0.00	1	0.29	3.42	1.47
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.21
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.81	0.00	-3.76
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.24
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-1.72
<b>Thyroid</b>	0	0.00	1	6.39	0	0.00	0	0.00	1	0.37	2.71	1.31
<b>Lymphatic, hematopoietic</b>	1	0.99	3	1.33	3	2.35	0	0.00	7	5.64	1.24	2.83
Hodgkin lymphoma	0	0.00	0	0.00	1	25.07	0	0.00	1	0.19	5.33	1.69
Non-Hodgkin lymphoma	0	0.00	2	1.99	0	0.00	0	0.00	2	2.54	0.79	-1.12
Myeloma	1	5.59	0	0.00	0	0.00	0	0.00	1	0.97	1.03	0.07
Leukemia	0	0.00	1	1.30	2	4.56	0	0.00	3	1.94	1.54	2.19
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-1.67
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-1.34
Chronic myeloid	0	0.00	1	9.72	1	17.41	0	0.00	2	0.26	7.72	3.62

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,562 PYR and for male cancers on 3,250 PYR.

## Hypopharynx Both Sexes

**Table 3.7.1:** Characteristics of patients with an initial cancer of the hypopharynx, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	3,996	100.0	1,155	100.0	5,151	100.0
<b>Initial treatment</b>						
Any radiation	3,259	81.6	920	79.7	4,179	81.1
With surgery	1,584	39.6	421	36.5	2,005	38.9
Without surgery	1,675	41.9	499	43.2	2,174	42.2
No radiation	737	18.4	235	20.3	972	18.9
With surgery	432	10.8	133	11.5	565	11.0
Without surgery	305	7.6	102	8.8	407	7.9
<b>Race</b>						
White	3,136	78.5	977	84.6	4,113	79.8
Black	617	15.4	145	12.6	762	14.8
Other	241	6.0	32	2.8	273	5.3
Unknown	2	0.1	1	0.1	3	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	5	0.1	2	0.2	7	0.1
30–49	377	9.4	113	9.8	490	9.5
50–69	2,588	64.8	729	63.1	3,317	64.4
70–79	813	20.3	242	21.0	1,055	20.5
≥ 80	213	5.3	69	6.0	282	5.5
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	3,448	86.3	1,025	88.7	4,473	86.8
1st and 2nd cancers	487	12.2	119	10.3	606	11.8
1st, 2nd, and 3rd cancers	58	1.5	7	0.6	65	1.3
1st, 2nd, 3rd, and additional cancers	3	0.1	4	0.3	7	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	63.4	—	63.4	—	63.4	—
Median year of 1st cancer diagnosis	1986.9	—	1986.2	—	1986.7	—
Median person-years at risk	1.3	—	1.5	—	1.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.1	—	95.4	—	95.1
1st, 2nd, and additional cancers	—	94.3	—	95.4	—	94.5
1st cancer only	—	4.6	—	3.1	—	4.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 3.7.2:** Risk of subsequent primary cancers after cancer of the hypopharynx, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	5,151 3,478		3,364 7,024		1,037 3,343		393 1,772		5,151 15,617			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	104	1.93*	373	3.17*	191	2.82*	91	2.11*	759	282.36	2.69*	305.21
All excluding same site	104	1.94*	370	3.15*	191	2.83*	88	2.04*	753	281.41	2.68*	301.98
<b>Buccal cavity, pharynx</b>	18	10.03*	60	16.43*	39	21.54*	16	16.37*	133	8.23	16.15*	79.89
Lip	0	0.00	1	1.85	1	3.54	0	0.00	2	1.25	1.60	0.48
Tongue	8	22.93*	19	26.38*	17	47.66*	5	26.20*	49	1.62	30.31*	30.34
Salivary gland	0	0.00	1	3.85	0	0.00	0	0.00	1	0.63	1.60	0.24
Mouth	6	13.05*	21	22.57*	16	35.12*	3	12.45*	46	2.09	22.04*	28.12
Nasopharynx	2	26.97*	3	20.80*	0	0.00	0	0.00	5	0.31	15.93*	3.00
Tonsil	2	10.77*	7	18.86*	2	11.55*	2	23.00*	13	0.82	15.91*	7.80
Oropharynx	0	0.00	0	0.00	1	18.19	2	68.12*	3	0.25	11.90*	1.76
Hypopharynx	0	0.00	3	6.96*	0	0.00	3	29.09*	6	0.96	6.28*	3.23
<b>Digestive system</b>	34	2.87*	86	3.38*	39	2.70*	21	2.31*	180	60.82	2.96*	76.31
Esophagus	17	21.96*	50	31.24*	21	24.81*	7	13.48*	95	3.74	25.40*	58.44
Stomach	3	2.19	4	1.42	2	1.31	3	3.23	12	6.63	1.81	3.44
Small intestine	0	0.00	1	2.78	0	0.00	0	0.00	1	0.87	1.15	0.08
Colon	7	1.41	14	1.29	7	1.09	4	0.96	32	26.39	1.21	3.59
Rectum, rectosigmoid junction	1	0.46	8	1.73	3	1.19	2	1.36	14	10.78	1.30	2.06
Anus, anal canal	0	0.00	1	4.69	0	0.00	0	0.00	1	0.50	2.01	0.32
Liver	1	2.14	2	2.01	1	1.87	1	2.93	5	2.34	2.14	1.70
Gallbladder	1	7.97	0	0.00	0	0.00	0	0.00	1	0.65	1.54	0.22
Bile ducts, other biliary	0	0.00	1	1.98	0	0.00	1	4.71	2	1.25	1.61	0.48
Pancreas	4	2.85	5	1.67	5	2.95	3	2.78	17	7.17	2.37*	6.29
<b>Respiratory system</b>	24	2.20*	169	7.26*	72	5.67*	30	3.93*	295	54.53	5.41*	153.99
Nose, nasal cavity, ear	0	0.00	2	11.14*	1	10.51	0	0.00	3	0.42	7.17*	1.65
Larynx	0	0.00	3	1.64	2	2.20	2	4.09	7	4.12	1.70	1.84
Lung, bronchus	24	2.42*	162	7.64*	69	5.91*	27	3.82*	282	49.85	5.66*	148.65
<b>Female breast</b>	1	0.38	5	0.81	2	0.54	3	1.31	11	14.78	0.74	-9.42
<b>Female genital system</b>	1	0.79	1	0.35	1	0.62	0	0.00	3	6.72	0.45	-9.26
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-1.76
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	3.56	0.00	-8.85
Ovary	0	0.00	1	1.21	1	2.07	0	0.00	2	1.95	1.03	0.13
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.24
Vulva	1	22.03	0	0.00	0	0.00	0	0.00	1	0.28	3.62	1.80
<b>Male genital system</b>	11	0.85	26	0.89	14	0.78	9	0.73	60	72.33	0.83	-10.63
Prostate	10	0.78	25	0.86	14	0.79	9	0.74	58	71.67	0.81	-11.79
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.18
<b>Urinary system</b>	4	0.87	11	1.10	12	2.07*	3	0.80	30	24.13	1.24	3.76
Urinary bladder	3	0.95	7	1.01	9	2.21*	2	0.75	21	16.84	1.25	2.66
Kidney parenchyma	0	0.00	3	1.21	2	1.45	1	1.17	6	5.84	1.03	0.10
Renal pelvis, other urinary	1	3.53	1	1.64	1	2.92	0	0.00	3	1.45	2.07	0.99
Ureter	0	0.00	1	4.93	1	8.64	0	0.00	2	0.48	4.15	0.97
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	1	2.29	0	0.00	0	0.00	1	1.04	0.96	-0.02
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.21
<b>Melanoma of skin</b>	1	0.93	2	0.81	2	1.43	1	1.09	6	5.85	1.03	0.10
<b>Eye, orbit</b>	0	0.00	2	11.97*	0	0.00	0	0.00	2	0.39	5.18	1.03
<b>Brain, central nervous system</b>	2	3.52	0	0.00	0	0.00	0	0.00	2	2.79	0.72	-0.51
<b>Thyroid</b>	1	4.15	0	0.00	0	0.00	0	0.00	1	1.15	0.87	-0.10
<b>Lymphatic, hematopoietic</b>	5	1.31	4	0.48	3	0.62	2	0.64	14	20.11	0.70	-3.91
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.40
Non-Hodgkin lymphoma	2	1.23	2	0.55	3	1.41	2	1.44	9	8.78	1.03	0.14
Myeloma	1	1.45	1	0.67	0	0.00	0	0.00	2	3.61	0.55	-1.03
Leukemia	2	1.47	1	0.34	0	0.00	0	0.00	3	7.09	0.42	-2.62
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.12
Chronic lymphocytic	1	1.79	0	0.00	0	0.00	0	0.00	1	2.91	0.34	-1.22
Acute non-lymphocytic	1	2.26	1	1.03	0	0.00	0	0.00	2	2.35	0.85	-0.22
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.95	0.00	-0.61

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 4,018 PYR and for male cancers on 11,599 PYR.

## Salivary Gland Both Sexes

**Table 3.8.1:** Characteristics of patients with an initial cancer of the salivary gland, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	3,008	100.0	2,543	100.0	5,551	100.0
<b>Initial treatment</b>						
Any radiation	1,747	58.1	1,197	47.1	2,944	53.0
With surgery	1,531	50.9	1,094	43.0	2,625	47.3
Without surgery	216	7.2	103	4.1	319	5.7
No radiation	1,261	41.9	1,346	52.9	2,607	47.0
With surgery	1,143	38.0	1,223	48.1	2,366	42.6
Without surgery	118	3.9	123	4.8	241	4.3
<b>Race</b>						
White	2,622	87.2	2,167	85.2	4,789	86.3
Black	206	6.8	207	8.1	413	7.4
Other	165	5.5	153	6.0	318	5.7
Unknown	15	0.5	16	0.6	31	0.6
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	176	5.9	251	9.9	427	7.7
30–49	572	19.0	652	25.6	1,224	22.1
50–69	1,260	41.9	866	34.1	2,126	38.3
70–79	629	20.9	458	18.0	1,087	19.6
≥ 80	371	12.3	316	12.4	687	12.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	2,639	87.7	2,323	91.3	4,962	89.4
1st and 2nd cancers	335	11.1	203	8.0	538	9.7
1st, 2nd, and 3rd cancers	31	1.0	17	0.7	48	0.9
1st, 2nd, 3rd, and additional cancers	3	0.1	0	0.0	3	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	62.7	—	59.3	—	61.3	—
Median year of 1st cancer diagnosis	1988.9	—	1988.4	—	1988.7	—
Median person-years at risk	3.6	—	6.2	—	4.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	96.5	—	95.0	—	95.9
1st, 2nd, and additional cancers	—	95.7	—	94.5	—	95.2
1st cancer only	—	3.0	—	4.5	—	3.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 3.8.2:** Risk of subsequent primary cancers after cancer of the salivary gland, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	5,551 4,240		4,715 14,064		2,737 10,571		1,598 10,524		5,551 39,399			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	81	1.49*	240	1.37*	158	1.17	165	1.11	644	513.68	1.25*	33.08
All excluding same site	80	1.47*	233	1.34*	158	1.17	162	1.09	633	512.48	1.24*	30.59
<b>Buccal cavity, pharynx</b>	7	4.82*	19	4.20*	9	2.72*	12	3.62*	47	12.59	3.73*	8.73
Lip	2	8.39	4	5.74*	3	6.30*	2	4.53	11	1.85	5.94*	2.32
Tongue	1	3.58	1	1.13	3	4.48	3	4.32	8	2.53	3.16*	1.39
Salivary gland	1	7.43	7	17.02*	0	0.00	3	8.74*	11	1.20	9.17*	2.49
Mouth	1	2.65	6	5.04*	1	1.14	3	3.42	11	3.33	3.31*	1.95
Nasopharynx	0	0.00	0	0.00	1	7.47	0	0.00	1	0.51	1.95	0.12
Tonsil	1	7.58	0	0.00	0	0.00	1	3.24	2	1.17	1.72	0.21
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.09
Hypopharynx	1	7.00	1	2.24	1	3.13	0	0.00	3	1.21	2.48	0.45
<b>Digestive system</b>	17	1.38	47	1.21	26	0.88	28	0.89	118	112.64	1.05	1.36
Esophagus	0	0.00	0	0.00	5	3.57*	1	0.66	6	5.38	1.12	0.16
Stomach	2	1.54	3	0.75	2	0.68	0	0.00	7	11.21	0.62	-1.07
Small intestine	0	0.00	0	0.00	0	0.00	1	2.01	1	1.61	0.62	-0.15
Colon	10	1.78	25	1.40	8	0.58	21	1.43	64	51.81	1.24	3.09
Rectum, rectosigmoid junction	0	0.00	9	1.34	2	0.40	4	0.78	15	18.98	0.79	-1.01
Anus, anal canal	0	0.00	0	0.00	3	10.35*	0	0.00	3	1.09	2.75	0.48
Liver	0	0.00	3	2.34	1	1.02	0	0.00	4	3.78	1.06	0.06
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.59	0.00	-0.40
Bile ducts, other biliary	0	0.00	1	1.20	0	0.00	1	1.31	2	2.52	0.79	-0.13
Pancreas	5	3.42*	6	1.29	5	1.40	0	0.00*	16	13.55	1.18	0.62
<b>Respiratory system</b>	14	1.52	60	2.05*	32	1.44	27	1.13	133	84.61	1.57*	12.28
Nose, nasal cavity, ear	0	0.00	1	3.83	0	0.00	1	4.79	2	0.75	2.67	0.32
Larynx	0	0.00	1	0.51	3	2.14	0	0.00	4	5.36	0.75	-0.35
Lung, bronchus	14	1.65	58	2.15*	29	1.41	26	1.16	127	78.28	1.62*	12.37
<b>Female breast</b>	5	0.97	17	0.92	16	0.99	21	1.07	59	59.60	0.99	-0.29
<b>Female genital system</b>	1	0.42	6	0.71	10	1.44	5	0.63	22	25.77	0.85	-1.82
Cervix uteri	0	0.00	0	0.00	3	3.40	0	0.00	3	3.23	0.93	-0.11
Corpus uteri	0	0.00	4	0.96	2	0.59	3	0.77	9	12.64	0.71	-1.76
Ovary	1	1.45	2	0.82	5	2.39	2	0.81	10	7.70	1.30	1.11
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.19
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.59
<b>Male genital system</b>	16	1.46	37	1.10	28	1.13	30	1.08	111	97.15	1.14	7.40
Prostate	16	1.48	37	1.11	28	1.14	30	1.10	111	95.88	1.16	8.07
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.34
<b>Urinary system</b>	5	1.12	12	0.87	10	0.96	13	1.16	40	39.94	1.00	0.01
Urinary bladder	4	1.28	6	0.62	6	0.84	7	0.92	23	27.56	0.83	-1.16
Kidney parenchyma	1	0.96	6	1.79	4	1.53	6	2.04	17	9.93	1.71	1.79
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	2.45	0.00	-0.62
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.20
<b>Bone, joints</b>	0	0.00	0	0.00	1	8.07	0	0.00	1	0.47	2.11	0.13
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	2	3.27	2	2.09	0.96	-0.02
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	1	3.89	1	0.93	1.08	0.02
<b>Melanoma of skin</b>	3	2.43	6	1.47	7	2.14	2	0.52	18	12.41	1.45	1.42
<b>Eye, orbit</b>	1	12.36	1	3.90	0	0.00	1	4.93	3	0.73	4.10	0.58
<b>Brain, central nervous system</b>	1	1.79	4	2.20	0	0.00	3	2.03	8	5.25	1.52	0.70
<b>Thyroid</b>	3	9.03*	4	3.52	2	2.22	2	1.99	11	3.37	3.26*	1.94
<b>Lymphatic, hematopoietic</b>	5	1.21	18	1.36	14	1.36	11	0.97	48	39.01	1.23	2.28
Hodgkin lymphoma	1	6.31	2	3.93	0	0.00	1	2.83	4	1.39	2.88	0.66
Non-Hodgkin lymphoma	2	1.11	8	1.36	5	1.07	5	0.93	20	17.73	1.13	0.58
Myeloma	0	0.00	3	1.36	2	1.17	1	0.53	6	6.51	0.92	-0.13
Leukemia	2	1.35	5	1.08	7	1.99	4	1.07	18	13.38	1.35	1.17
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.10
Chronic lymphocytic	2	3.41	0	0.00	3	2.17	2	1.38	7	5.25	1.33	0.44
Acute non-lymphocytic	0	0.00	3	1.91	2	1.68	1	0.77	6	4.55	1.32	0.37
Chronic myeloid	0	0.00	1	1.57	1	2.07	0	0.00	2	1.85	1.08	0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 20,673 PYR and for male cancers on 18,727 PYR.

## Salivary Gland Females

**Table 3.8.3:** Risk of subsequent primary cancers after cancer of the salivary gland, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	2,543		2,228		1,435		887		2,543			
Number starting interval	1,976		7,052		5,689		5,956		20,673			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	25	1.37	85	1.32*	57	1.03	70	1.05	237	205.14	1.16*	15.41
All excluding same site	25	1.38	80	1.24	57	1.03	67	1.00	229	204.72	1.12	11.75
<b>Buccal cavity, pharynx</b>	1	3.04	8	6.91*	4	4.11*	6	5.37*	19	3.58	5.31*	7.46
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.12
Tongue	0	0.00	0	0.00	2	9.29*	1	3.99	3	0.79	3.81	1.07
Salivary gland	0	0.00	5	37.08*	0	0.00	3	22.09*	8	0.42	18.94*	3.67
Mouth	0	0.00	3	7.58*	0	0.00	2	5.26	5	1.22	4.09*	1.83
Nasopharynx	0	0.00	0	0.00	1	23.63	0	0.00	1	0.16	6.44	0.41
Tonsil	1	35.37	0	0.00	0	0.00	0	0.00	1	0.30	3.31	0.34
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	1	15.61	0	0.00	1	0.23	4.31	0.37
<b>Digestive system</b>	7	1.63	19	1.27	10	0.79	13	0.88	49	46.73	1.05	1.10
Esophagus	0	0.00	0	0.00	1	2.91	1	2.41	2	1.27	1.57	0.35
Stomach	1	2.86	0	0.00	0	0.00	0	0.00	1	3.63	0.28	-1.27
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.33
Colon	3	1.40	13	1.73	4	0.63	9	1.21	29	23.45	1.24	2.68
Rectum, rectosigmoid junction	0	0.00	2	0.84	1	0.51	2	0.91	5	7.22	0.69	-1.08
Rectum	0	0.00	1	0.64	0	0.00	2	1.36	3	4.75	0.63	-0.85
Anus, anal canal	0	0.00	0	0.00	3	17.51*	0	0.00	3	0.63	4.75	1.15
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.02	0.00	-0.49
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.50
Bile ducts, other biliary	0	0.00	1	3.15	0	0.00	1	2.81	2	1.04	1.91	0.46
Pancreas	3	5.45*	3	1.56	1	0.60	0	0.00	7	6.12	1.14	0.43
<b>Respiratory system</b>	3	1.37	13	1.63	5	0.70	10	1.09	31	26.48	1.17	2.19
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.13
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.40
Lung, bronchus	3	1.44	13	1.72	5	0.73	10	1.14	31	25.30	1.23	2.76
<b>Female breast</b>	5	0.97	17	0.92	16	0.99	21	1.07	59	59.60	0.99	-0.29
<b>Female genital system</b>	1	0.42	6	0.71	10	1.44	5	0.63	22	25.77	0.85	-1.82
Cervix uteri	0	0.00	0	0.00	3	3.40	0	0.00	3	3.23	0.93	-0.11
Corpus uteri	0	0.00	4	0.96	2	0.59	3	0.77	9	12.64	0.71	-1.76
Ovary	1	1.45	2	0.82	5	2.39	2	0.81	10	7.70	1.30	1.11
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.19
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.59
<b>Urinary system</b>	1	1.17	5	1.65	1	0.38	3	0.93	10	9.71	1.03	0.14
Urinary bladder	1	1.95	4	2.23	0	0.00	1	0.53	6	5.72	1.05	0.14
Kidney parenchyma	0	0.00	1	1.03	1	1.16	2	1.81	4	3.21	1.25	0.38
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.38
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.12
<b>Bone, joints</b>	0	0.00	0	0.00	1	18.10	0	0.00	1	0.20	4.89	0.38
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-0.41
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.04
<b>Melanoma of skin</b>	1	2.63	2	1.44	2	1.63	1	0.66	6	4.52	1.33	0.72
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.14
<b>Brain, central nervous system</b>	0	0.00	1	1.46	0	0.00	1	1.49	2	2.13	0.94	-0.06
<b>Thyroid</b>	2	9.91*	3	4.10	1	1.63	2	2.85	8	2.25	3.56*	2.78
<b>Lymphatic, hematopoietic</b>	4	2.86	7	1.42	7	1.64	5	0.97	23	15.78	1.46	3.49
Hodgkin lymphoma	1	17.60	0	0.00	0	0.00	0	0.00	1	0.58	1.73	0.20
Non-Hodgkin lymphoma	2	3.08	4	1.72	2	0.98	4	1.56	12	7.58	1.58	2.14
Myeloma	0	0.00	1	1.20	1	1.39	0	0.00	2	2.66	0.75	-0.32
Leukemia	1	2.20	2	1.26	4	3.00	1	0.63	8	4.96	1.61	1.47
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.08
Chronic lymphocytic	1	5.82	0	0.00	3	5.92*	1	1.69	5	1.87	2.67	1.51
Acute non-lymphocytic	0	0.00	1	1.78	1	2.11	0	0.00	2	1.77	1.13	0.11
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.34

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



**Table 3.8.4:** Risk of subsequent primary cancers after cancer of the salivary gland, males, SEER 1973-2000.

Number starting interval Person-years in interval Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	0	O/E	0	O/E	0	O/E	0	O/E	0	E	O/E	EAR
	3,008		2,487		1,302		711		3,008			
	2,264		7,012		4,883		4,567		18,727			
<b>All subsequent cancers</b>	56	1.54*	155	1.41*	101	1.27*	95	1.15	407	308.54	1.32*	52.58
All excluding same site	55	1.52*	153	1.39*	101	1.27*	95	1.16	404	307.76	1.31*	51.39
<b>Buccal cavity, pharynx</b>	6	5.33*	11	3.27*	5	2.14	6	2.73	28	9.02	3.11*	10.14
Lip	2	9.26*	4	6.46*	3	7.32*	2	5.55	11	1.61	6.85*	5.02
Tongue	1	4.80	1	1.57	1	2.20	2	4.50	5	1.74	2.87	1.74
Salivary gland	1	10.56	2	7.24	0	0.00	0	0.00	3	0.78	3.86	1.19
Mouth	1	3.77	3	3.78	1	1.83	1	2.01	6	2.11	2.85*	2.08
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.19
Tonsil	0	0.00	0	0.00	0	0.00	1	4.56	1	0.86	1.16	0.07
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.14
Hypopharynx	1	8.24	1	2.71	0	0.00	0	0.00	2	0.98	2.04	0.54
<b>Digestive system</b>	10	1.24	28	1.17	16	0.94	15	0.89	69	65.90	1.05	1.65
Esophagus	0	0.00	0	0.00	4	3.78*	0	0.00	4	4.10	0.98	-0.05
Stomach	1	1.05	3	1.07	2	1.02	0	0.00	6	7.58	0.79	-0.84
Small intestine	0	0.00	0	0.00	0	0.00	1	3.83	1	0.93	1.07	0.04
Colon	7	2.02	12	1.16	4	0.54	12	1.66	35	28.36	1.23	3.55
Rectum, rectosigmoid junction	0	0.00	7	1.61	1	0.33	2	0.69	10	11.75	0.85	-0.94
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.25
Liver	0	0.00	3	3.09	1	1.41	0	0.00	4	2.75	1.45	0.67
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.30
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.47	0.00	-0.79
Pancreas	2	2.19	3	1.11	4	2.09	0	0.00	9	7.43	1.21	0.84
<b>Respiratory system</b>	11	1.57	47	2.21*	27	1.79*	17	1.15	102	58.13	1.75*	23.43
Nose, nasal cavity, ear	0	0.00	1	5.78	0	0.00	1	8.39	2	0.47	4.24	0.82
Larynx	0	0.00	1	0.59	3	2.56	0	0.00	4	4.53	0.88	-0.28
Lung, bronchus	11	1.73	45	2.33*	24	1.75*	16	1.18	96	52.98	1.81*	22.97
<b>Male breast</b>	1	14.36	1	4.77	0	0.00	1	6.35	3	0.59	5.09*	1.29
<b>Male genital system</b>	16	1.46	37	1.10	28	1.13	30	1.08	111	97.15	1.14	7.40
Prostate	16	1.48	37	1.11	28	1.14	30	1.10	111	95.88	1.16	8.07
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.34
<b>Urinary system</b>	4	1.11	7	0.65	9	1.15	10	1.25	30	30.23	0.99	-0.12
Urinary bladder	3	1.15	2	0.26*	6	1.07	6	1.04	17	21.84	0.78	-2.59
Kidney parenchyma	1	1.30	5	2.11	3	1.72	4	2.17	13	6.73	1.93*	3.35
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.66	0.00	-0.89
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.30
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	2	6.01	2	1.24	1.61	0.41
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	1	4.34	1	0.84	1.19	0.08
<b>Melanoma of skin</b>	2	2.34	4	1.49	5	2.45	1	0.43	12	7.89	1.52	2.20
<b>Eye, orbit</b>	1	18.88	1	6.30	0	0.00	1	8.88	3	0.44	6.86*	1.37
<b>Brain, central nervous system</b>	1	2.72	3	2.64	0	0.00	2	2.46	6	3.13	1.92	1.54
<b>Thyroid</b>	1	7.68	1	2.47	1	3.50	0	0.00	3	1.12	2.68	1.00
<b>Lymphatic, hematopoietic</b>	1	0.37	11	1.33	7	1.16	6	0.97	25	23.23	1.08	0.95
Hodgkin lymphoma	0	0.00	2	6.47	0	0.00	1	5.21	3	0.81	3.69	1.17
Non-Hodgkin lymphoma	0	0.00	4	1.13	3	1.14	1	0.35	8	10.15	0.79	-1.15
Myeloma	0	0.00	2	1.46	1	1.00	1	0.98	4	3.85	1.04	0.08
Leukemia	1	0.97	3	0.98	3	1.38	3	1.39	10	8.42	1.19	0.84
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.13
Chronic lymphocytic	1	2.42	0	0.00	0	0.00	1	1.16	2	3.38	0.59	-0.74
Acute non-lymphocytic	0	0.00	2	1.99	1	1.40	1	1.38	4	2.78	1.44	0.65
Chronic myeloid	0	0.00	1	2.41	1	3.38	0	0.00	2	1.15	1.74	0.45

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Salivary Gland

### Both Sexes, <60 Years of Age

**Table 3.8.5:** Risk of subsequent primary cancers after cancer of the salivary gland, both sexes, <60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	2,629		2,389		1,611		1,085		2,629			
Number starting interval	2,085		7,720		6,665		8,081		24,551			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	17	2.15*	52	1.53*	49	1.17	93	1.06	211	171.65	1.23*	16.03
All excluding same site	17	2.16*	48	1.41*	49	1.18	91	1.04	205	171.23	1.20*	13.76
<b>Buccal cavity, pharynx</b>	1	3.13	7	5.48*	3	2.19	9	4.10*	20	5.16	3.88*	6.04
Lip	0	0.00	2	15.63*	1	7.32	2	8.17	5	0.54	9.22*	1.82
Tongue	0	0.00	0	0.00	1	3.37	1	2.07	2	1.12	1.78	0.36
Salivary gland	0	0.00	4	40.90*	0	0.00	2	10.12*	6	0.42	14.13*	2.27
Mouth	0	0.00	1	2.97	1	2.76	3	5.36*	5	1.34	3.73*	1.49
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.11
Tonsil	0	0.00	0	0.00	0	0.00	1	4.17	1	0.60	1.67	0.16
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.06
Hypopharynx	1	32.17	0	0.00	0	0.00	0	0.00	1	0.52	1.91	0.19
<b>Digestive system</b>	4	3.02	9	1.56	10	1.38	6	0.38*	29	30.19	0.96	-0.48
Esophagus	0	0.00	0	0.00	2	4.32	1	1.08	3	1.87	1.61	0.46
Stomach	0	0.00	0	0.00	1	1.43	0	0.00	1	2.86	0.35	-0.76
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.23
Colon	2	3.99	4	1.79	1	0.34	3	0.44	10	12.48	0.80	-1.01
Rectum, rectosigmoid junction	0	0.00	1	0.85	1	0.70	2	0.70	4	5.74	0.70	-0.71
Anus, anal canal	0	0.00	0	0.00	2	18.30*	0	0.00	2	0.44	4.58	0.64
Liver	0	0.00	2	7.84	1	3.24	0	0.00	3	1.29	2.32	0.70
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.14
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.25
Pancreas	2	12.88*	2	2.97	2	2.33	0	0.00	6	3.62	1.66	0.97
<b>Respiratory system</b>	5	3.76*	10	1.73	13	1.79	17	1.12	45	29.51	1.53*	6.31
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.11
Larynx	0	0.00	0	0.00	1	1.66	0	0.00	1	2.26	0.44	-0.52
Lung, bronchus	5	4.25*	10	1.94	12	1.82	17	1.22	44	26.89	1.64*	6.97
<b>Female breast</b>	0	0.00	7	1.17	4	0.57	14	1.09	25	27.19	0.92	-1.67
<b>Female genital system</b>	0	0.00	2	0.73	4	1.31	4	0.77	10	11.63	0.86	-1.24
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.94	0.00	-1.48
Corpus uteri	0	0.00	2	1.62	2	1.40	3	1.14	7	5.56	1.26	1.10
Ovary	0	0.00	0	0.00	2	2.23	1	0.64	3	3.43	0.87	-0.33
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.10
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.27
<b>Male genital system</b>	1	1.31	3	0.83	6	1.04	19	1.13	29	26.94	1.08	1.80
Prostate	1	1.44	3	0.89	6	1.08	19	1.15	29	26.20	1.11	2.45
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.49
<b>Urinary system</b>	0	0.00	2	0.90	2	0.72	8	1.27	12	11.82	1.01	0.07
Urinary bladder	0	0.00	0	0.00	1	0.59	3	0.74	4	7.36	0.54	-1.37
Kidney parenchyma	0	0.00	2	2.48	1	1.05	5	2.63	8	3.85	2.08	1.69
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.25
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.08
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.09
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	2.77	1	0.81	1.23	0.08
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.27
<b>Melanoma of skin</b>	0	0.00	1	0.69	3	2.00	0	0.00	4	5.92	0.68	-0.78
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	7.81	1	0.28	3.56	0.29
<b>Brain, central nervous system</b>	1	6.94	1	1.75	0	0.00	1	1.00	3	2.30	1.30	0.28
<b>Thyroid</b>	2	12.92*	3	4.99*	2	3.52	2	2.50	9	2.13	4.23*	2.80
<b>Lymphatic, hematopoietic</b>	1	1.58	3	1.15	2	0.66	7	1.12	13	12.54	1.04	0.19
Hodgkin lymphoma	1	15.37	1	4.20	0	0.00	1	3.90	3	0.77	3.92	0.91
Non-Hodgkin lymphoma	0	0.00	1	0.79	1	0.68	2	0.64	4	6.17	0.65	-0.88
Myeloma	0	0.00	0	0.00	0	0.00	1	0.99	1	1.87	0.53	-0.36
Leukemia	0	0.00	1	1.31	1	1.12	3	1.58	5	3.74	1.34	0.51
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.07
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	1.36	1	1.40	0.72	-0.16
Acute non-lymphocytic	0	0.00	1	3.84	1	3.34	1	1.50	3	1.29	2.33	0.70
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.22

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 13,138 PYR and for male cancers on 11,414 PYR.

**Table 3.8.6:** Risk of subsequent primary cancers after cancer of the salivary gland, both sexes, ≥60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	2,922		2,326		1,126		513		2,922			
Number starting interval	Person-years in interval		2,155		6,344		3,906		2,443		14,848	
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	64	1.37*	188	1.34*	109	1.17	72	1.18	433	342.03	1.27*	61.27
All excluding same site	63	1.35*	185	1.32*	109	1.17	71	1.16	428	341.25	1.25*	58.42
<b>Buccal cavity, pharynx</b>	6	5.29*	12	3.70*	6	3.09*	3	2.68	27	7.43	3.63*	13.18
Lip	2	9.74*	2	3.51	2	5.89	0	0.00	6	1.31	4.58*	3.16
Tongue	1	4.72	1	1.63	2	5.37	2	9.43*	6	1.41	4.25*	3.09
Salivary gland	1	9.18	3	9.57*	0	0.00	1	6.86	5	0.78	6.45*	2.85
Mouth	1	3.39	5	5.86*	0	0.00	0	0.00	6	1.99	3.02*	2.70
Nasopharynx	0	0.00	0	0.00	1	16.30	0	0.00	1	0.24	4.13	0.51
Tonsil	1	10.86	0	0.00	0	0.00	0	0.00	1	0.57	1.77	0.29
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.13
Hypopharynx	0	0.00	1	3.14	1	5.68	0	0.00	2	0.69	2.91	0.88
<b>Digestive system</b>	13	1.18	38	1.14	16	0.71	22	1.39	89	82.45	1.08	4.41
Esophagus	0	0.00	0	0.00	3	3.20	0	0.00	3	3.51	0.85	-0.34
Stomach	2	1.73	3	0.88	1	0.45	0	0.00	6	8.34	0.72	-1.58
Small intestine	0	0.00	0	0.00	0	0.00	1	4.87	1	1.04	0.96	-0.03
Colon	8	1.57	21	1.35	7	0.65	18	2.29*	54	39.33	1.37*	9.88
Rectum, rectosigmoid junction	0	0.00	8	1.44	1	0.28	2	0.89	11	13.23	0.83	-1.50
Anus, anal canal	0	0.00	0	0.00	1	5.54	0	0.00	1	0.65	1.53	0.23
Liver	0	0.00	1	0.97	0	0.00	0	0.00	1	2.48	0.40	-1.00
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.24	0.00	-0.84
Bile ducts, other biliary	0	0.00	1	1.37	0	0.00	1	2.42	2	1.90	1.05	0.07
Pancreas	3	2.30	4	1.01	3	1.11	0	0.00	10	9.93	1.01	0.04
<b>Respiratory system</b>	9	1.14	50	2.13*	19	1.27	10	1.13	88	55.10	1.60*	22.16
Nose, nasal cavity, ear	0	0.00	1	5.06	0	0.00	1	11.44	2	0.48	4.16	1.02
Larynx	0	0.00	1	0.71	2	2.51	0	0.00	3	3.10	0.97	-0.06
Lung, bronchus	9	1.24	48	2.21*	17	1.22	9	1.08	83	51.39	1.62*	21.29
<b>Female breast</b>	5	1.32	10	0.80	12	1.30	7	1.02	34	32.41	1.05	2.11
<b>Female genital system</b>	1	0.57	4	0.70	6	1.53	1	0.36	12	14.14	0.85	-2.84
Cervix uteri	0	0.00	0	0.00	3	8.82*	0	0.00	3	1.29	2.33	2.27
Corpus uteri	0	0.00	2	0.68	0	0.00	0	0.00	2	7.08	0.28	-6.74
Ovary	1	1.97	2	1.20	3	2.51	1	1.12	7	4.26	1.64	3.63
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.35
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-1.16
<b>Male genital system</b>	15	1.47	34	1.13	22	1.15	11	1.01	82	70.21	1.17	16.13
Prostate	15	1.48	34	1.14	22	1.16	11	1.02	82	69.68	1.18	16.85
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.12
<b>Urinary system</b>	5	1.27	10	0.86	8	1.05	5	1.01	28	28.12	1.00	-0.08
Urinary bladder	4	1.42	6	0.72	5	0.91	4	1.11	19	20.20	0.94	-0.81
Kidney parenchyma	1	1.18	4	1.58	3	1.81	1	0.96	9	6.09	1.48	1.96
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.83	0.00	-1.23
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.41
<b>Bone, joints</b>	0	0.00	0	0.00	1	14.92	0	0.00	1	0.25	3.95	0.50
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	4.00	1	1.28	0.78	-0.19
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	1	18.22	1	0.27	3.67	0.49
<b>Melanoma of skin</b>	3	3.43	5	1.90	4	2.26	2	1.65	14	6.49	2.16*	5.06
<b>Eye, orbit</b>	1	15.54	1	5.24	0	0.00	0	0.00	2	0.45	4.43	1.04
<b>Brain, central nervous system</b>	0	0.00	3	2.40	0	0.00	2	4.12	5	2.95	1.69	1.38
<b>Thyroid</b>	1	5.64	1	1.87	0	0.00	0	0.00	2	1.24	1.61	0.51
<b>Lymphatic, hematopoietic</b>	4	1.14	15	1.41	12	1.65	4	0.78	35	26.47	1.32	5.74
Hodgkin lymphoma	0	0.00	1	3.69	0	0.00	0	0.00	1	0.63	1.60	0.25
Non-Hodgkin lymphoma	2	1.34	7	1.52	4	1.25	3	1.32	16	11.57	1.38	2.98
Myeloma	0	0.00	3	1.61	2	1.57	0	0.00	5	4.63	1.08	0.25
Leukemia	2	1.54	4	1.03	6	2.29	1	0.54	13	9.64	1.35	2.26
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.16
Chronic lymphocytic	2	3.81	0	0.00	3	2.86	1	1.40	6	3.85	1.56	1.45
Acute non-lymphocytic	0	0.00	2	1.53	1	1.12	0	0.00	3	3.26	0.92	-0.18
Chronic myeloid	0	0.00	1	1.94	1	2.84	0	0.00	2	1.30	1.54	0.47

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 7,535 PYR and for male cancers on 7,313 PYR.

## Nasopharynx Both Sexes

**Table 3.9.1:** Characteristics of patients with an initial cancer of the nasopharynx, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	2,526	100.0	1,125	100.0	3,651	100.0
<b>Initial treatment</b>						
Any radiation	2,277	90.1	1,002	89.1	3,279	89.8
With surgery	340	13.5	174	15.5	514	14.1
Without surgery	1,937	76.7	828	73.6	2,765	75.7
No radiation	249	9.9	123	10.9	372	10.2
With surgery	60	2.4	38	3.4	98	2.7
Without surgery	189	7.5	85	7.6	274	7.5
<b>Race</b>						
White	1,338	53.0	620	55.1	1,958	53.6
Black	228	9.0	96	8.5	324	8.9
Other	952	37.7	402	35.7	1,354	37.1
Unknown	8	0.3	7	0.6	15	0.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	196	7.8	125	11.1	321	8.8
30–49	758	30.0	329	29.2	1,087	29.8
50–69	1,238	49.0	458	40.7	1,696	46.5
70–79	276	10.9	153	13.6	429	11.8
≥ 80	58	2.3	60	5.3	118	3.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	2,359	93.4	1,049	93.2	3,408	93.3
1st and 2nd cancers	148	5.9	73	6.5	221	6.1
1st, 2nd, and 3rd cancers	17	0.7	3	0.3	20	0.5
1st, 2nd, 3rd, and additional cancers	2	0.1	0	0.0	2	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	54.5	—	55.7	—	54.8	—
Median year of 1st cancer diagnosis	1988.4	—	1988.4	—	1988.4	—
Median person-years at risk	2.7	—	3.2	—	2.8	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	92.2	—	94.7	—	93.0
1st, 2nd, and additional cancers	—	92.2	—	94.7	—	93.0
1st cancer only	—	7.8	—	3.9	—	6.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 3.9.2:** Risk of subsequent primary cancers after cancer of the nasopharynx, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	3,651 Person-years in interval 2,698		2,901 7,608		1,296 4,589		646 3,810		3,651 18,705			
Number starting interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	38	1.66*	94	1.44*	79	1.72*	56	1.24	267	179.49	1.49*	46.79
All excluding same site	38	1.67*	93	1.43*	77	1.68*	55	1.22	263	178.79	1.47*	45.02
<b>Buccal cavity, pharynx</b>	2	2.56	6	2.82*	4	2.95	5	4.36*	17	5.41	3.14*	6.20
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.31
Tongue	1	6.77	3	7.39*	1	3.81	4	17.21*	9	1.05	8.59*	4.25
Salivary gland	0	0.00	0	0.00	1	9.35	0	0.00	1	0.42	2.38	0.31
Mouth	1	5.34	1	1.99	0	0.00	0	0.00	2	1.27	1.57	0.39
Nasopharynx	0	0.00	1	3.58	2	11.53*	1	7.13	4	0.69	5.79*	1.77
Tonsil	0	0.00	1	5.01	0	0.00	0	0.00	1	0.50	2.00	0.27
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.07
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.32
<b>Digestive system</b>	7	1.29	23	1.48	13	1.21	10	0.98	53	41.96	1.26	5.90
Esophagus	4	13.02*	3	3.54	2	3.49	2	3.81	11	2.25	4.88*	4.68
Stomach	0	0.00	1	0.49	3	2.14	1	0.80	5	5.42	0.92	-0.23
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.30
Colon	2	0.94	12	1.98*	1	0.24	5	1.21	20	16.56	1.21	1.84
Rectum, rectosigmoid junction	0	0.00	3	1.08	4	2.11	1	0.58	8	7.40	1.08	0.32
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.18
Liver	0	0.00	0	0.00	0	0.00	1	1.39	1	2.86	0.35	-0.99
Gallbladder	0	0.00	0	0.00	1	7.34	0	0.00	1	0.54	1.86	0.25
Bile ducts, other biliary	1	8.45	1	2.81	0	0.00	0	0.00	2	1.00	2.00	0.53
Pancreas	0	0.00	3	1.75	2	1.68	0	0.00	5	4.67	1.07	0.18
<b>Respiratory system</b>	8	1.86	31	2.58*	27	3.30*	16	2.10*	82	32.11	2.55*	26.67
Nose, nasal cavity, ear	1	22.89	2	16.36*	1	12.08	0	0.00	4	0.32	12.40*	1.97
Larynx	0	0.00	1	1.14	1	1.78	1	2.17	3	2.23	1.35	0.41
Lung, bronchus	7	1.79	28	2.55*	25	3.32*	15	2.12*	75	29.47	2.55*	24.34
<b>Female breast</b>	4	2.27	3	0.57	5	1.37	7	1.71	19	14.72	1.29	6.66
<b>Female genital system</b>	0	0.00	1	0.41	3	1.83	2	1.17	6	6.66	0.90	-1.03
Cervix uteri	0	0.00	0	0.00	2	7.37	0	0.00	2	1.08	1.85	1.43
Corpus uteri	0	0.00	1	0.84	0	0.00	1	1.22	2	3.21	0.62	-1.89
Ovary	0	0.00	0	0.00	1	2.14	1	1.98	2	1.90	1.05	0.16
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.14
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.37
<b>Male genital system</b>	3	0.68	11	0.84	6	0.59	7	0.68	27	37.95	0.71	-8.91
Prostate	3	0.69	11	0.85	6	0.60	7	0.69	27	37.32	0.72	-8.40
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.29
<b>Urinary system</b>	5	2.87	6	1.21	1	0.29	3	0.89	15	13.54	1.11	0.78
Urinary bladder	3	2.61	3	0.93	0	0.00	1	0.45	7	8.89	0.79	-1.01
Kidney parenchyma	2	4.12	2	1.43	1	1.02	2	2.12	7	3.81	1.84	1.71
Renal pelvis, other urinary	0	0.00	1	3.19	0	0.00	0	0.00	1	0.85	1.18	0.08
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.15
<b>Bone, joints</b>	0	0.00	0	0.00	2	45.17*	1	24.73	3	0.18	16.41*	1.51
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	5.00	0	0.00	1	0.79	1.26	0.11
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.22
<b>Melanoma of skin</b>	1	2.23	0	0.00	1	1.12	1	1.05	3	3.57	0.84	-0.30
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.11
<b>Brain, central nervous system</b>	1	3.88	2	2.77	2	4.22	0	0.00	5	1.89	2.64	1.66
<b>Thyroid</b>	2	9.78*	1	1.66	0	0.00	0	0.00	3	1.56	1.93	0.77
<b>Lymphatic, hematopoietic</b>	4	2.38	8	1.67	10	3.00*	2	0.61	24	13.10	1.83*	5.82
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.28
Non-Hodgkin lymphoma	4	5.24*	5	2.24	5	3.17*	2	1.23	16	6.19	2.58*	5.24
Myeloma	0	0.00	1	1.26	1	1.81	0	0.00	2	2.17	0.92	-0.09
Leukemia	0	0.00	2	1.28	4	3.73*	0	0.00	6	4.22	1.42	0.95
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	1	2.70	0	0.00	1	1.45	0.69	-0.24
Acute non-lymphocytic	0	0.00	1	1.74	1	2.49	0	0.00	2	1.57	1.28	0.23
Chronic myeloid	0	0.00	1	4.32	1	6.42	0	0.00	2	0.62	3.22	0.74

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 6,422 PYR and for male cancers on 12,283 PYR.



## Nasopharynx Females

**Table 3.9.3:** Risk of subsequent primary cancers after cancer of the nasopharynx, females, SEER 1973-2000.

Number starting interval Person-years in interval Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	1,125 829		890 2,447		434 1,599		246 1,547		1,125 6,422			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	13	2.20*	21	1.22	19	1.58	26	1.90*	79	48.88	1.62*	46.90
All excluding same site	13	2.20*	21	1.22	18	1.50	25	1.83*	77	48.78	1.58*	43.95
<b>Buccal cavity, pharynx</b>	0	0.00	2	6.14	1	4.62	2	8.68	5	0.89	5.64*	6.41
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.07
Tongue	0	0.00	2	28.58*	0	0.00	1	19.05	3	0.19	15.51*	4.37
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.16
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.42
Nasopharynx	0	0.00	0	0.00	1	37.74	1	40.92	2	0.11	18.97*	2.95
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.11
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.09
<b>Digestive system</b>	4	3.04	4	1.05	2	0.75	5	1.63	15	10.86	1.38	6.45
Esophagus	3	86.04*	1	9.99	1	14.46	1	12.76	6	0.28	21.24*	8.90
Stomach	0	0.00	0	0.00	0	0.00	1	3.31	1	1.12	0.89	-0.19
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.24
Colon	1	1.64	3	1.73	0	0.00	3	2.11	7	4.97	1.41	3.16
Rectum, rectosigmoid junction	0	0.00	0	0.00	1	2.39	0	0.00	1	1.71	0.59	-1.10
Rectum	0	0.00	0	0.00	0	0.00	0	0.00	0	1.13	0.00	-1.75
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.21
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.65
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.40
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.42
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	1.39	0.00	-2.16
<b>Respiratory system</b>	1	1.39	6	2.80*	2	1.29	5	2.70	14	6.27	2.23*	12.04
Nose, nasal cavity, ear	0	0.00	1	38.02	0	0.00	0	0.00	1	0.07	13.83	1.44
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.31
Lung, bronchus	1	1.46	5	2.46	2	1.35	5	2.81	13	5.98	2.17*	10.94
<b>Female breast</b>	4	2.27	3	0.57	5	1.37	7	1.71	19	14.72	1.29	6.66
<b>Female genital system</b>	0	0.00	1	0.41	3	1.83	2	1.17	6	6.66	0.90	-1.03
Cervix uteri	0	0.00	0	0.00	2	7.37	0	0.00	2	1.08	1.85	1.43
Corpus uteri	0	0.00	1	0.84	0	0.00	1	1.22	2	3.21	0.62	-1.89
Ovary	0	0.00	0	0.00	1	2.14	1	1.98	2	1.90	1.05	0.16
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.14
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.37
<b>Urinary system</b>	1	4.06	1	1.42	0	0.00	2	3.31	4	2.06	1.95	3.03
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.14	0.00	-1.77
Kidney parenchyma	1	11.64	1	3.95	0	0.00	2	9.18*	4	0.74	5.39*	5.07
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.28
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.09
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	77.10*	1	0.05	19.89	1.48
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.33
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.02
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	1	3.97	1	0.84	1.20	0.26
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.09
<b>Brain, central nervous system</b>	1	16.43	0	0.00	0	0.00	0	0.00	1	0.49	2.04	0.79
<b>Thyroid</b>	1	10.19	0	0.00	0	0.00	0	0.00	1	0.81	1.23	0.29
<b>Lymphatic, hematopoietic</b>	0	0.00	4	3.34	5	5.87*	1	0.99	10	3.48	2.88*	10.16
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.21
Non-Hodgkin lymphoma	0	0.00	3	5.14*	2	4.75	1	1.93	6	1.72	3.49*	6.67
Myeloma	0	0.00	0	0.00	1	6.47	0	0.00	1	0.61	1.63	0.60
Leukemia	0	0.00	1	2.83	2	8.24	0	0.00	3	1.01	2.97	3.10
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.07
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.51
Acute non-lymphocytic	0	0.00	1	7.13	1	10.24	0	0.00	2	0.40	4.97	2.49
Chronic myeloid	0	0.00	0	0.00	1	27.80	0	0.00	1	0.15	6.70	1.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 3.9.4:** Risk of subsequent primary cancers after cancer of the nasopharynx, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	2,526 1,869		2,011 5,162		862 2,990		400 2,263		2,526 12,283			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	25	1.48	73	1.52*	60	1.76*	30	0.95	188	130.60	1.44*	46.73
All excluding same site	25	1.49	72	1.50*	59	1.74*	30	0.96	186	130.02	1.43*	45.58
<b>Buccal cavity, pharynx</b>	2	3.00	4	2.22	3	2.63	3	3.27	12	4.52	2.65*	6.09
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.43
Tongue	1	8.08	1	2.98	1	4.65	3	16.67*	6	0.85	7.02*	4.19
Salivary gland	0	0.00	0	0.00	1	12.13	0	0.00	1	0.32	3.14	0.55
Mouth	1	6.58	1	2.48	0	0.00	0	0.00	2	1.00	2.00	0.81
Nasopharynx	0	0.00	1	4.19	1	6.80	0	0.00	2	0.59	3.41	1.15
Tonsil	0	0.00	1	5.80	0	0.00	0	0.00	1	0.43	2.33	0.47
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.10
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.44
<b>Digestive system</b>	3	0.73	19	1.62	11	1.35	5	0.70	38	31.10	1.22	5.61
Esophagus	1	3.67	2	2.68	1	1.98	1	2.24	5	1.97	2.54	2.47
Stomach	0	0.00	1	0.61	3	2.67	0	0.00	4	4.30	0.93	-0.24
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.33
Colon	1	0.66	9	2.08	1	0.33	2	0.74	13	11.59	1.12	1.15
Rectum, rectosigmoid junction	0	0.00	3	1.38	3	2.03	1	0.79	7	5.69	1.23	1.07
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.16
Liver	0	0.00	0	0.00	0	0.00	1	1.69	1	2.44	0.41	-1.17
Gallbladder	0	0.00	0	0.00	1	13.51	0	0.00	1	0.28	3.54	0.58
Bile ducts, other biliary	1	11.33	1	3.79	0	0.00	0	0.00	2	0.73	2.74	1.03
Pancreas	0	0.00	3	2.43	2	2.36	0	0.00	5	3.28	1.52	1.40
<b>Respiratory system</b>	7	1.96	25	2.54*	25	3.77*	11	1.91	68	25.84	2.63*	34.32
Nose, nasal cavity, ear	1	28.52	1	10.42	1	15.37	0	0.00	3	0.25	11.98*	2.24
Larynx	0	0.00	1	1.24	1	1.95	1	2.44	3	2.03	1.48	0.79
Lung, bronchus	6	1.86	23	2.58*	23	3.81*	10	1.89	62	23.49	2.64*	31.35
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.19
<b>Male genital system</b>	3	0.68	11	0.84	6	0.59	7	0.68	27	37.95	0.71	-8.91
Prostate	3	0.69	11	0.85	6	0.60	7	0.69	27	37.32	0.72	-8.40
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.29
<b>Urinary system</b>	4	2.67	5	1.18	1	0.34	1	0.36	11	11.49	0.96	-0.40
Urinary bladder	3	2.97	3	1.06	0	0.00	1	0.53	7	7.75	0.90	-0.61
Kidney parenchyma	1	2.50	1	0.87	1	1.26	0	0.00	3	3.06	0.98	-0.05
Renal pelvis, other urinary	0	0.00	1	3.97	0	0.00	0	0.00	1	0.67	1.49	0.27
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.19
<b>Bone, joints</b>	0	0.00	0	0.00	2	61.51*	0	0.00	2	0.13	15.09*	1.52
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	6.80	0	0.00	1	0.58	1.72	0.34
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.32
<b>Melanoma of skin</b>	1	2.88	0	0.00	1	1.44	0	0.00	2	2.73	0.73	-0.60
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.13
<b>Brain, central nervous system</b>	0	0.00	2	3.67	2	5.66	0	0.00	4	1.40	2.86	2.12
<b>Thyroid</b>	1	9.40	1	3.35	0	0.00	0	0.00	2	0.75	2.68	1.02
<b>Lymphatic, hematopoietic</b>	4	3.16	4	1.11	5	2.02	1	0.44	14	9.63	1.45	3.56
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.32
Non-Hodgkin lymphoma	4	7.07*	2	1.21	3	2.59	1	0.91	10	4.47	2.24*	4.50
Myeloma	0	0.00	1	1.72	0	0.00	0	0.00	1	1.55	0.64	-0.45
Leukemia	0	0.00	1	0.83	2	2.41	0	0.00	3	3.21	0.94	-0.17
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.10
Chronic lymphocytic	0	0.00	0	0.00	1	3.43	0	0.00	1	1.12	0.89	-0.10
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.16	0.00	-0.95
Chronic myeloid	0	0.00	1	5.60	0	0.00	0	0.00	1	0.47	2.12	0.43

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Chapter 4

## New Malignancies Following Cancer of the Digestive Tract, Excluding Colorectal Cancer

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### Synopsis

The risk of developing a subsequent primary cancer was evaluated in 124,524 patients diagnosed with cancers of the digestive tract (excluding colorectal and anal cancers) between 1973 and 2000. Significant excesses of all new malignancies combined were observed after cancers of the esophagus (O/E=1.38, O=635, EAR=70 per 10,000 person-years) and small intestine (O/E=1.11, O=422, EAR=18) but not after cancers of the stomach (O/E=0.91, O=1,609), liver and intrahepatic bile ducts (O/E=1.05, O=168, EAR=7), gallbladder (O/E=1.10, O=167, EAR=16), extrahepatic bile ducts/other biliary tract (O/E=0.86, O=175), or pancreas (O/E=0.75, O=377). Elevated risks of cancers of the buccal cavity and respiratory tract following esophageal cancer are likely related to tobacco and/or alcohol exposure, with increased risks seen among those with an initial esophageal squamous cell cancer (O/E=1.63) but not those with adenocarcinomas (O/E=0.87). Excesses of new cancers were seen among patients with small intestine adenocarcinomas and sarcomas. Following small intestine adenocarcinoma, the increased risks involved mainly digestive tract cancers, including colorectal cancer, while survivors of small intestine sarcomas had excesses of kidney cancer, as well as soft tissue sarcomas and cutaneous melanoma. Younger patients with small intestine adenocarcinomas, as well as those with stomach cancers, had a pattern of subsequent cancer risk suggestive of genetic syndromes, including hereditary nonpolyposis colorectal cancer. In addition, there were elevated risks of ovarian and pancreatic tumors following gallbladder cancer, and excesses of cancers of the mouth, ovary, kidney, and thyroid following liver cancer. Common etiologic factors may contribute to some patterns of multiple cancers (e.g., alcohol abuse with liver and mouth cancer), while other associations may be related to increased surveillance, difficulties in distinguishing primary from metastatic tumors, or incidental autopsy findings.

### Esophageal Cancer

Esophageal cancer accounts for only 1% of incident malignancies in the U.S., but it is the seventh leading

cause of cancer death in men. Death rates are higher among black men compared with white men (Brown and Devesa, 2002; Jemal et al, 2005). More than 90% of esophageal cancers are squamous cell carcinomas (SCE) or adenocarcinomas (ACE). The histologic pattern of the disease has changed significantly over the past 20 years, with the incidence of SCE decreasing in all race and gender groups and incidence of ACE increasing, particularly among white men (Brown and Devesa, 2002). The 5-year relative survival rate is quite low, approximately 14.2%. Surgical resection, radiotherapy, chemotherapy, or a combination of these treatments is used for localized tumors of both histologic types (Enzinger and Mayer, 2003). Combination chemotherapy (cisplatin and 5-fluorouracil), radiotherapy, and stenting are used for palliative therapy (Enzinger and Mayer, 2003).

Tobacco smoking, alcohol abuse, low fruit and vegetable intake, and other correlates of low socioeconomic status may explain 98% of SCE in the U.S. (Brown and Devesa, 2002). Gastroesophageal reflux disease, obesity, smoking, and low intake of fruits and vegetables may account for up to 80% of ACE (Engel et al, 2003). Tylosis, a rare autosomal dominant disorder, is the only recognized familial syndrome that has been associated with SCE (Enzinger and Mayer, 2003).

### Results and Discussion

Among the 18,402 patients initially diagnosed with esophageal cancer who survived 2 months or more, there was a 38% increased risk of subsequent primary cancers (O/E=1.38, O=635, 95% CI=1.28-1.49, EAR=70 per 10,000 person-years). The cumulative incidence of developing a second cancer, adjusted for the competing risk of death due to other causes, was 4.0% at 15 years (95% CI=3.7%-4.4%). The elevated risks of new malignancies were seen throughout all follow-up periods. Overall relative and absolute risks were substantially higher for blacks (O/E=1.89, EAR=158) than for whites (O/E=1.28, EAR=52). Excess risks were limited to patients diagnosed with esophageal cancer at ages younger than 70 years and to those with SCE (O/E=1.63, EAR=115), but not ACE (O/E=0.87, EAR=-24). Although the overall relative risk was somewhat higher for females than for males, the excess absolute risks were similar. The elevated risks

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

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were 9- to 17-fold for subsequent oral cancers (tongue, tonsil, mouth, oropharynx, and hypopharynx) and 1.7- to 4-fold for cancers of the respiratory tract (larynx, lung, and bronchus), thyroid, stomach (males only), and small intestine. Significant deficits of prostate cancer were seen following esophageal cancer overall (O/E=0.81), primarily among patients with initial ACE (O/E=0.59) but not SCE (O/E=0.92). The findings are generally consistent with earlier surveys of subsequent cancers after esophageal cancer (Berg et al, 1970; Hoar et al, 1985; Dong and Hemminki, 2001; Matsubara et al, 2003).

Exposure of the epithelial surface along the upper aerodigestive tract to the carcinogenic effects of smoking and drinking contributes to the increased risks of multiple cancers (buccal cavity, larynx, lung) following SCE but not ACE (Ahsan et al, 1997; Hemminki and Jiang, 2002). This field cancerogenic effect is also due to the clonal migration of mutated cells (van Oijen and Slootweg, 2000). These factors also account for the reciprocally increased risk of SCE following initial cancers of the buccal cavity and respiratory tract.

The significantly lower-than-expected rate of prostate cancers following esophageal cancer, particularly among patients with ACE, is not consistent with a previous study indicating a positive association between esophageal cancer (all types combined) and prostate cancer (Hoar et al, 1985). The excess of subsequent thyroid cancers in our study appeared as a result of incidental autopsy findings (4 of 6 cases). Reasons for the increased risk of stomach cancer following SCE and ACE are unclear.

## Stomach Cancer

Stomach cancer is the second leading cause of cancer mortality in the world, although in the U.S. it ranks 13th among both men and women (Brown and Devesa, 2002; Jemal et al, 2005). The majority of stomach cancers (85-90%) are adenocarcinomas, with 76% being intestinal type and 13% diffuse type (Henson et al, 2004). During the past 60 years, incidence and mortality rates have declined strikingly in the U.S. and in other industrial countries as a result of decreases in noncardia gastric adenocarcinoma (Brown and Devesa, 2002). In contrast, the incidence rates for cancers in the esophagogastric junction and gastric cardia have increased or remained stable (Brown and Devesa, 2002; Hohenberger and Gretschel, 2003). Stomach cancer occurs more often in men and in minority populations of the U.S. (Brown and Devesa, 2002). Prognosis following stomach cancer has remained poor, with 5-year relative survival rates at 17.0% for gastric cardia cancers and 25.6% for noncardia gastric cancers. For patients with localized disease, surgical removal of the tumor and adjacent lymph nodes offers the only cure, although radiation and chemotherapy are often given (Hohenberger and Gretschel, 2003).

Gastric carriage of *Helicobacter pylori* has emerged as the major risk factor in the development and progression

of chronic atrophic gastritis to intestinal metaplasia, dysplasia, and eventually stomach cancer (Brown and Devesa, 2002). Dietary factors also play a role through poorly refrigerated or preserved foods (e.g., salted, pickled, smoked) and low fruit and vegetable intake. Cigarette smoking has also been linked to stomach cancer (Brown and Devesa, 2002). Changes in the prevalence of these risk factors have probably contributed to the marked decline in noncardia gastric adenocarcinoma. For tumors of the gastric cardia, the risk factors resemble those of ACE, including obesity and gastroesophageal reflux disease (Brown and Devesa, 2002; Engel et al, 2003). Genetic predisposition to stomach cancer may also occur with hereditary nonpolyposis colorectal cancer, familial adenomatous polyposis, familial gastric cancer of the diffuse type caused by germline mutations of E-cadherin (Lindor and Greene, 1998; Graziano et al, 2003), and immunogenetic susceptibility to gastric atrophy caused by proinflammatory cytokines (El-Omar et al, 2003).

## Results and Discussion

Among the 39,998 patients who survived at least 2 months after their initial diagnosis of stomach cancer, a significantly reduced risk of subsequent primary cancers was observed (O/E=0.91, O=1,609, 95% CI=0.86-0.95). The estimated cumulative incidence of second cancer was 5.0% at 20 years (95% CI=4.7%-5.3%). The observed number of new malignancies among the 8,847 patients with gastric cardia cancers did not differ from that expected (O/E=0.97), while a significant deficit in risk was seen among 31,151 patients with noncardia gastric cancers (O/E=0.90). The overall risk of subsequent cancers was decreased during the first year after stomach cancer diagnosis and then rose to levels prevailing in the general population for the remaining follow-up intervals. The risk of new cancers did not differ by gender, but blacks had higher risks than whites, with practically all (93%) of the new malignancies among blacks occurring after noncardia gastric cancer (O/E=1.08, O=214). The risks of subsequent primary cancers were increased for patients diagnosed before age 50 years (O/E=1.50, EAR=24), were similar to expected values for those diagnosed at ages 50-69 years (O/E=1.03, EAR=5), and were lower than expected at older ages ( $\geq 70$  years, O/E=0.77). Risks were significantly elevated for new cancers of the small intestine and thyroid and were decreased for cancers of the lip, uterine corpus, and prostate. Our results are consistent with previous surveys of stomach cancer showing either no increased risk or deficits in risk for all second cancers combined (Hoar et al, 1985; Lyng et al, 1985; Buiatti et al, 1997). However, some studies of stomach cancer have suggested elevated risks for certain subsequent cancers, including those of the colon, liver, pancreas, lung, and breast, as well as for lymphoma (Lyng et al, 1985; Ikeda et al, 1995; Neugut and Gold, 1999; Bozzetti et al, 2000; Kinoshita et al, 2000; Dinis-Ribeiro et al, 2002).



Although smoking is generally considered a risk factor for gastric cancer (Engel et al, 2003) and may predispose to subsequent primary cancers (Kinoshita et al, 2000), we found no excess of new malignancies at tobacco-related sites, except for an increased risk of respiratory cancer among stomach cancer patients diagnosed at ages younger than 50 years ( $O/E=1.74$ ,  $O=17$ ). The excess of colorectal cancers among younger patients suggests the influence of genetic factors, such as hereditary nonpolyposis colon cancer, which features certain extracolonic tumors, including gastric cancer (Umar, 2004). The excess cancers of the small intestine and thyroid were most pronounced in the first year of follow-up, suggesting the role of medical surveillance, or incidental tumors seen during the initial medical work-up or at autopsy.

## Small Intestine Cancer

Cancer of the small intestine is relatively rare in the U.S., accounting for about 0.4% of incident cancers and 0.2% of cancer deaths (Jemal et al, 2005). Although this site represents 90% of the gastrointestinal surface area, the cancer frequency is less than 3% of all gastrointestinal cancers combined (Neugut et al, 1998; Rustgi, 2002). Adenocarcinomas, carcinoids, lymphomas, and sarcomas account for approximately 95% of malignant tumors of the small bowel (Neugut et al, 1998). Since the mid-1980s, small intestine tumors described as carcinoids NOS (not otherwise specified) have been considered malignant and reportable to the SEER Program. Lymphomas of the small intestine are grouped with other non-Hodgkin lymphomas in this survey and are thus excluded from this chapter. Adenocarcinomas and carcinoids occur more often among males than females, and more often among blacks than whites (Neugut et al, 1998). Five-year relative survival rates for cancers of the small intestine are 24.4% for adenocarcinomas, 78.6% for carcinoids, and 45.1% for sarcomas. Treatments include surgery and adjuvant chemotherapy for adenocarcinomas and carcinoids (Anthony and Kim, 2002; Rustgi, 2002) and surgery for leiomyosarcomas (Rustgi, 2002).

Although the etiology of cancers arising in the small intestine is unclear, adenocarcinomas of the small and large intestine are thought to have similar risk factors (Neugut et al, 1998). Some studies have suggested an effect of obesity, alcohol consumption, and cigarette smoking (Neugut et al, 1998; Kaerlev et al, 2000; Wolk et al, 2001; Samanic et al, 2004). Genetic factors are involved in cases associated with familial adenomatous polyposis, hereditary nonpolyposis colon cancer, and Peutz-Jeghers syndrome (Delaunoy et al, 2005). In addition, small intestine cancer occurs excessively in patients with celiac disease and Crohn's disease (Neugut et al, 1998; Delaunoy et al, 2005).

## Results and Discussion

Overall, 422 subsequent primary cancers were observed among 5,432 2-month survivors of cancer of the small intestine, with an overall 11% elevated risk compared

with the general population ( $O/E=1.11$ , 95%  $CI=1.01-1.22$ ,  $EAR=18$ ). Eleven percent of patients developed a second primary cancer over a 20-year interval (cumulative incidence=10.8%, 95%  $CI=9.6\%-12.0\%$ ). The 2,110 patients with adenocarcinoma of the small intestine had a significant 25% increase in subsequent cancer risk ( $O/E=1.25$ ,  $O=137$ ,  $EAR=42$ ), while no excess was found among 2,332 patients diagnosed with carcinoids ( $O/E=1.02$ ,  $O=222$ ,  $EAR=3$ ). A nonsignificant 23% elevation in subsequent cancer risk was seen in 749 patients with small intestine sarcomas ( $O/E=1.23$ ,  $O=48$ ,  $EAR=30$ ). The risk of new malignancy was increased more than 2-fold when small intestine cancers were diagnosed before 50 years of age, whereas observed numbers did not differ from expectation at older ages. Risks of subsequent cancers did not vary substantially by race, gender, or follow-up interval. Significantly increased risks were observed for new cancers of the small intestine and kidney, as well as melanomas and soft tissue sarcomas. Previous studies using the SEER database have reported elevated risks for colorectal and other digestive tract cancers after small intestine adenocarcinomas, for melanoma after small intestine sarcomas among males only, and for prostate cancer following small intestine carcinoids (Neugut and Santos, 1993). Excesses of subsequent digestive cancers have also been reported in other cancer registry studies (Hoar et al, 1985; Lynge et al, 1985; Neugut and Santos, 1993; Ripley and Weinerman, 1997; Neugut et al, 1998; Neugut and Gold, 1999).

In the current SEER survey, patients with small intestine adenocarcinomas had 2-fold or greater increases in risks of subsequent digestive tract cancers, especially colon cancer, which did not occur in excess following small intestine sarcomas or carcinoids. Since reciprocally increased risks of small intestine cancers were seen following cancers of the colon and other digestive sites, it is likely that shared risk factors are involved (Neugut and Santos, 1993; Neugut et al, 1998). In particular, patients with small intestine adenocarcinoma diagnosed at younger than age 50 years had 10- to 18-fold increased risks for new cancers of the colon and rectum ( $O=10$ ) and corpus uteri ( $O=2$ ), a constellation of tumors associated with hereditary nonpolyposis colon cancer (Umar, 2004). Other genetic syndromes, such as familial adenomatous polyposis and Peutz-Jeghers syndrome, may also predispose to small and large intestine cancers at a young age (Delaunoy et al, 2005).

Both males and females with small intestine sarcoma had an increased risk of cutaneous melanoma, an association previously reported in SEER registries among males only (Neugut and Santos, 1993). This finding was most pronounced among younger patients (ages <50 years,  $O/E=24.74$ ,  $O=5$ ), suggesting genetic or immunologic factors, although some sarcomas and melanomas may be difficult to separate on diagnostic grounds (Matz et al, 2002). The increased risk of renal cancer after small intestine sarcoma is noteworthy, as 3 of the 4 cases had documented leiomyosarcoma of the small intestine, raising the possibility of hereditary leiomyomatosis



associated with renal cell cancer, even though the leiomyomas in this syndrome are primarily cutaneous and uterine (Kiuru et al, 2002).

## Liver and Intrahepatic Bile Duct Cancers

Although liver and intrahepatic bile duct cancers account for an estimated 1.3% of incident cancers and 2.7% of cancer deaths in the U.S. (Jemal et al, 2005), they are the fifth most common malignant neoplasm worldwide and the third most common cause of cancer death (Llovet et al, 2003). The incidence and mortality rates for liver and intrahepatic bile duct cancers have been increasing in the U.S. (El-Serag, 2004; Shaib and El-Serag, 2004). Hepatocellular carcinoma (HCC) constitutes the majority of primary liver cancers, followed by intrahepatic bile duct cancer or cholangiocarcinoma (Carriaga and Henson, 1995). Prognosis is especially poor for all forms of primary liver cancer, with a 5-year relative survival rate of 8.2%. Curative surgery and liver transplantation are used to treat the small proportion of liver cancers that are localized and resectable. Treatment options for unresectable tumors include palliative surgery to relieve obstruction of the biliary tree and limited use of adjuvant chemotherapy, radiation, and/or photodynamic therapy (Khan et al, 2002; Valea, 2002).

The major risk factors for HCC include hepatitis B and C virus, chronic alcoholism, and the cirrhosis associated with these exposures. The fungal metabolite aflatoxin B<sub>1</sub> from food sources plays an important role in developing countries. In addition, metabolic diseases such as tyrosinemia, hemochromatosis, and porphyrias contribute to a small proportion of the cancers (Valea, 2002). Recent studies have implicated obesity and diabetes mellitus as conditions predisposing to nonalcoholic steatohepatitis and to HCC (El-Serag, 2004).

## Results and Discussion

No overall excess of subsequent primary cancer was observed among the 11,500 patients who survived 2 months or more following cancer of the liver or intrahepatic bile duct (O/E=1.05, O=168, 95% CI=0.90-1.22, EAR=7). Notably, 15% of the new malignancies were diagnosed at autopsy. As with other cancers that are rapidly fatal, the cumulative incidence of developing a second cancer was very low (1.8% at 15 years, 95% CI=1.5%-2.2%). However, the rate of new cancers tended to increase over time, with a nonsignificant 64% excess seen among 200 patients surviving 10 years or more (O=15). Risks for all subsequent cancers combined did not differ substantially by gender, race, or treatment. Significantly elevated risks were observed for new malignancies of the mouth, ovary, kidney, and thyroid, based on small numbers. Among the 1,937 patients diagnosed with liver cancer at ages younger than 50 years, there was a significantly increased risk of all subsequent cancers combined (O/E=3.15, O=23, EAR=40), with 10- to 27-fold elevated risks for cancers of the colon, ovary, and bladder, as well as for acute non-lymphocytic leukemia,

based on fewer than 5 cases each. Common risk factors (e.g., alcohol for oral cavity cancer), incidental autopsy findings (e.g., thyroid cancer), treatment effects (e.g., acute myeloid leukemia), and misdiagnosed metastases (e.g., ovarian and digestive tract cancers) may have contributed to these results. Previous reports of second cancers following primary liver cancer are sparse and based on small numbers (Kaczynski et al, 1995).

## Gallbladder Cancer

Gallbladder cancers account for an estimated 0.2% of incident cancers in the U.S., with rates for women being 2 to 6 times higher than for men (Misra et al, 2003). Most tumors (90%) are adenocarcinomas, and the relative survival rate is low (14.9% at 5 years). Surgical resection is used to treat patients with localized disease; therapies for more advanced stages may include palliative surgery, radiation, and chemotherapy (Misra et al, 2003).

Because the major precursor state is cholesterol gallstones, the risk factors for stones resemble those for gallbladder cancer; they include female gender, obesity, parity, and physical inactivity (Lazcano-Ponce et al, 2001). Native Americans have the highest rates of stones and gallbladder cancer in the U.S. (Lazcano-Ponce et al, 2001). The mechanisms by which stones predispose to gallbladder cancer are not entirely clear, but they appear to involve chronic inflammatory processes (Misra et al, 2003).

## Results and Discussion

Among the 5,343 patients diagnosed with gallbladder cancer who survived at least 2 months, the subsequent cancer risk did not differ significantly from that expected (O/E=1.10, O=167, 95% CI=0.94-1.27, EAR=16). Overall risks were similar by gender and race. The cumulative incidence of second cancers at 15 years was 3.4% (95% CI=2.9%-4.0%). An increased risk of subsequent ovarian cancers in excess of 4-fold was observed, as reported in a previous SEER survey (Su et al, 1999), and a nearly 3-fold excess of pancreatic cancer was seen, in agreement with a Connecticut registry study (Hoar et al, 1985). In addition, a 12-fold increased risk of subsequent bile duct cancer was noted. Although the associations may result in part from misdiagnosed metastases, it is possible that the increased risk of pancreatic and bile duct tumors was caused by a common etiologic factor such as obesity, or predisposing conditions such as gallstones or sclerosing cholangitis (de Groen et al, 1999).

## Other Biliary Tract Cancers

Cancers of other segments of the biliary tract include tumors of the extrahepatic bile ducts and the ampulla of Vater, as well as other and unspecified biliary malignancies. These tumors are more common in men than women, and relative survival is typically poor, 20.0% at 5 years. Surgical resection is the primary treatment for those without metastasis or nodal involvement. Palliative surgery, adjuvant chemotherapy, and radiation are treatment options for unresectable tumors (Khan et al, 2002).

The main risk factor for extrahepatic bile duct cancer is primary sclerosing cholangitis, a chronic autoimmune inflammatory process that is often associated with ulcerative colitis (Cullen and Chapman, 2003). Gallstones also predispose to bile duct cancers (de Groen et al, 1999; Khan et al, 2002). Familial adenomatous polyposis may be associated with ampulla of Vater cancer in some cases (Lillemoe, 2003).

## Results and Discussion

Among the 5,498 patients who survived 2 months or longer following a diagnosis of other biliary cancer, a total of 175 subsequent primary cancers were observed, yielding a significant deficit in risk (O/E=0.86, 95% CI=0.74-1.00). The cumulative incidence of second cancers was estimated at 3.8% at 15 years (95% CI=3.2%-4.4%). Overall, 65 new malignancies were observed among 3,110 patients with extrahepatic bile duct cancer (O/E=0.78, 95% CI=0.61-1.00); 108 subsequent malignancies occurred among 1,961 patients with carcinoma of the ampulla of Vater (O/E=0.94, 95% CI=0.77-1.14); and 2 new malignancies were observed among 427 patients with other/unspecified biliary tumors. Overall, a significant increased risk of subsequent rectal cancer (excluding rectosigmoid junction) was found (O/E=2.28, O=12), especially among patients with an initial diagnosis of ampulla of Vater cancer (O/E=2.76, O=8). In the reverse direction, there were significant increased risks for extrahepatic bile duct cancer (O/E=1.41, O=86) and ampulla of Vater cancer (O/E=1.45, O=52) after colorectal cancer. These associations are consistent with previous SEER evaluations that reported an elevated risk of colorectal cancers after extrahepatic bile duct and/or ampulla of Vater cancer (Su et al, 1999; Das et al, 2004), as well as an excess of these cancers after colorectal cancer (Hatch et al, 1992; Su et al, 1999). These findings suggest the influence of a genetic susceptibility syndrome, such as hereditary nonpolyposis colon cancer or familial adenomatous polyposis (de Groen et al, 1999), or a predisposing condition, such as sclerosing cholangitis (de Groen et al, 1999). Contrary to an earlier report (Hatch et al, 1992), there was no elevation in the risk of ovarian cancer following cancers of the ampulla of Vater in this extended follow-up study. Prior reports have also shown no excess risk for cancers of the breast, female genital organs, or for smoking-related aerodigestive tract cancers after extrahepatic and ampullary biliary tract cancers (Su et al, 1999).

## Pancreatic Cancer

Pancreatic cancer is estimated to be the eleventh most frequent incident cancer, and the fourth most common cause of cancer mortality for men and women in the U.S. (Jemal et al, 2005). More than 90% of pancreatic cancers are ductal adenocarcinomas, with islet-cell tumors constituting about 5% (Mayer, 2005). The incidence of pancreatic cancer is higher in men compared with women, and in blacks compared with whites (Ries et al, 2004). Pancreatic cancer is most often diagnosed at advanced stages, resulting in a 5-year relative survival rate of only 4.3%. For patients

with localized disease, surgical resection of the pancreas offers the only effective treatment; palliative treatments, such as surgery for biliary decompression and adjunctive radiation and chemotherapy (fluorouracil), are used for nonresectable tumors (Mayer, 2005).

Of the few risk factors that have been identified, cigarette smoking is the most consistent (Mayer, 2005). Diabetes mellitus (Huxley et al, 2005) and chronic pancreatitis also predispose to the disease (Lowenfels et al, 1999). An association with obesity has been reported in several studies (Berrington de Gonzalez et al, 2003), but the effect of dietary factors and physical activity is unclear. Genetic susceptibility plays a role, with some cases being familial or related to hereditary melanoma, Peutz-Jeghers syndrome, hereditary breast or ovarian cancer, familial pancreatitis, or hereditary nonpolyposis colon cancer (Hansel et al, 2003).

## Results and Discussion

Among 38,351 2-month survivors of pancreatic cancer, a deficit in risk of subsequent primary cancers was observed (O/E=0.75, O=377, 95% CI 0.67-0.82). Nearly 16% of the 377 new malignancies were diagnosed at autopsy. The cumulative incidence of second cancer was very low, 1.0% at 10 years (95% CI=0.9%-1.1%), consistent with very poor survival rates. The 578 patients diagnosed with primary islet-cell tumors had fewer new malignancies than expected (O/E=0.85, O=23). Males had a rate of subsequent cancer that was similar to that of females, while risks appeared to be somewhat higher in blacks (O/E=0.96) than whites (O/E=0.68). A 27% nonsignificant increase in subsequent cancer risk was observed among those who were younger than age 50 years when diagnosed with pancreatic cancer. Over all ages combined, risks were significantly increased for subsequent cancers of the small intestine and thyroid, but deficits in risk were seen for cancers of the colon, liver, respiratory tract, uterine corpus, and bladder, as well as myeloma. In 2 other registry-based studies of pancreatic cancer, the risk of second cancers did not differ from that of the general population (Hoar et al, 1985; Lynge et al, 1985), although significant deficits were noted in a third study (Dong and Hemminki, 2001).

The extremely poor survival associated with pancreatic cancer impedes the detection of new primaries and likely explains the deficits in risk for many cancers. The elevated risk of new thyroid tumors was related to incidental findings at autopsy (10 of 12 thyroid cancers), while misclassified metastases probably explained the increased risk for small intestine cancer, which was limited to the early follow-up period. Cigarette smoking may underlie the elevated risk of lung cancer following pancreatic cancer among patients diagnosed at younger than 50 years of age (O/E=2.84, O=7), especially because a reciprocal increased risk of subsequent pancreatic cancer was associated with other smoking-related cancers (lung, head and neck, and bladder) in a previous SEER survey (Neugut et al, 1995; Neugut and Gold, 1999). Although an elevated risk of pancreatic cancer has been reported in

melanoma-prone families (Goldstein et al, 1995) and in patients with early-onset melanoma in an earlier SEER study (Schenk et al, 1998), we found no evidence in the current SEER data of a significantly increased risk of melanoma after pancreatic cancer at any age.

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## Esophagus Both Sexes

**Table 4.1.1:** Characteristics of patients with an initial cancer of the esophagus, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	13,496	100.0	4,906	100.0	18,402	100.0
<b>Initial treatment</b>						
Any radiation	8,901	66.0	3,310	67.5	12,211	66.4
With surgery	2,066	15.3	585	11.9	2,651	14.4
Without surgery	6,835	50.6	2,725	55.5	9,560	52.0
No radiation	4,595	34.0	1,596	32.5	6,191	33.6
With surgery	2,315	17.2	685	14.0	3,000	16.3
Without surgery	2,280	16.9	911	18.6	3,191	17.3
<b>Race</b>						
White	10,070	74.6	3,763	76.7	13,833	75.2
Black	2,590	19.2	960	19.6	3,550	19.3
Other	825	6.1	178	3.6	1,003	5.5
Unknown	11	0.1	5	0.1	16	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	21	0.2	7	0.1	28	0.2
30–49	1,251	9.3	285	5.8	1,536	8.3
50–69	7,704	57.1	2,343	47.8	10,047	54.6
70–79	3,373	25.0	1,366	27.8	4,739	25.8
≥ 80	1,147	8.5	905	18.4	2,052	11.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	13,066	96.8	4,759	97.0	17,825	96.9
1st and 2nd cancers	388	2.9	139	2.8	527	2.9
1st, 2nd, and 3rd cancers	37	0.3	6	0.1	43	0.2
1st, 2nd, 3rd, and additional cancers	5	0.0	2	0.0	7	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	65.2	—	68.7	—	66.2	—
Median year of 1st cancer diagnosis	1989.1	—	1987.8	—	1988.8	—
Median person-years at risk	0.5	—	0.6	—	0.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.9	—	90.5	—	93.8
1st, 2nd, and additional cancers	—	94.4	—	89.8	—	93.2
1st cancer only	—	4.0	—	6.1	—	4.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 4.1.2:** Risk of subsequent primary cancers after cancer of the esophagus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	197	1.23*	296	1.57*	94	1.31*	48	1.22	635	459.74	1.38*	70.18
All excluding same site	196	1.24*	294	1.59*	93	1.31*	48	1.23	631	453.53	1.39*	71.07
<b>Buccal cavity, pharynx</b>	39	8.33*	46	8.94*	21	11.95*	11	12.66*	117	12.46	9.39*	41.86
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.76	0.00	-0.70
Tongue	7	7.56*	14	13.48*	6	16.73*	0	0.00	27	2.50	10.81*	9.81
Salivary gland	1	2.83	1	2.44	1	6.37	0	0.00	3	1.01	2.97	0.80
Mouth	12	9.96*	15	11.42*	3	6.72*	1	4.56	31	3.18	9.74*	11.14
Nasopharynx	0	0.00	1	4.98	0	0.00	0	0.00	1	0.49	2.06	0.21
Tonsil	6	12.56*	9	17.29*	5	29.57*	1	12.99	21	1.24	16.88*	7.91
Oropharynx	2	13.85*	2	12.55*	1	18.46	0	0.00	5	0.38	13.03*	1.85
Hypopharynx	8	14.76*	4	6.82*	4	21.01*	7	80.01*	23	1.41	16.36*	8.65
<b>Digestive system</b>	47	1.30	52	1.27	11	0.70	11	1.26	121	101.41	1.19	7.85
Esophagus	1	0.43	2	0.79	1	1.11	0	0.00	4	6.20	0.64	-0.88
Stomach	12	2.95*	10	2.25*	2	1.23	2	2.24	26	11.04	2.36*	5.99
Small intestine	2	4.01	3	5.04*	0	0.00	1	7.48	6	1.46	4.10*	1.82
Colon	21	1.35	21	1.17	2	0.29	4	1.00	48	44.47	1.08	1.41
Rectum, rectosigmoid junction	5	0.81	8	1.14	2	0.78	1	0.73	16	17.07	0.94	-0.43
Anus, anal canal	1	3.44	0	0.00	0	0.00	0	0.00	1	0.84	1.19	0.06
Liver	0	0.00	1	0.62	0	0.00	0	0.00	1	3.94	0.25	-1.18
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-0.47
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	4.69	1	2.14	0.47	-0.46
Pancreas	5	1.16	4	0.81	3	1.59	2	1.89	14	12.18	1.15	0.73
<b>Respiratory system</b>	39	1.28	89	2.57*	27	2.12*	7	1.04	162	84.55	1.92*	31.02
Nose, nasal cavity, ear	0	0.00	1	3.68	0	0.00	0	0.00	1	0.67	1.50	0.13
Larynx	7	3.03*	10	3.94*	4	4.65*	2	4.85	23	6.11	3.76*	6.76
Lung, bronchus	32	1.15	77	2.42*	23	1.96*	4	0.64	136	77.56	1.75*	23.40
<b>Female breast</b>	7	0.78	16	1.41	5	1.05	2	0.75	30	27.79	1.08	3.01
<b>Female genital system</b>	2	0.47	3	0.59	1	0.49	1	0.92	7	12.48	0.56	-7.45
Cervix uteri	1	1.91	0	0.00	1	4.68	0	0.00	2	1.42	1.40	0.78
Corpus uteri	1	0.47	2	0.77	0	0.00	0	0.00	3	6.30	0.48	-4.48
Ovary	0	0.00	1	0.68	0	0.00	1	2.97	2	3.62	0.55	-2.21
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.30
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.83
<b>Male genital system</b>	31	0.78	44	0.92	12	0.65	8	0.79	95	115.84	0.82	-11.83
Prostate	31	0.79	42	0.89	12	0.66	8	0.80	93	114.82	0.81*	-12.39
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.19
<b>Urinary system</b>	15	1.13	20	1.29	7	1.18	1	0.30	43	38.01	1.13	2.00
Urinary bladder	10	1.09	15	1.40	5	1.22	1	0.43	31	26.35	1.18	1.86
Kidney parenchyma	5	1.53	2	0.52	2	1.36	0	0.00	9	9.41	0.96	-0.16
Renal pelvis, other urinary	0	0.00	3	3.27	0	0.00	0	0.00	3	2.26	1.33	0.30
Ureter	0	0.00	1	3.34	0	0.00	0	0.00	1	0.74	1.36	0.11
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.73	0.00	-0.69
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.22
<b>Melanoma of skin</b>	2	0.64	6	1.52	2	1.31	0	0.00	10	9.45	1.06	0.22
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.24
<b>Brain, central nervous system</b>	1	0.66	2	1.12	0	0.00	0	0.00	3	4.30	0.70	-0.52
<b>Thyroid</b>	4	5.92*	2	2.52	0	0.00	0	0.00	6	1.90	3.17*	1.64
<b>Lymphatic, hematopoietic</b>	5	0.43	8	0.59	4	0.76	5	1.68	22	33.32	0.66*	-4.53
Hodgkin lymphoma	0	0.00	1	2.47	0	0.00	0	0.00	1	0.98	1.02	0.01
Non-Hodgkin lymphoma	3	0.61	4	0.67	1	0.43	2	1.49	10	14.53	0.69	-1.82
Myeloma	1	0.46	1	0.40	1	1.02	2	3.65	5	6.22	0.80	-0.49
Leukemia	1	0.25	2	0.43	2	1.11	1	0.98	6	11.58	0.52	-2.24
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.12
Chronic lymphocytic	0	0.00	1	0.53	0	0.00	1	2.50	2	4.67	0.43	-1.07
Acute non-lymphocytic	0	0.00	1	0.64	1	1.63	0	0.00	2	3.88	0.52	-0.75
Chronic myeloid	0	0.00	0	0.00	1	4.07	0	0.00	1	1.59	0.63	-0.24

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 7,357 PYR and for male cancers on 17,615 PYR.



## Esophagus Females

**Table 4.1.3:** Risk of subsequent primary cancers after cancer of the esophagus, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	45	1.35	74	1.78*	25	1.41	13	1.26	157	102.94	1.53*	73.48
All excluding same site	44	1.33	74	1.79*	24	1.36	13	1.27	155	102.17	1.52*	71.81
<b>Buccal cavity, pharynx</b>	12	19.64*	14	18.85*	8	26.37*	4	24.30*	38	1.82	20.86*	49.18
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.17
Tongue	1	7.54	6	37.20*	2	30.28*	0	0.00	9	0.40	22.74*	11.70
Salivary gland	0	0.00	1	12.70	1	30.18	0	0.00	2	0.19	10.26*	2.45
Mouth	4	18.73*	5	19.29*	1	9.36	1	16.65	11	0.64	17.20*	14.08
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.10
Tonsil	3	53.10*	2	30.31*	2	80.08*	0	0.00	7	0.16	44.19*	9.30
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.06
Hypopharynx	3	68.84*	0	0.00	1	48.61	3	318.17*	7	0.13	55.34*	9.34
<b>Digestive system</b>	10	1.20	8	0.78	4	0.90	2	0.73	24	25.75	0.93	-2.38
Esophagus	1	3.89	0	0.00	1	7.71	0	0.00	2	0.77	2.60	1.67
Stomach	1	1.46	0	0.00	0	0.00	0	0.00	1	2.08	0.48	-1.46
Small intestine	1	8.94	0	0.00	0	0.00	0	0.00	1	0.36	2.78	0.87
Colon	5	1.21	3	0.59	1	0.44	2	1.43	11	12.92	0.85	-2.60
Rectum, rectosigmoid junction	1	0.78	5	3.21*	1	1.54	0	0.00	7	3.86	1.81	4.27
Rectum	0	0.00	5	4.91*	1	2.35	0	0.00	6	2.53	2.38	4.72
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.43
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.77
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.77
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.75
Pancreas	1	0.91	0	0.00	0	0.00	0	0.00	1	3.45	0.29	-3.33
<b>Respiratory system</b>	7	1.61	19	3.37*	3	1.21	2	1.38	31	13.91	2.23*	23.23
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.19
Larynx	0	0.00	2	10.99*	0	0.00	1	27.43	3	0.44	6.80*	3.48
Lung, bronchus	7	1.69	16	2.97*	3	1.27	1	0.72	27	13.29	2.03*	18.63
<b>Female breast</b>	7	0.78	16	1.41	5	1.05	2	0.75	30	27.79	1.08	3.01
<b>Female genital system</b>	2	0.47	3	0.59	1	0.49	1	0.92	7	12.48	0.56	-7.45
Cervix uteri	1	1.91	0	0.00	1	4.68	0	0.00	2	1.42	1.40	0.78
Corpus uteri	1	0.47	2	0.77	0	0.00	0	0.00	3	6.30	0.48	-4.48
Ovary	0	0.00	1	0.68	0	0.00	1	2.97	2	3.62	0.55	-2.21
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.30
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.83
<b>Urinary system</b>	2	1.24	7	3.43*	1	1.12	0	0.00	10	5.10	1.96	6.67
Urinary bladder	0	0.00	3	2.49	1	1.89	0	0.00	4	3.02	1.32	1.33
Kidney parenchyma	2	3.88	2	3.02	0	0.00	0	0.00	4	1.64	2.44	3.21
Renal pelvis, other urinary	0	0.00	2	11.55*	0	0.00	0	0.00	2	0.43	4.62	2.13
Ureter	0	0.00	1	19.18	0	0.00	0	0.00	1	0.13	7.66	1.18
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.12
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.56
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.06
<b>Melanoma of skin</b>	1	1.91	1	1.47	0	0.00	0	0.00	2	1.66	1.21	0.46
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.19
<b>Brain, central nervous system</b>	0	0.00	1	2.47	0	0.00	0	0.00	1	0.99	1.01	0.02
<b>Thyroid</b>	1	4.01	1	3.26	0	0.00	0	0.00	2	0.74	2.70	1.71
<b>Lymphatic, hematopoietic</b>	2	0.78	2	0.62	2	1.40	1	1.14	7	8.12	0.86	-1.53
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.29
Non-Hodgkin lymphoma	1	0.85	2	1.32	0	0.00	0	0.00	3	3.77	0.79	-1.05
Myeloma	0	0.00	0	0.00	1	3.65	1	6.06	2	1.56	1.28	0.60
Leukemia	1	1.21	0	0.00	1	2.24	0	0.00	2	2.57	0.78	-0.78
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.10
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-1.37
Acute non-lymphocytic	0	0.00	0	0.00	1	6.37	0	0.00	1	0.90	1.11	0.13
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.49

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.1.4:** Risk of subsequent primary cancers after cancer of the esophagus, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	152	1.19*	222	1.52*	69	1.28	35	1.20	478	356.80	1.34*	68.81
All excluding same site	152	1.21*	220	1.53*	69	1.29*	35	1.22	476	351.36	1.35*	70.76
<b>Buccal cavity, pharynx</b>	27	6.63*	32	7.26*	13	8.94*	7	9.93*	79	10.64	7.43*	38.81
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.63	0.00	-0.93
Tongue	6	7.56*	8	9.12*	4	13.67*	0	0.00	18	2.10	8.56*	9.02
Salivary gland	1	3.46	0	0.00	0	0.00	0	0.00	1	0.81	1.23	0.11
Mouth	8	8.07*	10	9.49*	2	5.89	0	0.00	20	2.54	7.86*	9.91
Nasopharynx	0	0.00	1	5.82	0	0.00	0	0.00	1	0.42	2.40	0.33
Tonsil	3	7.13*	7	15.40*	3	20.82*	1	15.14	14	1.09	12.89*	7.33
Oropharynx	2	15.51*	2	14.27*	1	21.43	0	0.00	5	0.34	14.80*	2.65
Hypopharynx	5	10.03*	4	7.50*	3	17.67*	4	51.25*	16	1.28	12.50*	8.36
<b>Digestive system</b>	37	1.34	44	1.43*	7	0.63	9	1.51	97	75.66	1.28*	12.12
Esophagus	0	0.00	2	0.90	0	0.00	0	0.00	2	5.44	0.37	-1.95
Stomach	11	3.25*	10	2.76*	2	1.57	2	2.98	25	8.96	2.79*	9.11
Small intestine	1	2.58	3	6.64*	0	0.00	1	10.70	5	1.10	4.53*	2.21
Colon	16	1.41	18	1.40	1	0.21	2	0.77	37	31.56	1.17	3.09
Rectum, rectosigmoid junction	4	0.82	3	0.55	1	0.52	1	1.01	9	13.21	0.68	-2.39
Anus, anal canal	1	5.32	0	0.00	0	0.00	0	0.00	1	0.52	1.92	0.27
Liver	0	0.00	1	0.72	0	0.00	0	0.00	1	3.37	0.30	-1.35
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.35
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	6.86	1	1.59	0.63	-0.33
Pancreas	4	1.24	4	1.13	3	2.35	2	2.94	13	8.73	1.49	2.42
<b>Respiratory system</b>	32	1.23	70	2.41*	24	2.34*	5	0.95	131	70.64	1.85*	34.27
Nose, nasal cavity, ear	0	0.00	1	4.66	0	0.00	0	0.00	1	0.53	1.90	0.27
Larynx	7	3.24*	8	3.40*	4	5.09*	1	2.66	20	5.67	3.53*	8.13
Lung, bronchus	25	1.06	61	2.31*	20	2.13*	3	0.62	109	64.27	1.70*	25.39
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.39
<b>Male genital system</b>	31	0.78	44	0.92	12	0.65	8	0.79	95	115.84	0.82	-11.83
Prostate	31	0.79	42	0.89	12	0.66	8	0.80	93	114.82	0.81*	-12.39
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.19
<b>Urinary system</b>	13	1.12	13	0.96	6	1.19	1	0.36	33	32.92	1.00	0.05
Urinary bladder	10	1.22	12	1.26	4	1.12	1	0.50	27	23.32	1.16	2.09
Kidney parenchyma	3	1.09	0	0.00	2	1.70	0	0.00	5	7.77	0.64	-1.57
Renal pelvis, other urinary	0	0.00	1	1.34	0	0.00	0	0.00	1	1.83	0.55	-0.47
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.34
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.32	0.00	-0.75
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.51	0.00	-0.29
<b>Melanoma of skin</b>	1	0.38	5	1.53	2	1.62	0	0.00	8	7.79	1.03	0.12
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.26
<b>Brain, central nervous system</b>	1	0.83	1	0.72	0	0.00	0	0.00	2	3.32	0.60	-0.75
<b>Thyroid</b>	3	7.04*	1	2.06	0	0.00	0	0.00	4	1.16	3.46	1.61
<b>Lymphatic, hematopoietic</b>	3	0.33*	6	0.58	2	0.52	4	1.91	15	25.20	0.60*	-5.79
Hodgkin lymphoma	0	0.00	1	3.15	0	0.00	0	0.00	1	0.77	1.30	0.13
Non-Hodgkin lymphoma	2	0.53	2	0.45	1	0.60	2	2.16	7	10.76	0.65	-2.13
Myeloma	1	0.59	1	0.53	0	0.00	1	2.62	3	4.66	0.64	-0.94
Leukemia	0	0.00	2	0.55	1	0.74	1	1.35	4	9.01	0.44	-2.84
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.13
Chronic lymphocytic	0	0.00	1	0.67	0	0.00	1	3.39	2	3.66	0.55	-0.94
Acute non-lymphocytic	0	0.00	1	0.82	0	0.00	0	0.00	1	2.98	0.34	-1.12
Chronic myeloid	0	0.00	0	0.00	1	5.43	0	0.00	1	1.23	0.81	-0.13

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Esophagus

## Both Sexes, <60 Years of Age

**Table 4.1.5:** Risk of subsequent primary cancers after cancer of the esophagus, both sexes, <60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	48	2.45*	86	2.99*	37	2.23*	30	1.80*	201	81.65	2.46*	135.95
All excluding same site	48	2.51*	86	3.05*	37	2.26*	30	1.82*	201	80.17	2.51*	137.64
<b>Buccal cavity, pharynx</b>	20	19.40*	19	14.56*	13	21.84*	8	18.28*	60	3.37	17.81*	64.51
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.33
Tongue	4	18.17*	7	24.57*	4	30.70*	0	0.00	15	0.73	20.57*	16.26
Salivary gland	1	18.39	0	0.00	0	0.00	0	0.00	1	0.20	4.95	0.91
Mouth	7	25.11*	6	17.54*	2	13.09*	1	9.31	16	0.88	18.16*	17.22
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.18
Tonsil	3	20.24*	4	22.16*	3	39.46*	1	20.82	11	0.45	24.30*	12.01
Oropharynx	1	28.52	0	0.00	0	0.00	0	0.00	1	0.12	8.54	1.01
Hypopharynx	2	15.87*	2	12.74*	3	41.37*	5	97.42*	12	0.41	29.49*	13.21
<b>Digestive system</b>	6	1.50	13	2.30*	2	0.63	5	1.56	26	16.02	1.62*	11.37
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	1.48	0.00	-1.69
Stomach	3	6.62*	3	4.94	1	3.12	0	0.00	7	1.70	4.12*	6.04
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.35
Colon	1	0.72	7	3.38*	0	0.00	1	0.74	9	6.05	1.49	3.37
Rectum, rectosigmoid junction	1	1.35	1	0.93	0	0.00	1	1.80	3	2.96	1.01	0.05
Anus, anal canal	1	17.98	0	0.00	0	0.00	0	0.00	1	0.20	4.96	0.91
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.93
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.15
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	15.06	1	0.29	3.49	0.81
Pancreas	0	0.00	2	2.92	1	2.60	2	5.10	5	1.95	2.56	3.47
<b>Respiratory system</b>	11	2.55*	36	5.97*	12	3.63*	6	1.91	65	16.78	3.87*	54.93
Nose, nasal cavity, ear	0	0.00	1	18.08	0	0.00	0	0.00	1	0.15	6.79	0.97
Larynx	3	6.49*	4	6.51*	1	3.33	2	8.56	10	1.61	6.21*	9.56
Lung, bronchus	8	2.11	31	5.80*	11	3.70*	3	1.04	53	14.98	3.54*	43.31
<b>Female breast</b>	1	0.69	1	0.51	1	0.88	1	1.09	4	5.46	0.73	-7.39
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	1	2.58	1	2.48	0.40	-7.45
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-2.02
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.24	0.00	-6.28
Ovary	0	0.00	0	0.00	0	0.00	1	8.70	1	0.68	1.47	1.62
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.16
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.37
<b>Male genital system</b>	3	0.96	9	1.54	1	0.24	6	1.22	19	18.09	1.05	1.33
Prostate	3	1.00	8	1.40	1	0.24	6	1.23	18	17.77	1.01	0.35
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.30
<b>Urinary system</b>	2	1.35	4	1.79	5	3.97*	1	0.75	12	6.31	1.90	6.48
Urinary bladder	1	1.18	4	3.04	4	5.18*	1	1.12	10	3.82	2.62*	7.04
Kidney parenchyma	1	1.76	0	0.00	1	2.35	0	0.00	2	2.18	0.92	-0.21
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.35
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.10
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.42
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.31
<b>Melanoma of skin</b>	0	0.00	0	0.00	1	2.23	0	0.00	1	2.38	0.42	-1.57
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.14
<b>Brain, central nervous system</b>	1	3.39	0	0.00	0	0.00	0	0.00	1	1.05	0.96	-0.05
<b>Thyroid</b>	2	11.08*	0	0.00	0	0.00	0	0.00	2	0.60	3.35	1.60
<b>Lymphatic, hematopoietic</b>	2	1.31	1	0.47	2	1.76	2	1.75	7	5.94	1.18	1.21
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.33
Non-Hodgkin lymphoma	1	1.41	1	0.99	0	0.00	1	1.89	3	2.79	1.08	0.24
Myeloma	0	0.00	0	0.00	1	4.68	1	4.61	2	1.08	1.85	1.04
Leukemia	1	2.25	0	0.00	1	2.92	0	0.00	2	1.78	1.12	0.25
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.08
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.84
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.63
Chronic myeloid	0	0.00	0	0.00	1	21.05	0	0.00	1	0.26	3.87	0.84

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,982 PYR and for male cancers on 6,796 PYR.

**Table 4.1.6:** Risk of subsequent primary cancers after cancer of the esophagus, both sexes, 60-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	73	1.35*	112	1.57*	31	1.03	12	0.72	228	172.46	1.32*	63.97
All excluding same site	72	1.35*	111	1.58*	30	1.01	12	0.73	225	169.99	1.32*	63.36
<b>Buccal cavity, pharynx</b>	13	7.33*	20	9.81*	5	7.30*	2	6.24	40	4.82	8.30*	40.52
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.72
Tongue	2	5.60	5	12.07*	1	7.05	0	0.00	8	0.98	8.19*	8.09
Salivary gland	0	0.00	1	7.11	1	17.20	0	0.00	2	0.34	5.82	1.91
Mouth	4	8.79*	8	15.58*	0	0.00	0	0.00	12	1.22	9.83*	12.41
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.22
Tonsil	2	10.42*	4	18.94*	2	31.21*	0	0.00	8	0.49	16.29*	8.65
Oropharynx	0	0.00	1	14.37	1	45.60	0	0.00	2	0.16	12.30*	2.12
Hypopharynx	5	21.58*	1	3.88	0	0.00	1	34.24	7	0.60	11.71*	7.37
<b>Digestive system</b>	21	1.88*	18	1.25	3	0.48	4	1.03	46	35.60	1.29	11.97
Esophagus	1	1.13	1	0.97	1	2.66	0	0.00	3	2.47	1.21	0.61
Stomach	5	4.02*	2	1.32	0	0.00	1	2.47	8	3.82	2.09	4.81
Small intestine	2	12.25*	1	4.57	0	0.00	1	17.75	4	0.53	7.48*	3.99
Colon	7	1.56	5	0.84	1	0.37	2	1.09	15	14.98	1.00	0.02
Rectum, rectosigmoid junction	2	0.97	3	1.16	1	0.97	0	0.00	6	6.27	0.96	-0.31
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.36
Liver	0	0.00	1	1.62	0	0.00	0	0.00	1	1.51	0.66	-0.58
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.43
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.80
Pancreas	4	2.93	2	1.14	0	0.00	0	0.00	6	4.34	1.38	1.91
<b>Respiratory system</b>	15	1.30	33	2.30*	11	1.96	0	0.00	59	34.25	1.72*	28.51
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.28
Larynx	4	4.08*	4	3.58	2	5.45	0	0.00	10	2.61	3.84*	8.52
Lung, bronchus	11	1.05	28	2.14*	9	1.73	0	0.00	48	31.32	1.53*	19.21
<b>Female breast</b>	3	1.07	6	1.48	3	1.51	1	0.76	13	10.17	1.28	10.86
<b>Female genital system</b>	1	0.70	1	0.51	0	0.00	0	0.00	2	4.81	0.42	-10.76
Cervix uteri	1	5.80	0	0.00	0	0.00	0	0.00	1	0.52	1.94	1.86
Corpus uteri	0	0.00	1	0.94	0	0.00	0	0.00	1	2.59	0.39	-6.09
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.35	0.00	-5.18
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.28
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.67
<b>Male genital system</b>	10	0.72	17	0.87	5	0.60	1	0.25	33	45.73	0.72	-20.96
Prostate	10	0.72	17	0.88	5	0.60	1	0.26	33	45.41	0.73	-20.43
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.13
<b>Urinary system</b>	4	0.94	9	1.60	1	0.42	0	0.00	14	13.69	1.02	0.36
Urinary bladder	2	0.71	7	1.84	0	0.00	0	0.00	9	9.28	0.97	-0.32
Kidney parenchyma	2	1.71	1	0.66	1	1.65	0	0.00	4	3.60	1.11	0.46
Renal pelvis, other urinary	0	0.00	1	3.02	0	0.00	0	0.00	1	0.81	1.23	0.22
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.31
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.68
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.12
<b>Melanoma of skin</b>	1	0.96	3	2.10	0	0.00	0	0.00	4	3.39	1.18	0.70
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.25
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.66	0.00	-1.91
<b>Thyroid</b>	1	4.16	1	3.33	0	0.00	0	0.00	2	0.71	2.83	1.49
<b>Lymphatic, hematopoietic</b>	1	0.28	2	0.42	1	0.48	2	1.53	6	11.62	0.52	-6.47
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.40
Non-Hodgkin lymphoma	1	0.66	2	0.96	0	0.00	1	1.69	4	5.11	0.78	-1.28
Myeloma	0	0.00	0	0.00	0	0.00	1	4.19	1	2.27	0.44	-1.46
Leukemia	0	0.00	0	0.00	1	1.44	0	0.00	1	3.90	0.26	-3.34
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.12
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.62	0.00	-1.87
Acute non-lymphocytic	0	0.00	0	0.00	1	4.14	0	0.00	1	1.30	0.77	-0.35
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.61

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,608 PYR and for male cancers on 6,074 PYR.

## Esophagus

### Both Sexes, ≥70 Years of Age

**Table 4.1.7:** Risk of subsequent primary cancers after cancer of the esophagus, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	6,791		2,361		329		79		6,791			
<b>Person-years in interval</b>	3,220		3,205		875		212		7,511			
<b>All subsequent cancers</b>	76	0.88	98	1.12	26	1.04	6	1.00	206	205.63	1.00	0.50
All excluding same site	76	0.89	97	1.12	26	1.05	6	1.01	205	203.37	1.01	2.16
<b>Buccal cavity, pharynx</b>	6	3.19*	7	3.88*	3	6.29*	1	9.00	17	4.27	3.98*	16.94
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-1.12
Tongue	1	2.86	2	5.89	1	11.56	0	0.00	4	0.79	5.04*	4.27
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.62
Mouth	1	2.12	1	2.19	1	8.08	0	0.00	3	1.08	2.77	2.55
Nasopharynx	0	0.00	1	17.59	0	0.00	0	0.00	1	0.13	7.41	1.15
Tonsil	1	7.28	1	7.75	0	0.00	0	0.00	2	0.30	6.66	2.26
Oropharynx	1	21.40	1	22.28	0	0.00	0	0.00	2	0.10	19.22*	2.52
Hypopharynx	1	5.43	1	5.82	1	25.95	1	143.73*	4	0.40	9.96*	4.79
<b>Digestive system</b>	20	0.96	21	1.00	6	0.96	2	1.24	49	49.78	0.98	-1.04
Esophagus	0	0.00	1	1.05	0	0.00	0	0.00	1	2.25	0.44	-1.67
Stomach	4	1.68	5	2.16	1	1.53	1	5.89	11	5.52	1.99	7.30
Small intestine	0	0.00	2	7.52	0	0.00	0	0.00	2	0.62	3.21	1.83
Colon	13	1.35	9	0.91	1	0.33	1	1.23	24	23.45	1.02	0.74
Rectum, rectosigmoid junction	2	0.60	4	1.20	1	1.07	0	0.00	7	7.84	0.89	-1.11
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.44
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.62	0.00	-2.15
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.91
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.16	0.00	-1.54
Pancreas	1	0.41	0	0.00	2	2.70	0	0.00	3	5.89	0.51	-3.84
<b>Respiratory system</b>	13	0.89	20	1.40	4	1.05	1	1.19	38	33.52	1.13	5.96
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.38
Larynx	0	0.00	2	2.48	1	5.19	0	0.00	3	1.90	1.58	1.47
Lung, bronchus	13	0.96	18	1.35	3	0.84	1	1.27	35	31.26	1.12	4.98
<b>Female breast</b>	3	0.63	9	1.69	1	0.61	0	0.00	13	12.16	1.07	3.05
<b>Female genital system</b>	1	0.48	2	0.88	1	1.49	0	0.00	4	5.20	0.77	-4.33
Cervix uteri	0	0.00	0	0.00	1	16.06	0	0.00	1	0.51	1.97	1.78
Corpus uteri	1	0.99	1	0.92	0	0.00	0	0.00	2	2.47	0.81	-1.69
Ovary	0	0.00	1	1.44	0	0.00	0	0.00	1	1.59	0.63	-2.14
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.41
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-1.32
<b>Male genital system</b>	18	0.80	18	0.81	6	1.02	1	0.79	43	52.02	0.83	-19.01
Prostate	18	0.80	17	0.77	6	1.03	1	0.80	42	51.64	0.81	-20.32
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.10
<b>Urinary system</b>	9	1.20	7	0.91	1	0.44	0	0.00	17	18.01	0.94	-1.35
Urinary bladder	7	1.27	4	0.71	1	0.59	0	0.00	12	13.25	0.91	-1.66
Kidney parenchyma	2	1.31	1	0.64	0	0.00	0	0.00	3	3.63	0.83	-0.83
Renal pelvis, other urinary	0	0.00	2	4.15	0	0.00	0	0.00	2	1.14	1.75	1.14
Ureter	0	0.00	1	6.17	0	0.00	0	0.00	1	0.38	2.61	0.82
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.19
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-1.02
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.23
<b>Melanoma of skin</b>	1	0.68	3	1.88	1	2.03	0	0.00	5	3.68	1.36	1.75
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.34
<b>Brain, central nervous system</b>	0	0.00	2	2.90	0	0.00	0	0.00	2	1.60	1.25	0.54
<b>Thyroid</b>	1	3.93	1	3.91	0	0.00	0	0.00	2	0.59	3.38	1.87
<b>Lymphatic, hematopoietic</b>	2	0.31	5	0.75	1	0.49	1	1.91	9	15.76	0.57	-9.00
Hodgkin lymphoma	0	0.00	1	6.74	0	0.00	0	0.00	1	0.35	2.86	0.87
Non-Hodgkin lymphoma	1	0.37	1	0.35	1	1.14	0	0.00	3	6.64	0.45	-4.84
Myeloma	1	0.83	1	0.82	0	0.00	0	0.00	2	2.87	0.70	-1.16
Leukemia	0	0.00	2	0.80	0	0.00	1	4.98	3	5.90	0.51	-3.86
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.18
Chronic lymphocytic	0	0.00	1	1.03	0	0.00	1	13.04	2	2.31	0.86	-0.42
Acute non-lymphocytic	0	0.00	1	1.17	0	0.00	0	0.00	1	2.02	0.49	-1.36
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-1.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,767 PYR and for male cancers on 4,744 PYR.

## Esophagus Squamous Cell Carcinoma, Both Sexes

**Table 4.1.8:** Risk of subsequent primary cancers after squamous cell carcinoma of the esophagus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	149	1.45*	222	1.87*	72	1.49*	43	1.54*	486	297.71	1.63*	114.53
All excluding same site	148	1.46*	221	1.89*	71	1.49*	43	1.55*	483	293.53	1.65*	115.24
<b>Buccal cavity, pharynx</b>	37	12.04*	43	13.22*	21	18.04*	11	18.10*	112	8.10	13.83*	63.20
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.63
Tongue	7	11.66*	13	20.09*	6	25.38*	0	0.00	26	1.61	16.18*	14.84
Salivary gland	0	0.00	1	4.06	1	9.84	0	0.00	2	0.63	3.20	0.84
Mouth	12	14.71*	13	15.11*	3	9.78*	1	6.34	29	2.14	13.55*	16.34
Nasopharynx	0	0.00	1	7.39	0	0.00	0	0.00	1	0.34	2.97	0.40
Tonsil	6	18.79*	9	27.13*	5	44.31*	1	18.27	21	0.82	25.65*	12.28
Oropharynx	2	20.50*	2	19.44*	1	27.22	0	0.00	5	0.26	19.58*	2.89
Hypopharynx	8	21.46*	4	10.40*	4	30.91*	7	112.28*	23	0.95	24.23*	13.41
<b>Digestive system</b>	29	1.21	31	1.15	9	0.84	10	1.59	79	67.94	1.16	6.73
Esophagus	1	0.63	1	0.60	1	1.64	0	0.00	3	4.18	0.72	-0.72
Stomach	8	2.81*	8	2.65*	2	1.76	2	3.06	20	7.65	2.61*	7.51
Small intestine	1	3.10	3	7.90*	0	0.00	1	10.27	5	0.96	5.20*	2.46
Colon	13	1.27	8	0.68	1	0.21	4	1.38	26	29.75	0.87	-2.28
Rectum, rectosigmoid junction	3	0.75	6	1.35	2	1.17	0	0.00	11	11.10	0.99	-0.06
Anus, anal canal	1	5.21	0	0.00	0	0.00	0	0.00	1	0.56	1.78	0.27
Liver	0	0.00	1	0.97	0	0.00	0	0.00	1	2.61	0.38	-0.98
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.52
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	6.56	1	1.37	0.73	-0.23
Pancreas	2	0.68	2	0.61	2	1.52	2	2.58	8	8.30	0.96	-0.18
<b>Respiratory system</b>	31	1.56*	71	3.23*	21	2.46*	6	1.26	129	55.20	2.34*	44.89
Nose, nasal cavity, ear	0	0.00	1	5.82	0	0.00	0	0.00	1	0.44	2.30	0.34
Larynx	5	3.31*	9	5.67*	3	5.30*	1	3.50	18	3.95	4.56*	8.55
Lung, bronchus	26	1.43	60	2.97*	18	2.28*	4	0.90	108	50.68	2.13*	34.86
<b>Female breast</b>	6	0.84	12	1.31	4	1.00	2	0.89	24	22.54	1.06	2.42
<b>Female genital system</b>	1	0.30	2	0.48	1	0.58	1	1.08	5	10.20	0.49	-8.62
Cervix uteri	1	2.26	0	0.00	1	5.57	0	0.00	2	1.20	1.66	1.32
Corpus uteri	0	0.00	1	0.48	0	0.00	0	0.00	1	5.13	0.19	-6.85
Ovary	0	0.00	1	0.84	0	0.00	1	3.50	2	2.94	0.68	-1.56
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.30
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.82
<b>Male genital system</b>	24	1.03	28	1.03	7	0.61	6	0.89	65	68.78	0.95	-3.63
Prostate	24	1.04	26	0.96	7	0.61	6	0.89	63	68.19	0.92	-4.98
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.16
<b>Urinary system</b>	8	1.02	15	1.66	3	0.82	0	0.00	26	22.81	1.14	1.94
Urinary bladder	5	0.93	11	1.79	3	1.20	0	0.00	19	15.53	1.22	2.11
Kidney parenchyma	3	1.50	1	0.43	0	0.00	0	0.00	4	5.84	0.68	-1.12
Renal pelvis, other urinary	0	0.00	3	5.28*	0	0.00	0	0.00	3	1.44	2.09	0.95
Ureter	0	0.00	1	5.53	0	0.00	0	0.00	1	0.46	2.19	0.33
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.10	0.00	-0.67
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.20
<b>Melanoma of skin</b>	2	1.26	3	1.49	0	0.00	0	0.00	5	5.05	0.99	-0.03
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.22
<b>Brain, central nervous system</b>	1	1.08	2	1.88	0	0.00	0	0.00	3	2.65	1.13	0.22
<b>Thyroid</b>	4	9.11*	2	3.91	0	0.00	0	0.00	6	1.25	4.79*	2.89
<b>Lymphatic, hematopoietic</b>	4	0.55	5	0.60	3	0.86	5	2.39	17	21.20	0.80	-2.56
Hodgkin lymphoma	0	0.00	1	4.01	0	0.00	0	0.00	1	0.62	1.60	0.23
Non-Hodgkin lymphoma	2	0.67	2	0.56	1	0.66	2	2.12	7	8.98	0.78	-1.20
Myeloma	1	0.67	1	0.60	1	1.46	2	5.02	5	4.24	1.18	0.46
Leukemia	1	0.39	1	0.34	1	0.85	1	1.41	4	7.36	0.54	-2.04
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.12
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	3.61	1	2.95	0.34	-1.19
Acute non-lymphocytic	0	0.00	1	1.03	0	0.00	0	0.00	1	2.47	0.41	-0.89
Chronic myeloid	0	0.00	0	0.00	1	6.18	0	0.00	1	1.02	0.98	-0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 6,029 PYR and for male cancers on 10,412 PYR.



## Esophagus Adenocarcinoma, Both Sexes

**Table 4.1.9:** Risk of subsequent primary cancers after adenocarcinoma of the esophagus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	5,636	2,964	2,330	3,400	356	976	99	407	5,636	7,748		
<b>All subsequent cancers</b>	43	0.80	64	0.99	19	0.89	5	0.48	131	149.89	0.87	-24.39
All excluding same site	43	0.81	64	1.00	19	0.90	5	0.48	131	148.01	0.89	-21.96
<b>Buccal cavity, pharynx</b>	2	1.33	2	1.13	0	0.00	0	0.00	4	4.05	0.99	-0.06
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.88
Tongue	0	0.00	1	2.74	0	0.00	0	0.00	1	0.83	1.21	0.22
Salivary gland	1	7.77	0	0.00	0	0.00	0	0.00	1	0.36	2.79	0.83
Mouth	0	0.00	1	2.40	0	0.00	0	0.00	1	0.96	1.04	0.05
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.18
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.51
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.15
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.55
<b>Digestive system</b>	18	1.62	16	1.22	2	0.46	1	0.46	37	30.71	1.20	8.12
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	1.88	0.00	-2.43
Stomach	4	3.55	2	1.53	0	0.00	0	0.00	6	3.09	1.94	3.75
Small intestine	1	6.10	0	0.00	0	0.00	0	0.00	1	0.46	2.16	0.69
Colon	8	1.65	11	1.93	1	0.52	0	0.00	20	13.47	1.48	8.42
Rectum, rectosigmoid junction	2	0.99	1	0.42	0	0.00	1	2.75	4	5.50	0.73	-1.94
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.32
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.24	0.00	-1.60
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.37
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.92
Pancreas	3	2.34	1	0.66	1	2.00	0	0.00	5	3.54	1.41	1.88
<b>Respiratory system</b>	7	0.71	16	1.35	5	1.31	1	0.55	29	27.25	1.06	2.25
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.28
Larynx	2	2.68	0	0.00	1	3.70	1	8.33	4	2.02	1.98	2.55
Lung, bronchus	5	0.56	16	1.48	4	1.14	0	0.00	25	24.95	1.00	0.06
<b>Female breast</b>	1	0.65	4	2.38	0	0.00	0	0.00	5	3.91	1.28	11.43
<b>Female genital system</b>	1	1.53	1	1.42	0	0.00	0	0.00	2	1.64	1.22	3.77
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-1.50
Corpus uteri	1	3.00	1	2.73	0	0.00	0	0.00	2	0.84	2.39	12.22
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-5.29
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.29
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.97
<b>Male genital system</b>	4	0.26*	15	0.77	5	0.76	2	0.61	26	44.79	0.58*	-27.65
Prostate	4	0.26*	15	0.78	5	0.77	2	0.62	26	44.38	0.59*	-27.04
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.23
<b>Urinary system</b>	6	1.18	5	0.82	3	1.45	1	0.96	15	14.30	1.05	0.90
Urinary bladder	4	1.11	4	0.92	1	0.67	1	1.31	10	10.20	0.98	-0.26
Kidney parenchyma	2	1.68	1	0.69	2	4.28	0	0.00	5	3.33	1.50	2.16
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.99
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.34
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.16
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.75
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.27
<b>Melanoma of skin</b>	0	0.00	3	1.64	2	3.37	0	0.00	5	4.17	1.20	1.07
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.29
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.54	0.00	-1.99
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.75
<b>Lymphatic, hematopoietic</b>	1	0.25	2	0.42	1	0.62	0	0.00	4	11.22	0.36*	-9.32
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.43
Non-Hodgkin lymphoma	1	0.55	1	0.45	0	0.00	0	0.00	2	5.16	0.39	-4.08
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.81	0.00	-2.34
Leukemia	0	0.00	1	0.60	1	1.79	0	0.00	2	3.92	0.51	-2.47
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.13
Chronic lymphocytic	0	0.00	1	1.48	0	0.00	0	0.00	1	1.59	0.63	-0.76
Acute non-lymphocytic	0	0.00	0	0.00	1	5.24	0	0.00	1	1.31	0.76	-0.40
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.68

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 952 PYR and for male cancers on 6,796 PYR.

**Table 4.2.1:** Characteristics of patients with an initial cancer of the stomach, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	24,914	100.0	15,084	100.0	39,998	100.0
<b>Initial treatment</b>						
Any radiation	4,809	19.3	1,765	11.7	6,574	16.4
With surgery	2,381	9.6	882	5.8	3,263	8.2
Without surgery	2,428	9.7	883	5.9	3,311	8.3
No radiation	20,105	80.7	13,319	88.3	33,424	83.6
With surgery	12,880	51.7	8,108	53.8	20,988	52.5
Without surgery	7,225	29.0	5,211	34.5	12,436	31.1
<b>Race</b>						
White	18,783	75.4	11,151	73.9	29,934	74.8
Black	2,866	11.5	1,752	11.6	4,618	11.5
Other	3,225	12.9	2,154	14.3	5,379	13.4
Unknown	40	0.2	27	0.2	67	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	125	0.5	108	0.7	233	0.6
30–49	2,328	9.3	1,379	9.1	3,707	9.3
50–69	11,683	46.9	5,084	33.7	16,767	41.9
70–79	7,213	29.0	4,518	30.0	11,731	29.3
≥ 80	3,565	14.3	3,995	26.5	7,560	18.9
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	23,890	95.9	14,629	97.0	38,519	96.3
1st and 2nd cancers	942	3.8	416	2.8	1,358	3.4
1st, 2nd, and 3rd cancers	73	0.3	39	0.3	112	0.3
1st, 2nd, 3rd, and additional cancers	9	0.0	0	0.0	9	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	67.8	—	72.3	—	69.4	—
Median year of 1st cancer diagnosis	1987.0	—	1986.9	—	1987.0	—
Median person-years at risk	0.7	—	0.8	—	0.8	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	93.4	—	93.8	—	93.5
1st, 2nd, and additional cancers	—	92.8	—	93.8	—	93.1
1st cancer only	—	6.2	—	4.6	—	5.7

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Stomach Both Sexes

**Table 4.2.2:** Risk of subsequent primary cancers after cancer of the stomach, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	259	0.69*	657	0.96	376	0.96	317	1.00	1,609	1,770.56	0.91*	-17.03
All excluding same site	256	0.70*	646	0.97	369	0.98	308	1.00	1,579	1,718.52	0.92*	-14.70
<b>Buccal cavity, pharynx</b>	11	1.09	11	0.63	6	0.67	7	1.04	35	43.17	0.81	-0.86
Lip	0	0.00	0	0.00	0	0.00	1	1.03	1	6.44	0.16*	-0.57
Tongue	3	1.56	1	0.30	1	0.57	2	1.48	7	8.38	0.84	-0.15
Salivary gland	0	0.00	1	0.67	0	0.00	1	1.39	2	3.90	0.51	-0.20
Mouth	5	1.90	2	0.44	2	0.85	1	0.58	10	11.25	0.89	-0.13
Nasopharynx	1	1.98	1	1.11	1	2.17	1	3.01	4	2.20	1.82	0.19
Tonsil	1	1.11	4	2.63	0	0.00	0	0.00	5	3.73	1.34	0.13
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-0.12
Hypopharynx	0	0.00	1	0.54	1	1.07	1	1.48	3	4.55	0.66	-0.16
<b>Digestive system</b>	60	0.65*	194	1.15	99	1.03	76	1.00	429	432.88	0.99	-0.41
Esophagus	4	0.87	11	1.34	7	1.58	5	1.40	27	20.78	1.30	0.66
Stomach	3	0.26*	11	0.54*	7	0.61	9	1.02	30	52.04	0.58*	-2.32
Small intestine	9	8.09*	5	2.44	1	0.83	2	1.93	17	5.41	3.14*	1.22
Colon	25	0.61*	78	1.05	44	1.02	37	1.08	184	193.06	0.95	-0.95
Rectum, rectosigmoid junction	10	0.64	39	1.41*	13	0.86	17	1.48	79	69.65	1.13	0.99
Anus, anal canal	0	0.00	1	0.79	2	2.77	0	0.00	3	3.23	0.93	-0.02
Liver	2	0.57	4	0.61	3	0.80	2	0.64	11	16.98	0.65	-0.63
Gallbladder	0	0.00	1	0.40	1	0.71	0	0.00	2	6.31	0.32	-0.45
Bile ducts, other biliary	2	1.00	7	1.84	1	0.43	1	0.50	11	10.11	1.09	0.09
Pancreas	5	0.45	37	1.85*	20	1.75*	3	0.33*	65	51.47	1.26	1.43
<b>Respiratory system</b>	31	0.47*	115	0.98	61	0.95	74	1.43*	281	300.00	0.94	-2.00
Nose, nasal cavity, ear	0	0.00	2	1.90	0	0.00	0	0.00	2	2.68	0.75	-0.07
Larynx	4	0.88	5	0.65	6	1.53	7	2.38	22	19.13	1.15	0.30
Lung, bronchus	27	0.44*	108	0.99	54	0.90	67	1.39*	256	277.42	0.92	-2.26
<b>Female breast</b>	24	0.86	55	1.02	35	1.08	13	0.53*	127	139.04	0.91	-3.05
<b>Female genital system</b>	6	0.46*	25	1.01	12	0.85	1	0.10*	44	62.05	0.71*	-4.58
Cervix uteri	1	0.57	1	0.32	2	1.21	0	0.00	4	7.63	0.52	-0.92
Corpus uteri	4	0.63	10	0.84	3	0.45	0	0.00*	17	29.86	0.57*	-3.26
Ovary	1	0.27	9	1.26	4	0.95	1	0.32	15	18.21	0.82	-0.81
Vagina	0	0.00	1	2.08	1	3.54	0	0.00	2	1.21	1.65	0.20
Vulva	0	0.00	4	3.03	1	1.19	0	0.00	5	3.49	1.43	0.38
<b>Male genital system</b>	59	0.72*	124	0.84*	73	0.85	73	0.97	329	390.54	0.84*	-11.09
Prostate	59	0.73*	122	0.83*	73	0.86	73	0.98	327	386.99	0.84*	-10.81
Testis	0	0.00	1	2.49	0	0.00	0	0.00	1	0.95	1.06	0.01
<b>Urinary system</b>	30	0.99	59	1.09	33	1.08	30	1.17	152	140.79	1.08	1.18
Urinary bladder	15	0.70	38	1.00	27	1.26	22	1.21	102	98.94	1.03	0.32
Kidney parenchyma	14	2.01*	15	1.19	4	0.56	6	1.01	39	32.63	1.20	0.67
Renal pelvis, other urinary	1	0.49	6	1.66	2	1.00	2	1.26	11	9.23	1.19	0.19
Ureter	1	1.48	3	2.46	0	0.00	1	1.92	5	3.09	1.62	0.20
<b>Bone, joints</b>	0	0.00	1	1.87	0	0.00	1	4.71	2	1.33	1.50	0.07
<b>Soft tissue including heart</b>	2	1.38	2	0.76	5	3.35*	2	1.59	11	6.83	1.61	0.44
<b>Kaposi sarcoma</b>	0	0.00	1	1.34	0	0.00	0	0.00	1	1.89	0.53	-0.09
<b>Melanoma of skin</b>	5	0.78	8	0.69	6	0.89	5	0.82	24	30.85	0.78	-0.72
<b>Eye, orbit</b>	0	0.00	0	0.00	2	4.41	0	0.00	2	2.14	0.93	-0.02
<b>Brain, central nervous system</b>	1	0.30	7	1.17	3	0.93	3	1.18	14	15.11	0.93	-0.12
<b>Thyroid</b>	9	4.99*	2	0.61	4	2.25	0	0.00	15	8.22	1.83*	0.71
<b>Lymphatic, hematopoietic</b>	17	0.61*	47	0.93	26	0.89	22	0.91	112	131.61	0.85	-2.07
Hodgkin lymphoma	0	0.00	1	0.70	1	1.38	0	0.00	2	3.54	0.57	-0.16
Non-Hodgkin lymphoma	8	0.69	21	0.97	11	0.86	7	0.64	47	57.00	0.82	-1.05
Myeloma	5	0.98	10	1.07	1	0.19	5	1.15	21	24.17	0.87	-0.33
Leukemia	4	0.39	15	0.83	13	1.26	10	1.20	42	46.90	0.90	-0.52
Acute lymphocytic	0	0.00	1	2.07	0	0.00	0	0.00	1	1.23	0.81	-0.02
Chronic lymphocytic	1	0.25	7	1.00	1	0.26	5	1.60	14	17.99	0.78	-0.42
Acute non-lymphocytic	1	0.29	4	0.64	7	1.95	3	1.02	15	16.26	0.92	-0.13
Chronic myeloid	2	1.44	2	0.80	3	2.11	2	1.70	9	6.48	1.39	0.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 39,417 PYR and for male cancers on 55,476 PYR.

**Table 4.2.3:** Risk of subsequent primary cancers after cancer of the stomach, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	78	0.73*	218	1.04	125	0.98	73	0.76*	494	541.73	0.91*	-12.11
All excluding same site	77	0.74*	213	1.04	122	0.98	72	0.77*	484	527.17	0.92	-10.95
<b>Buccal cavity, pharynx</b>	4	2.13	3	0.83	1	0.47	1	0.64	9	9.22	0.98	-0.06
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.17
Tongue	1	2.46	0	0.00	0	0.00	1	2.85	2	2.03	0.99	-0.01
Salivary gland	0	0.00	1	2.46	0	0.00	0	0.00	1	1.04	0.96	-0.01
Mouth	3	4.53	1	0.78	1	1.32	0	0.00	5	3.25	1.54	0.44
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.12
Tonsil	0	0.00	1	3.50	0	0.00	0	0.00	1	0.70	1.44	0.08
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.14
<b>Digestive system</b>	19	0.64*	64	1.10	43	1.20	21	0.79	147	149.99	0.98	-0.76
Esophagus	2	2.68	2	1.38	1	1.14	2	3.01	7	3.74	1.87	0.83
Stomach	1	0.34	5	0.88	3	0.86	1	0.40	10	14.56	0.69	-1.16
Small intestine	4	11.47*	0	0.00	0	0.00	1	2.75	5	1.86	2.70	0.80
Colon	7	0.48*	35	1.22	23	1.30	13	0.99	78	74.10	1.05	0.99
Rectum, rectosigmoid junction	3	0.67	13	1.53	6	1.20	1	0.28	23	21.53	1.07	0.37
Rectum	2	0.69	8	1.43	3	0.90	0	0.00	13	14.21	0.91	-0.31
Anus, anal canal	0	0.00	0	0.00	2	5.24	0	0.00	2	1.61	1.24	0.10
Liver	0	0.00	0	0.00	1	1.06	0	0.00	1	3.90	0.26	-0.74
Gallbladder	0	0.00	1	0.70	1	1.20	0	0.00	2	3.58	0.56	-0.40
Bile ducts, other biliary	0	0.00	0	0.00	1	1.11	1	1.42	2	3.65	0.55	-0.42
Pancreas	2	0.52	8	1.06	5	1.06	2	0.56	17	19.72	0.86	-0.69
<b>Respiratory system</b>	4	0.32*	29	1.15	13	0.83	18	1.42	64	66.15	0.97	-0.55
Nose, nasal cavity, ear	0	0.00	1	3.21	0	0.00	0	0.00	1	0.81	1.24	0.05
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.86	0.00	-0.47
Lung, bronchus	4	0.34*	28	1.16	13	0.87	18	1.47	63	63.30	1.00	-0.08
<b>Female breast</b>	24	0.86	55	1.02	35	1.08	13	0.53*	127	139.04	0.91	-3.05
<b>Female genital system</b>	6	0.46*	25	1.01	12	0.85	1	0.10*	44	62.05	0.71*	-4.58
Cervix uteri	1	0.57	1	0.32	2	1.21	0	0.00	4	7.63	0.52	-0.92
Corpus uteri	4	0.63	10	0.84	3	0.45	0	0.00*	17	29.86	0.57*	-3.26
Ovary	1	0.27	9	1.26	4	0.95	1	0.32	15	18.21	0.82	-0.81
Vagina	0	0.00	1	2.08	1	3.54	0	0.00	2	1.21	1.65	0.20
Vulva	0	0.00	4	3.03	1	1.19	0	0.00	5	3.49	1.43	0.38
<b>Urinary system</b>	5	0.94	8	0.77	8	1.24	6	1.21	27	27.22	0.99	-0.06
Urinary bladder	3	0.92	5	0.78	7	1.77	2	0.66	17	16.63	1.02	0.09
Kidney parenchyma	1	0.64	2	0.64	0	0.00	3	1.95	6	8.16	0.74	-0.55
Renal pelvis, other urinary	1	2.06	1	1.05	1	1.74	1	2.38	4	2.43	1.65	0.40
Ureter	1	6.41	0	0.00	0	0.00	0	0.00	1	0.80	1.26	0.05
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.12
<b>Soft tissue including heart</b>	1	2.31	1	1.17	1	1.90	0	0.00	3	2.22	1.35	0.20
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.07
<b>Melanoma of skin</b>	0	0.00	4	1.28	2	1.03	2	1.28	8	8.19	0.98	-0.05
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.17
<b>Brain, central nervous system</b>	1	1.04	6	3.20*	1	0.90	2	2.40	10	4.78	2.09*	1.32
<b>Thyroid</b>	4	4.50*	1	0.58	2	2.03	0	0.00	7	4.32	1.62	0.68
<b>Lymphatic, hematopoietic</b>	10	1.17	20	1.19	6	0.57	6	0.75	42	43.94	0.96	-0.49
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.09	0.00	-0.28
Non-Hodgkin lymphoma	6	1.57	11	1.43	3	0.62	3	0.78	23	20.22	1.14	0.71
Myeloma	1	0.61	3	0.94	1	0.51	1	0.68	6	8.22	0.73	-0.56
Leukemia	3	1.04	6	1.08	2	0.58	2	0.78	13	14.41	0.90	-0.36
Acute lymphocytic	0	0.00	1	6.35	0	0.00	0	0.00	1	0.41	2.45	0.15
Chronic lymphocytic	1	0.92	2	0.96	0	0.00	2	2.13	5	5.37	0.93	-0.09
Acute non-lymphocytic	1	0.99	1	0.50	0	0.00	0	0.00	2	5.16	0.39	-0.80
Chronic myeloid	1	2.51	1	1.30	1	2.09	0	0.00	3	2.01	1.49	0.25

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Stomach  
Males**

**Table 4.2.4:** Risk of subsequent primary cancers after cancer of the stomach, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	24,914		11,929		3,217		1,505		24,914			
<b>Person-years in interval</b>	13,692		22,566		10,976		8,242		55,476			
<b>All subsequent cancers</b>	181	0.67*	439	0.92	251	0.96	244	1.10	1,115	1,228.83	0.91*	-20.52
All excluding same site	179	0.68*	433	0.94	247	0.97	236	1.10	1,095	1,191.35	0.92*	-17.37
<b>Buccal cavity, pharynx</b>	7	0.85	8	0.58	5	0.73	6	1.15	26	33.96	0.77	-1.43
Lip	0	0.00	0	0.00	0	0.00	1	1.18	1	5.77	0.17*	-0.86
Tongue	2	1.32	1	0.39	1	0.78	1	1.00	5	6.35	0.79	-0.24
Salivary gland	0	0.00	0	0.00	0	0.00	1	1.86	1	2.86	0.35	-0.33
Mouth	2	1.02	1	0.31	1	0.63	1	0.85	5	8.00	0.63	-0.54
Nasopharynx	1	2.45	1	1.41	1	2.88	1	4.00	4	1.71	2.34	0.41
Tonsil	1	1.34	3	2.43	0	0.00	0	0.00	4	3.03	1.32	0.17
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.17
Hypopharynx	0	0.00	1	0.61	1	1.23	1	1.69	3	4.01	0.75	-0.18
<b>Digestive system</b>	41	0.65*	130	1.18	56	0.93	55	1.12	282	282.89	1.00	-0.16
Esophagus	2	0.52	9	1.34	6	1.69	3	1.04	20	17.04	1.17	0.53
Stomach	2	0.24*	6	0.41*	4	0.50	8	1.26	20	37.48	0.53*	-3.15
Small intestine	5	6.54*	5	3.68*	1	1.32	1	1.49	12	3.55	3.38*	1.52
Colon	18	0.69	43	0.94	21	0.82	24	1.13	106	118.96	0.89	-2.34
Rectum, rectosigmoid junction	7	0.63	26	1.36	7	0.70	16	2.02*	56	48.12	1.16	1.42
Anus, anal canal	0	0.00	1	1.58	0	0.00	0	0.00	1	1.62	0.62	-0.11
Liver	2	0.72	4	0.78	2	0.71	2	0.85	10	13.08	0.76	-0.56
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	2.73	0.00	-0.49
Bile ducts, other biliary	2	1.51	7	2.87*	0	0.00	0	0.00	9	6.46	1.39	0.46
Pancreas	3	0.42	29	2.34*	15	2.24*	1	0.18	48	31.75	1.51*	2.93
<b>Respiratory system</b>	27	0.50*	86	0.93	48	0.98	56	1.43*	217	233.85	0.93	-3.04
Nose, nasal cavity, ear	0	0.00	1	1.35	0	0.00	0	0.00	1	1.87	0.54	-0.16
Larynx	4	0.96	5	0.72	6	1.72	7	2.67*	22	17.27	1.27	0.85
Lung, bronchus	23	0.47*	80	0.95	41	0.91	49	1.36*	193	214.13	0.90	-3.81
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.27	0.00	-0.41
<b>Male genital system</b>	59	0.72*	124	0.84*	73	0.85	73	0.97	329	390.54	0.84*	-11.09
Prostate	59	0.73*	122	0.83*	73	0.86	73	0.98	327	386.99	0.84*	-10.81
Testis	0	0.00	1	2.49	0	0.00	0	0.00	1	0.95	1.06	0.01
<b>Urinary system</b>	25	1.00	51	1.17	25	1.04	24	1.16	125	113.57	1.10	2.06
Urinary bladder	12	0.66	33	1.05	20	1.14	20	1.32	85	82.30	1.03	0.49
Kidney parenchyma	13	2.40*	13	1.37	4	0.77	3	0.68	33	24.47	1.35	1.54
Renal pelvis, other urinary	0	0.00	5	1.87	1	0.70	1	0.86	7	6.80	1.03	0.04
Ureter	0	0.00	3	3.31	0	0.00	1	2.60	4	2.29	1.74	0.31
<b>Bone, joints</b>	0	0.00	1	2.83	0	0.00	1	7.24	2	0.88	2.28	0.20
<b>Soft tissue including heart</b>	1	0.99	1	0.56	4	4.14*	2	2.34	8	4.61	1.74	0.61
<b>Kaposi sarcoma</b>	0	0.00	1	1.56	0	0.00	0	0.00	1	1.61	0.62	-0.11
<b>Melanoma of skin</b>	5	1.03	4	0.47	4	0.84	3	0.66	16	22.66	0.71	-1.20
<b>Eye, orbit</b>	0	0.00	0	0.00	2	6.67	0	0.00	2	1.46	1.37	0.10
<b>Brain, central nervous system</b>	0	0.00	1	0.24	2	0.94	1	0.58	4	10.33	0.39*	-1.14
<b>Thyroid</b>	5	5.47*	1	0.64	2	2.53	0	0.00	8	3.89	2.05	0.74
<b>Lymphatic, hematopoietic</b>	7	0.36*	27	0.80	20	1.07	16	1.00	70	87.66	0.80	-3.18
Hodgkin lymphoma	0	0.00	1	1.00	1	2.09	0	0.00	2	2.44	0.82	-0.08
Non-Hodgkin lymphoma	2	0.25*	10	0.71	8	1.01	4	0.57	24	36.78	0.65*	-2.30
Myeloma	4	1.15	7	1.14	0	0.00	4	1.38	15	15.95	0.94	-0.17
Leukemia	1	0.14*	9	0.72	11	1.60	8	1.39	29	32.49	0.89	-0.63
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.15
Chronic lymphocytic	0	0.00	5	1.02	1	0.38	3	1.37	9	12.62	0.71	-0.65
Acute non-lymphocytic	0	0.00	3	0.70	7	2.95*	3	1.49	13	11.10	1.17	0.34
Chronic myeloid	1	1.01	1	0.58	2	2.12	2	2.45	6	4.47	1.34	0.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.2.5:** Risk of subsequent primary cancers after cancer of the stomach, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	8	1.49	23	1.78*	14	1.17	42	1.50*	87	58.16	1.50*	23.55
All excluding same site	7	1.33	23	1.82*	13	1.11	40	1.46*	83	56.98	1.46*	21.24
<b>Buccal cavity, pharynx</b>	1	3.92	0	0.00	0	0.00	1	1.13	2	2.26	0.88	-0.21
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.14
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.39
Salivary gland	0	0.00	0	0.00	0	0.00	1	15.23	1	0.17	5.96	0.68
Mouth	1	16.29	0	0.00	0	0.00	0	0.00	1	0.56	1.78	0.36
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.18
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.24
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.19
<b>Digestive system</b>	4	4.72*	10	4.61*	3	1.40	12	2.28*	29	10.41	2.78*	15.18
Esophagus	0	0.00	0	0.00	0	0.00	2	5.21	2	0.78	2.56	1.00
Stomach	1	8.87	0	0.00	1	4.13	2	3.60	4	1.18	3.39	2.30
Small intestine	1	44.75	1	19.03	0	0.00	0	0.00	2	0.22	9.12*	1.45
Colon	1	3.49	5	6.74*	1	1.31	3	1.49	10	3.81	2.63*	5.06
Rectum, rectosigmoid junction	0	0.00	3	7.23*	0	0.00	2	2.06	5	1.96	2.55	2.48
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.13
Liver	0	0.00	1	6.42	0	0.00	2	5.98	3	0.69	4.34	1.88
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.09
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.17
Pancreas	1	10.96	0	0.00	1	4.12	1	1.64	3	1.18	2.53	1.48
<b>Respiratory system</b>	0	0.00	1	0.51	4	1.96	12	2.39*	17	9.77	1.74*	5.91
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.09
Larynx	0	0.00	0	0.00	0	0.00	1	2.48	1	0.88	1.13	0.10
Lung, bronchus	0	0.00	1	0.58	3	1.66	11	2.41*	15	8.74	1.72	5.11
<b>Female breast</b>	1	0.92	1	0.38	0	0.00	4	1.20	6	9.27	0.65	-6.19
<b>Female genital system</b>	0	0.00	3	2.78	1	1.09	1	0.74	5	3.80	1.32	2.27
Cervix uteri	0	0.00	1	3.12	0	0.00	0	0.00	1	0.89	1.12	0.20
Corpus uteri	0	0.00	2	5.13	0	0.00	0	0.00	2	1.59	1.26	0.77
Ovary	0	0.00	0	0.00	1	3.71	1	2.54	2	1.10	1.81	1.70
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.07
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.19
<b>Male genital system</b>	0	0.00	0	0.00	0	0.00	8	1.36	8	7.90	1.01	0.14
Prostate	0	0.00	0	0.00	0	0.00	8	1.38	8	7.50	1.07	0.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.47
<b>Urinary system</b>	1	3.18	2	2.61	1	1.34	3	1.55	7	3.77	1.86	2.64
Urinary bladder	1	6.26	0	0.00	1	2.49	2	1.72	4	2.12	1.89	1.54
Kidney parenchyma	0	0.00	2	5.86	0	0.00	1	1.47	3	1.48	2.03	1.24
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.14
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.04
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	1	9.76	1	13.53	0	0.00	2	0.35	5.76	1.35
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.37
<b>Melanoma of skin</b>	0	0.00	1	1.63	0	0.00	0	0.00	1	2.14	0.47	-0.93
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.08
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	5.29	0	0.00	1	0.87	1.15	0.10
<b>Thyroid</b>	1	6.18	0	0.00	1	4.37	0	0.00	2	1.00	2.00	0.81
<b>Lymphatic, hematopoietic</b>	0	0.00	4	3.50	2	2.13	0	0.00	6	4.52	1.33	1.21
Hodgkin lymphoma	0	0.00	1	8.39	0	0.00	0	0.00	1	0.33	3.00	0.54
Non-Hodgkin lymphoma	0	0.00	1	1.71	1	2.11	0	0.00	2	2.28	0.88	-0.23
Myeloma	0	0.00	1	7.57	0	0.00	0	0.00	1	0.65	1.54	0.29
Leukemia	0	0.00	1	3.27	1	3.86	0	0.00	2	1.26	1.59	0.61
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.33
Acute non-lymphocytic	0	0.00	1	8.81	1	11.08	0	0.00	2	0.45	4.47	1.27
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,282 PYR and for male cancers on 6,966 PYR.



## Stomach Both Sexes, 50-69 Years of Age

**Table 4.2.6:** Risk of subsequent primary cancers after cancer of the stomach, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	16,767		8,814		2,729		1,493		16,767			
<b>Person-years in interval</b>	9,775		17,651		10,060		8,774		46,261			
<b>All subsequent cancers</b>	106	0.85	281	1.08	195	1.02	230	1.08	812	789.80	1.03	4.80
All excluding same site	105	0.87	276	1.09	191	1.02	224	1.08	796	769.78	1.03	5.67
<b>Buccal cavity, pharynx</b>	8	1.76	6	0.71	2	0.40	5	1.12	21	22.44	0.94	-0.31
Lip	0	0.00	0	0.00	0	0.00	1	1.55	1	2.82	0.36	-0.39
Tongue	2	2.21	1	0.60	0	0.00	1	1.12	4	4.49	0.89	-0.11
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	1.64	0.00	-0.36
Mouth	4	3.38	0	0.00	0	0.00	1	0.88	5	5.76	0.87	-0.16
Nasopharynx	1	3.76	1	2.01	1	3.55	1	4.56	4	1.26	3.17	0.59
Tonsil	1	2.02	3	3.41	0	0.00	0	0.00	4	2.22	1.80	0.39
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.15
Hypopharynx	0	0.00	0	0.00	1	1.65	1	2.08	2	2.70	0.74	-0.15
<b>Digestive system</b>	20	0.74	71	1.26	45	1.08	54	1.12	190	173.03	1.10	3.67
Esophagus	1	0.52	8	2.11	4	1.63	3	1.23	16	10.61	1.51	1.16
Stomach	1	0.32	5	0.76	4	0.83	6	1.10	16	20.03	0.80	-0.87
Small intestine	3	7.98*	2	2.51	1	1.69	2	2.93	8	2.45	3.27*	1.20
Colon	9	0.85	24	1.06	16	0.91	28	1.30	77	72.27	1.07	1.02
Rectum, rectosigmoid junction	3	0.58	10	0.96	7	0.97	14	1.85*	34	30.29	1.12	0.80
Anus, anal canal	0	0.00	1	1.98	1	2.90	0	0.00	2	1.46	1.37	0.12
Liver	1	0.78	0	0.00	2	1.01	0	0.00	3	8.11	0.37	-1.11
Gallbladder	0	0.00	0	0.00	1	1.95	0	0.00	1	2.06	0.49	-0.23
Bile ducts, other biliary	0	0.00	3	2.79	0	0.00	1	0.83	4	3.64	1.10	0.08
Pancreas	2	0.62	18	2.68*	9	1.82	0	0.00*	29	20.63	1.41	1.81
<b>Respiratory system</b>	19	0.72	65	1.22	39	1.06	53	1.43*	176	153.34	1.15	4.90
Nose, nasal cavity, ear	0	0.00	1	2.42	0	0.00	0	0.00	1	1.20	0.83	-0.04
Larynx	4	1.75	3	0.71	5	1.98	5	2.35	17	11.16	1.52	1.26
Lung, bronchus	15	0.63	61	1.26	34	1.01	48	1.39*	158	140.62	1.12	3.76
<b>Female breast</b>	11	1.20	27	1.35	18	1.25	9	0.61	65	58.37	1.11	4.01
<b>Female genital system</b>	1	0.21	9	0.91	7	1.07	0	0.00*	17	27.33	0.62*	-6.25
Cervix uteri	0	0.00	0	0.00	2	2.77	0	0.00	2	3.22	0.62	-0.74
Corpus uteri	1	0.39	3	0.56	1	0.29	0	0.00	5	14.49	0.35*	-5.75
Ovary	0	0.00	3	1.12	2	1.07	0	0.00	5	7.67	0.65	-1.62
Vagina	0	0.00	1	7.68	1	10.10	0	0.00	2	0.40	4.99	0.97
Vulva	0	0.00	2	6.96	0	0.00	0	0.00	2	0.98	2.05	0.62
<b>Male genital system</b>	18	0.72	48	0.84	36	0.77	55	1.00	157	183.96	0.85*	-9.06
Prostate	18	0.73	48	0.85	36	0.77	55	1.01	157	182.41	0.86	-8.54
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.14
<b>Urinary system</b>	14	1.45	21	1.06	23	1.57	20	1.15	78	61.49	1.27*	3.57
Urinary bladder	4	0.63	12	0.92	18	1.82*	16	1.31	50	41.47	1.21	1.84
Kidney parenchyma	9	3.27*	6	1.09	3	0.78	3	0.73	21	16.19	1.30	1.04
Renal pelvis, other urinary	1	1.68	3	2.41	2	2.15	1	0.94	7	3.83	1.83	0.68
Ureter	1	5.22	2	4.89	0	0.00	1	2.80	4	1.27	3.15	0.59
<b>Bone, joints</b>	0	0.00	1	4.44	0	0.00	1	7.33	2	0.62	3.21	0.30
<b>Soft tissue including heart</b>	1	2.11	0	0.00	1	1.50	2	2.54	4	2.88	1.39	0.24
<b>Kaposi sarcoma</b>	0	0.00	1	4.87	0	0.00	0	0.00	1	0.58	1.71	0.09
<b>Melanoma of skin</b>	2	0.79	1	0.20	3	0.89	4	1.01	10	14.80	0.68	-1.04
<b>Eye, orbit</b>	0	0.00	0	0.00	1	4.43	0	0.00	1	0.99	1.01	0.00
<b>Brain, central nervous system</b>	0	0.00	3	1.09	1	0.56	3	1.70	7	7.75	0.90	-0.16
<b>Thyroid</b>	4	5.14*	0	0.00	1	1.09	0	0.00	5	4.00	1.25	0.22
<b>Lymphatic, hematopoietic</b>	6	0.71	23	1.32	11	0.84	17	1.09	57	54.55	1.04	0.53
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.65	0.00	-0.36
Non-Hodgkin lymphoma	2	0.54	10	1.29	5	0.85	7	0.98	24	24.49	0.98	-0.11
Myeloma	2	1.28	5	1.50	0	0.00	3	1.03	10	10.30	0.97	-0.06
Leukemia	2	0.72	8	1.39	6	1.39	7	1.34	23	18.11	1.27	1.06
Acute lymphocytic	0	0.00	1	6.01	0	0.00	0	0.00	1	0.49	2.02	0.11
Chronic lymphocytic	1	0.87	5	2.12	1	0.58	3	1.51	10	7.21	1.39	0.60
Acute non-lymphocytic	0	0.00	1	0.52	4	2.63	3	1.58	8	6.25	1.28	0.38
Chronic myeloid	1	2.57	0	0.00	1	1.74	1	1.38	3	2.46	1.22	0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 16,514 PYR and for male cancers on 29,747 PYR.

**Table 4.2.7:** Risk of subsequent primary cancers after cancer of the stomach, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	145	0.58*	353	0.86*	167	0.90	45	0.59*	710	922.60	0.77*	-58.43
All excluding same site	144	0.60*	347	0.87*	165	0.92	44	0.60*	700	891.77	0.78*	-52.71
<b>Buccal cavity, pharynx</b>	2	0.38	5	0.60	4	1.16	1	0.72	12	18.47	0.65	-1.78
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	3.45	0.00	-0.95
Tongue	1	1.03	0	0.00	1	1.54	1	3.89	3	3.41	0.88	-0.11
Salivary gland	0	0.00	1	1.10	0	0.00	0	0.00	1	2.09	0.48	-0.30
Mouth	0	0.00	2	0.90	2	2.11	0	0.00	4	4.93	0.81	-0.26
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.20
Tonsil	0	0.00	1	1.78	0	0.00	0	0.00	1	1.22	0.82	-0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.11
Hypopharynx	0	0.00	1	1.31	0	0.00	0	0.00	1	1.62	0.62	-0.17
<b>Digestive system</b>	36	0.55*	113	1.03	51	0.98	10	0.45*	210	249.44	0.84*	-10.84
Esophagus	3	1.14	3	0.71	3	1.67	0	0.00	9	9.39	0.96	-0.11
Stomach	1	0.12*	6	0.44*	2	0.31	1	0.36	10	30.83	0.32*	-5.73
Small intestine	5	6.99*	2	1.66	0	0.00	0	0.00	7	2.74	2.55*	1.17
Colon	15	0.50*	49	0.96	27	1.08	6	0.55	97	116.98	0.83	-5.49
Rectum, rectosigmoid junction	7	0.68	26	1.55*	6	0.81	1	0.34	40	37.40	1.07	0.71
Anus, anal canal	0	0.00	0	0.00	1	2.94	0	0.00	1	1.61	0.62	-0.17
Liver	1	0.46	3	0.80	1	0.61	0	0.00	5	8.18	0.61	-0.87
Gallbladder	0	0.00	1	0.54	0	0.00	0	0.00	1	4.15	0.24	-0.87
Bile ducts, other biliary	2	1.34	4	1.48	1	0.71	0	0.00	7	6.26	1.12	0.20
Pancreas	2	0.26*	19	1.46	10	1.60	2	0.74	33	29.65	1.11	0.92
<b>Respiratory system</b>	12	0.31*	49	0.78	18	0.70	9	0.94	88	136.89	0.64*	-13.44
Nose, nasal cavity, ear	0	0.00	1	1.64	0	0.00	0	0.00	1	1.37	0.73	-0.10
Larynx	0	0.00	2	0.61	1	0.84	1	2.45	4	7.09	0.56	-0.85
Lung, bronchus	12	0.33*	46	0.79	17	0.70	8	0.88	83	128.06	0.65*	-12.39
<b>Female breast</b>	12	0.68	27	0.85	17	1.07	0	0.00*	56	71.40	0.78	-8.74
<b>Female genital system</b>	5	0.63	13	0.94	4	0.61	0	0.00	22	30.92	0.71	-5.06
Cervix uteri	1	1.06	0	0.00	0	0.00	0	0.00	1	3.52	0.28	-1.43
Corpus uteri	3	0.82	5	0.80	2	0.71	0	0.00	10	13.78	0.73	-2.14
Ovary	1	0.43	6	1.44	1	0.48	0	0.00	8	9.43	0.85	-0.81
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.44
Vulva	0	0.00	2	1.99	1	1.73	0	0.00	3	2.41	1.25	0.34
<b>Male genital system</b>	41	0.73*	76	0.84	37	0.99	10	0.69	164	198.67	0.83*	-18.48
Prostate	41	0.73*	74	0.82	37	1.00	10	0.70	162	197.09	0.82*	-18.70
Testis	0	0.00	1	10.97	0	0.00	0	0.00	1	0.19	5.15	0.43
<b>Urinary system</b>	15	0.74	36	1.07	9	0.60	7	1.10	67	75.53	0.89	-2.35
Urinary bladder	10	0.67	26	1.06	8	0.72	4	0.83	48	55.35	0.87	-2.02
Kidney parenchyma	5	1.22	7	1.04	1	0.34	2	1.72	15	14.96	1.00	0.01
Renal pelvis, other urinary	0	0.00	3	1.28	0	0.00	1	2.35	4	5.22	0.77	-0.33
Ureter	0	0.00	1	1.25	0	0.00	0	0.00	1	1.77	0.56	-0.21
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.17
<b>Soft tissue including heart</b>	1	1.08	1	0.63	3	3.99	0	0.00	5	3.60	1.39	0.38
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.24
<b>Melanoma of skin</b>	3	0.84	6	0.98	3	1.04	1	0.74	13	13.91	0.93	-0.25
<b>Eye, orbit</b>	0	0.00	0	0.00	1	4.79	0	0.00	1	1.06	0.94	-0.02
<b>Brain, central nervous system</b>	1	0.56	4	1.35	1	0.80	0	0.00	6	6.49	0.92	-0.13
<b>Thyroid</b>	4	4.63*	2	1.37	2	3.15	0	0.00	8	3.21	2.49*	1.32
<b>Lymphatic, hematopoietic</b>	11	0.58	20	0.63*	13	0.86	5	0.76	49	72.54	0.68*	-6.47
Hodgkin lymphoma	0	0.00	0	0.00	1	3.44	0	0.00	1	1.55	0.65	-0.15
Non-Hodgkin lymphoma	6	0.78	10	0.75	5	0.78	0	0.00	21	30.23	0.69	-2.54
Myeloma	3	0.86	4	0.68	1	0.37	2	1.77	10	13.23	0.76	-0.89
Leukemia	2	0.28*	6	0.50	6	1.05	3	1.18	17	27.53	0.62*	-2.90
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.18
Chronic lymphocytic	0	0.00	2	0.44	0	0.00	2	2.14	4	10.38	0.39*	-1.75
Acute non-lymphocytic	1	0.40	2	0.47	2	1.01	0	0.00	5	9.56	0.52	-1.25
Chronic myeloid	1	1.03	2	1.21	2	2.48	1	2.67	6	3.80	1.58	0.60

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 17,620 PYR and for male cancers on 18,763 PYR.

# Stomach Cardia, Both Sexes

**Table 4.2.8:** Risk of subsequent primary cancers after cancer of the stomach cardia, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	8,847	4,833	4,020	6,383	765	2,450	303	1,448	8,847	15,113		
<b>All subsequent cancers</b>	61	0.75*	120	1.04	57	1.12	36	1.04	274	283.24	0.97	-6.12
All excluding same site	61	0.76*	118	1.04	54	1.08	36	1.07	269	276.48	0.97	-4.95
<b>Buccal cavity, pharynx</b>	2	0.83	1	0.31	1	0.78	0	0.00	4	7.72	0.52	-2.46
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.29	0.00	-0.85
Tongue	1	2.11	0	0.00	0	0.00	0	0.00	1	1.53	0.65	-0.35
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.43
Mouth	1	1.66	0	0.00	0	0.00	0	0.00	1	1.90	0.53	-0.59
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.20
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.47
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.15
Hypopharynx	0	0.00	0	0.00	1	7.28	0	0.00	1	0.83	1.20	0.11
<b>Digestive system</b>	19	1.05	33	1.31	13	1.17	7	0.93	72	61.84	1.16	6.72
Esophagus	1	0.98	3	2.10	1	1.66	0	0.00	5	3.45	1.45	1.02
Stomach	0	0.00	2	0.73	3	2.46	0	0.00	5	6.76	0.74	-1.17
Small intestine	1	4.09	2	5.73	0	0.00	0	0.00	3	0.86	3.51	1.42
Colon	10	1.27	12	1.09	5	1.01	5	1.49	32	27.15	1.18	3.21
Rectum, rectosigmoid junction	4	1.22	6	1.34	1	0.53	2	1.61	13	10.91	1.19	1.39
Anus, anal canal	0	0.00	1	5.02	0	0.00	0	0.00	1	0.48	2.08	0.34
Liver	1	1.47	0	0.00	0	0.00	0	0.00	1	2.45	0.41	-0.96
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.45
Bile ducts, other biliary	1	2.59	1	1.78	0	0.00	0	0.00	2	1.41	1.42	0.39
Pancreas	1	0.48	6	2.05	3	2.33	0	0.00	10	7.18	1.39	1.86
<b>Respiratory system</b>	8	0.52	22	1.02	12	1.32	7	1.18	49	52.02	0.94	-2.00
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.28
Larynx	0	0.00	0	0.00	0	0.00	1	2.68	1	3.77	0.27	-1.83
Lung, bronchus	8	0.57	22	1.12	11	1.32	6	1.09	47	47.71	0.99	-0.47
<b>Female breast</b>	3	0.90	8	1.59	5	2.11	0	0.00	16	12.17	1.31	11.74
<b>Female genital system</b>	0	0.00	2	0.90	0	0.00	0	0.00	2	5.30	0.38	-10.12
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-1.70
Corpus uteri	0	0.00	1	0.89	0	0.00	0	0.00	1	2.67	0.37	-5.12
Ovary	0	0.00	1	1.52	0	0.00	0	0.00	1	1.58	0.63	-1.79
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.27
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.84
<b>Male genital system</b>	15	0.71	28	0.91	11	0.79	15	1.51	69	75.71	0.91	-5.66
Prostate	15	0.72	28	0.92	11	0.79	15	1.52	69	74.98	0.92	-5.05
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.21
<b>Urinary system</b>	10	1.34	12	1.15	8	1.76	4	1.25	34	25.64	1.33	5.53
Urinary bladder	5	0.94	6	0.81	7	2.15	4	1.73	22	18.23	1.21	2.49
Kidney parenchyma	4	2.31	4	1.64	1	0.96	0	0.00	9	5.91	1.52	2.04
Renal pelvis, other urinary	1	2.26	2	3.29	0	0.00	0	0.00	3	1.49	2.01	1.00
Ureter	1	6.64	1	4.78	0	0.00	0	0.00	2	0.51	3.92	0.99
<b>Bone, joints</b>	0	0.00	1	10.60	0	0.00	0	0.00	1	0.23	4.40	0.51
<b>Soft tissue including heart</b>	0	0.00	1	2.27	1	5.19	0	0.00	2	1.08	1.84	0.61
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.25
<b>Melanoma of skin</b>	0	0.00	1	0.36	1	0.85	0	0.00	2	6.68	0.30	-3.10
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.27
<b>Brain, central nervous system</b>	0	0.00	1	0.85	0	0.00	0	0.00	1	2.82	0.35	-1.20
<b>Thyroid</b>	1	2.85	0	0.00	0	0.00	0	0.00	1	1.17	0.86	-0.11
<b>Lymphatic, hematopoietic</b>	1	0.16*	8	0.94	4	1.06	2	0.77	15	20.95	0.72	-3.94
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.41
Non-Hodgkin lymphoma	1	0.37	4	1.04	1	0.59	0	0.00	6	9.41	0.64	-2.25
Myeloma	0	0.00	2	1.40	0	0.00	1	2.31	3	3.51	0.85	-0.34
Leukemia	0	0.00	2	0.67	3	2.27	1	1.10	6	7.41	0.81	-0.94
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.13
Chronic lymphocytic	0	0.00	1	0.83	1	1.91	1	2.83	3	2.97	1.01	0.02
Acute non-lymphocytic	0	0.00	1	0.99	2	4.39	0	0.00	3	2.51	1.20	0.33
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-0.66

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,262 PYR and for male cancers on 11,852 PYR.

**Table 4.2.9:** Risk of subsequent primary cancers after cancer of the stomach excluding cardia, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	198	0.67*	537	0.94	319	0.94	281	0.99	1,335	1,487.32	0.90*	-19.09
All excluding same site	195	0.68*	528	0.96	315	0.96	272	0.99	1,310	1,442.04	0.91*	-16.55
<b>Buccal cavity, pharynx</b>	9	1.17	10	0.71	5	0.65	7	1.17	31	35.45	0.87	-0.56
Lip	0	0.00	0	0.00	0	0.00	1	1.19	1	5.15	0.19	-0.52
Tongue	2	1.38	1	0.37	1	0.66	2	1.68	6	6.85	0.88	-0.11
Salivary gland	0	0.00	1	0.81	0	0.00	1	1.56	2	3.24	0.62	-0.16
Mouth	4	1.97	2	0.54	2	0.98	1	0.65	9	9.35	0.96	-0.04
Nasopharynx	1	2.43	1	1.29	1	2.45	1	3.32	4	1.89	2.11	0.26
Tonsil	1	1.49	4	3.28	0	0.00	0	0.00	5	3.02	1.66	0.25
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.12
Hypopharynx	0	0.00	1	0.66	0	0.00	1	1.68	2	3.71	0.54	-0.21
<b>Digestive system</b>	41	0.55*	161	1.12	86	1.01	69	1.01	357	371.05	0.96	-1.76
Esophagus	3	0.84	8	1.18	6	1.57	5	1.58	22	17.33	1.27	0.59
Stomach	3	0.32*	9	0.51*	4	0.39	9	1.13	25	45.28	0.55*	-2.54
Small intestine	8	9.21*	3	1.76	1	0.95	2	2.15	14	4.55	3.07*	1.18
Colon	15	0.46*	66	1.04	39	1.02	32	1.03	152	165.91	0.92	-1.74
Rectum, rectosigmoid junction	6	0.49	33	1.43	12	0.91	15	1.47	66	58.74	1.12	0.91
Anus, anal canal	0	0.00	0	0.00	2	3.14	0	0.00	2	2.75	0.73	-0.09
Liver	1	0.35	4	0.71	3	0.91	2	0.71	10	14.53	0.69	-0.57
Gallbladder	0	0.00	1	0.45	1	0.77	0	0.00	2	5.64	0.35	-0.46
Bile ducts, other biliary	1	0.62	6	1.85	1	0.49	1	0.56	9	8.70	1.03	0.04
Pancreas	4	0.45	31	1.82*	17	1.68	3	0.37	55	44.29	1.24	1.34
<b>Respiratory system</b>	23	0.45*	93	0.97	49	0.88	67	1.46*	232	247.97	0.94	-2.00
Nose, nasal cavity, ear	0	0.00	2	2.28	0	0.00	0	0.00	2	2.26	0.89	-0.03
Larynx	4	1.19	5	0.82	6	1.82	6	2.34	21	15.37	1.37	0.71
Lung, bronchus	19	0.41*	86	0.97	43	0.84	61	1.43*	209	229.71	0.91	-2.60
<b>Female breast</b>	21	0.86	47	0.96	30	1.00	13	0.56*	111	126.87	0.87	-4.39
<b>Female genital system</b>	6	0.52	23	1.02	12	0.92	1	0.10*	42	56.75	0.74	-4.08
Cervix uteri	1	0.63	1	0.34	2	1.29	0	0.00	4	7.07	0.57	-0.85
Corpus uteri	4	0.71	9	0.83	3	0.49	0	0.00*	16	27.19	0.59*	-3.09
Ovary	1	0.30	8	1.23	4	1.02	1	0.34	14	16.62	0.84	-0.73
Vagina	0	0.00	1	2.26	1	3.77	0	0.00	2	1.12	1.78	0.24
Vulva	0	0.00	4	3.31	1	1.27	0	0.00	5	3.21	1.56	0.49
<b>Male genital system</b>	44	0.73*	96	0.82*	62	0.87	58	0.89	260	314.83	0.83*	-12.57
Prostate	44	0.74*	94	0.81*	62	0.88	58	0.89	258	312.01	0.83*	-12.38
Testis	0	0.00	1	3.42	0	0.00	0	0.00	1	0.69	1.44	0.07
<b>Urinary system</b>	20	0.87	47	1.07	25	0.96	26	1.16	118	115.15	1.02	0.36
Urinary bladder	10	0.62	32	1.05	20	1.10	18	1.14	80	80.70	0.99	-0.09
Kidney parenchyma	10	1.90	11	1.08	3	0.50	6	1.15	30	26.71	1.12	0.41
Renal pelvis, other urinary	0	0.00	4	1.33	2	1.16	2	1.42	8	7.73	1.03	0.03
Ureter	0	0.00	2	1.98	0	0.00	1	2.18	3	2.58	1.16	0.05
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	5.32	1	1.11	0.90	-0.01
<b>Soft tissue including heart</b>	2	1.77	1	0.46	4	3.08	2	1.78	9	5.74	1.57	0.41
<b>Kaposi sarcoma</b>	0	0.00	1	1.70	0	0.00	0	0.00	1	1.51	0.66	-0.06
<b>Melanoma of skin</b>	5	1.11	7	0.79	5	0.90	5	0.95	22	24.17	0.91	-0.27
<b>Eye, orbit</b>	0	0.00	0	0.00	2	5.19	0	0.00	2	1.74	1.15	0.03
<b>Brain, central nervous system</b>	1	0.40	6	1.25	3	1.09	3	1.34	13	12.29	1.06	0.09
<b>Thyroid</b>	8	5.50*	2	0.71	4	2.54	0	0.00	14	7.05	1.99*	0.87
<b>Lymphatic, hematopoietic</b>	16	0.74	39	0.93	22	0.87	20	0.93	97	110.65	0.88	-1.71
Hodgkin lymphoma	0	0.00	1	0.85	1	1.60	0	0.00	2	2.91	0.69	-0.11
Non-Hodgkin lymphoma	7	0.78	17	0.95	10	0.91	7	0.72	41	47.59	0.86	-0.83
Myeloma	5	1.22	8	1.01	1	0.21	4	1.02	18	20.66	0.87	-0.33
Leukemia	4	0.50	13	0.86	10	1.11	9	1.21	36	39.49	0.91	-0.44
Acute lymphocytic	0	0.00	1	2.48	0	0.00	0	0.00	1	1.04	0.96	0.00
Chronic lymphocytic	1	0.32	6	1.04	0	0.00	4	1.44	11	15.02	0.73	-0.50
Acute non-lymphocytic	1	0.37	3	0.57	5	1.59	3	1.14	12	13.75	0.87	-0.22
Chronic myeloid	2	1.82	2	0.96	3	2.41	2	1.90	9	5.48	1.64	0.44

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 36,155 PYR and for male cancers on 43,624 PYR.

## Small Intestine Both Sexes

**Table 4.3.1:** Characteristics of patients with an initial cancer of the small intestine, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	2,796	100.0	2,636	100.0	5,432	100.0
<b>Initial treatment</b>						
Any radiation	223	8.0	154	5.8	377	6.9
With surgery	140	5.0	97	3.7	237	4.4
Without surgery	83	3.0	57	2.2	140	2.6
No radiation	2,573	92.0	2,482	94.2	5,055	93.1
With surgery	2,164	77.4	2,051	77.8	4,215	77.6
Without surgery	409	14.6	431	16.4	840	15.5
<b>Race</b>						
White	2,317	82.9	2,174	82.5	4,491	82.7
Black	332	11.9	344	13.1	676	12.4
Other	143	5.1	110	4.2	253	4.7
Unknown	4	0.1	8	0.3	12	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	39	1.4	38	1.4	77	1.4
30–49	511	18.3	434	16.5	945	17.4
50–69	1,374	49.1	1,120	42.5	2,494	45.9
70–79	641	22.9	656	24.9	1,297	23.9
≥ 80	231	8.3	388	14.7	619	11.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	2,567	91.8	2,486	94.3	5,053	93.0
1st and 2nd cancers	204	7.3	139	5.3	343	6.3
1st, 2nd, and 3rd cancers	19	0.7	10	0.4	29	0.5
1st, 2nd, 3rd, and additional cancers	6	0.2	1	0.0	7	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	63.1	—	66.3	—	64.5	—
Median year of 1st cancer diagnosis	1990.3	—	1990.7	—	1990.5	—
Median person-years at risk	2.2	—	2.5	—	2.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.2	—	95.3	—	95.3
1st, 2nd, and additional cancers	—	94.3	—	95.3	—	94.7
1st cancer only	—	4.4	—	4.7	—	4.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 4.3.2:** Risk of subsequent primary cancers after cancer of the small intestine, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	68	1.26	165	1.06	104	1.08	85	1.15	422	379.79	1.11*	17.73
All excluding same site	68	1.26	160	1.03	102	1.07	83	1.13	413	378.55	1.09	14.47
<b>Buccal cavity, pharynx</b>	0	0.00	4	1.03	3	1.32	2	1.26	9	9.17	0.98	-0.07
Lip	0	0.00	1	1.85	0	0.00	0	0.00	1	1.28	0.78	-0.12
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.86	0.00	-0.78
Salivary gland	0	0.00	0	0.00	1	4.66	1	6.02	2	0.85	2.37	0.48
Mouth	0	0.00	0	0.00	1	1.66	1	2.39	2	2.44	0.82	-0.19
Nasopharynx	0	0.00	0	0.00	1	11.65	0	0.00	1	0.35	2.84	0.27
Tonsil	0	0.00	1	2.67	0	0.00	0	0.00	1	0.87	1.15	0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.11
Hypopharynx	0	0.00	1	2.54	0	0.00	0	0.00	1	0.92	1.09	0.04
<b>Digestive system</b>	15	1.24	40	1.16	23	1.09	24	1.51	102	83.46	1.22	7.79
Esophagus	1	1.64	0	0.00	0	0.00	0	0.00	1	4.17	0.24	-1.33
Stomach	1	0.81	2	0.58	0	0.00	1	0.67	4	8.21	0.49	-1.77
Small intestine	0	0.00	5	9.92*	2	6.39	2	8.00	9	1.24	7.23*	3.26
Colon	8	1.46	21	1.33	11	1.13	10	1.35	50	38.39	1.30	4.88
Rectum, rectosigmoid junction	2	0.97	6	1.04	3	0.87	5	1.99	16	13.80	1.16	0.92
Anus, anal canal	0	0.00	1	3.02	1	4.97	1	6.57	3	0.80	3.75	0.92
Liver	1	2.46	1	0.86	0	0.00	2	3.62	4	2.84	1.41	0.49
Gallbladder	1	5.81	0	0.00	1	3.51	0	0.00	2	1.15	1.74	0.36
Bile ducts, other biliary	0	0.00	1	1.35	3	6.39*	1	2.64	5	1.84	2.71	1.33
Pancreas	1	0.68	3	0.71	2	0.78	2	1.02	8	10.19	0.78	-0.92
<b>Respiratory system</b>	12	1.29	19	0.72	11	0.68	7	0.57	49	64.33	0.76	-6.44
Nose, nasal cavity, ear	0	0.00	0	0.00	1	7.33	0	0.00	1	0.54	1.84	0.19
Larynx	1	1.60	1	0.58	0	0.00	0	0.00	2	4.05	0.49	-0.86
Lung, bronchus	11	1.28	18	0.73	10	0.67	7	0.61	46	59.58	0.77	-5.70
<b>Female breast</b>	4	0.66	15	0.85	7	0.67	7	0.85	33	42.44	0.78	-7.88
<b>Female genital system</b>	1	0.36	10	1.28	2	0.45	5	1.48	18	18.39	0.98	-0.33
Cervix uteri	0	0.00	2	2.25	0	0.00	0	0.00	2	2.00	1.00	0.00
Corpus uteri	1	0.72	5	1.27	2	0.89	3	1.74	11	9.30	1.18	1.42
Ovary	0	0.00	3	1.31	0	0.00	2	1.92	5	5.47	0.91	-0.40
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.24
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.90	0.00	-0.75
<b>Male genital system</b>	13	1.30	34	1.14	27	1.38	17	1.10	91	74.95	1.21	13.56
Prostate	13	1.31	32	1.08	27	1.39	17	1.11	89	74.20	1.20	12.51
Testis	0	0.00	2	14.34*	0	0.00	0	0.00	2	0.30	6.75	1.44
<b>Urinary system</b>	11	2.68*	15	1.26	13	1.74	5	0.87	44	29.20	1.51*	6.22
Urinary bladder	7	2.50*	6	0.74	10	1.94	3	0.76	26	19.99	1.30	2.52
Kidney parenchyma	4	3.80*	6	1.98	3	1.59	1	0.69	14	7.42	1.89*	2.77
Renal pelvis, other urinary	0	0.00	3	4.05	0	0.00	1	2.93	4	1.80	2.23	0.93
Ureter	0	0.00	1	4.16	0	0.00	1	9.09	2	0.58	3.43	0.60
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.13
<b>Soft tissue including heart</b>	1	4.68	1	1.64	2	5.41	1	3.55	5	1.48	3.39*	1.48
<b>Kaposi sarcoma</b>	0	0.00	2	8.82	0	0.00	0	0.00	2	0.51	3.96	0.63
<b>Melanoma of skin</b>	4	3.50	6	1.78	1	0.47	5	2.99	16	8.32	1.92*	3.22
<b>Eye, orbit</b>	0	0.00	0	0.00	1	7.78	0	0.00	1	0.52	1.94	0.20
<b>Brain, central nervous system</b>	1	1.83	2	1.29	1	1.08	1	1.47	5	3.70	1.35	0.55
<b>Thyroid</b>	2	6.44	1	1.15	0	0.00	0	0.00	3	2.04	1.47	0.40
<b>Lymphatic, hematopoietic</b>	4	0.99	9	0.78	10	1.39	7	1.26	30	28.38	1.06	0.68
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-0.36
Non-Hodgkin lymphoma	2	1.12	3	0.57	5	1.53	4	1.55	14	12.85	1.09	0.48
Myeloma	0	0.00	3	1.46	2	1.58	0	0.00	5	5.03	0.99	-0.01
Leukemia	2	1.45	3	0.76	3	1.23	3	1.61	11	9.65	1.14	0.57
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.11
Chronic lymphocytic	1	1.82	2	1.27	1	1.03	1	1.36	5	3.84	1.30	0.49
Acute non-lymphocytic	1	2.14	1	0.74	0	0.00	1	1.55	3	3.29	0.91	-0.12
Chronic myeloid	0	0.00	0	0.00	2	5.96	1	3.92	3	1.32	2.27	0.70

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 11,972 PYR and for male cancers on 11,837 PYR.



## Small Intestine Females

**Table 4.3.3:** Risk of subsequent primary cancers after cancer of the small intestine, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	2,636	1,847								2,636		
			1,959	5,173	869	2,895	387	2,056		11,972		
<b>All subsequent cancers</b>	24	1.11	59	0.95	37	1.00	42	1.43*	162	150.22	1.08	9.84
All excluding same site	24	1.12	58	0.93	36	0.98	41	1.40*	159	149.69	1.06	7.77
<b>Buccal cavity, pharynx</b>	0	0.00	2	1.81	1	1.56	1	2.02	4	2.63	1.52	1.15
Lip	0	0.00	1	13.26	0	0.00	0	0.00	1	0.18	5.47	0.68
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.48
Salivary gland	0	0.00	0	0.00	0	0.00	1	17.54	1	0.29	3.39	0.59
Mouth	0	0.00	0	0.00	1	4.49	0	0.00	1	0.91	1.10	0.07
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.08
Tonsil	0	0.00	1	10.34	0	0.00	0	0.00	1	0.22	4.48	0.65
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.15
<b>Digestive system</b>	8	1.57	13	0.89	11	1.28	12	1.76	44	35.18	1.25	7.36
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-0.84
Stomach	0	0.00	0	0.00	0	0.00	1	2.02	1	2.68	0.37	-1.40
Small intestine	0	0.00	1	4.62	1	7.78	1	9.27	3	0.53	5.69*	2.07
Colon	5	1.96	6	0.82	7	1.61	5	1.45	23	17.70	1.30	4.42
Rectum, rectosigmoid junction	2	2.53	4	1.78	1	0.77	2	2.00	9	5.34	1.69	3.06
Rectum	1	1.93	4	2.71	1	1.17	2	3.01	8	3.51	2.28	3.75
Anus, anal canal	0	0.00	1	5.20	0	0.00	1	10.95	2	0.46	4.30	1.28
Liver	0	0.00	1	3.22	0	0.00	1	6.26	2	0.77	2.61	1.03
Gallbladder	1	8.75	0	0.00	0	0.00	0	0.00	1	0.76	1.32	0.20
Bile ducts, other biliary	0	0.00	0	0.00	1	5.20	0	0.00	1	0.79	1.27	0.18
Pancreas	0	0.00	0	0.00	1	0.87	1	1.08	2	4.69	0.43	-2.25
<b>Respiratory system</b>	3	1.07	6	0.72	5	0.99	4	0.93	18	20.48	0.88	-2.07
Nose, nasal cavity, ear	0	0.00	0	0.00	1	19.80	0	0.00	1	0.21	4.87	0.66
Larynx	1	10.86	0	0.00	0	0.00	0	0.00	1	0.63	1.58	0.31
Lung, bronchus	2	0.75	6	0.75	4	0.83	4	0.97	16	19.59	0.82	-2.99
<b>Female breast</b>	4	0.66	15	0.85	7	0.67	7	0.85	33	42.44	0.78	-7.88
<b>Female genital system</b>	1	0.36	10	1.28	2	0.45	5	1.48	18	18.39	0.98	-0.33
Cervix uteri	0	0.00	2	2.25	0	0.00	0	0.00	2	2.00	1.00	0.00
Corpus uteri	1	0.72	5	1.27	2	0.89	3	1.74	11	9.30	1.18	1.42
Ovary	0	0.00	3	1.31	0	0.00	2	1.92	5	5.47	0.91	-0.40
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.24
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.90	0.00	-0.75
<b>Urinary system</b>	2	1.94	6	1.99	3	1.66	1	0.68	12	7.33	1.64	3.90
Urinary bladder	1	1.64	3	1.68	3	2.83	0	0.00	7	4.32	1.62	2.24
Kidney parenchyma	1	2.97	2	2.02	0	0.00	1	2.03	4	2.42	1.66	1.32
Renal pelvis, other urinary	0	0.00	1	4.03	0	0.00	0	0.00	1	0.60	1.67	0.34
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.15
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.11
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	6.80	1	8.53	2	0.60	3.31	1.17
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
<b>Melanoma of skin</b>	3	7.47*	2	1.66	0	0.00	3	5.14*	8	2.90	2.75*	4.26
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.18
<b>Brain, central nervous system</b>	0	0.00	1	1.59	0	0.00	0	0.00	1	1.51	0.66	-0.42
<b>Thyroid</b>	2	10.33*	0	0.00	0	0.00	0	0.00	2	1.29	1.55	0.59
<b>Lymphatic, hematopoietic</b>	1	0.60	0	0.00*	5	1.74	4	1.71	10	11.70	0.85	-1.42
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.28
Non-Hodgkin lymphoma	0	0.00	0	0.00	2	1.45	2	1.72	4	5.63	0.71	-1.36
Myeloma	0	0.00	0	0.00	1	1.97	0	0.00	1	2.08	0.48	-0.90
Leukemia	1	1.91	0	0.00	2	2.23	2	2.80	5	3.66	1.37	1.12
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	1	2.89	1	3.64	2	1.41	1.42	0.49
Acute non-lymphocytic	1	5.39	0	0.00	0	0.00	0	0.00	1	1.30	0.77	-0.25
Chronic myeloid	0	0.00	0	0.00	1	8.04	1	10.24	2	0.51	3.94	1.25

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.3.4:** Risk of subsequent primary cancers after cancer of the small intestine, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	44	1.35	106	1.13	67	1.13	43	0.97	260	229.57	1.13	25.71
All excluding same site	44	1.36	102	1.09	66	1.12	42	0.95	254	228.86	1.11	21.24
<b>Buccal cavity, pharynx</b>	0	0.00	2	0.72	2	1.22	1	0.91	5	6.54	0.76	-1.30
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.10	0.00	-0.93
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.28	0.00	-1.08
Salivary gland	0	0.00	0	0.00	1	6.99	0	0.00	1	0.55	1.82	0.38
Mouth	0	0.00	0	0.00	0	0.00	1	4.06	1	1.53	0.65	-0.45
Nasopharynx	0	0.00	0	0.00	1	16.37	0	0.00	1	0.25	3.98	0.63
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.55
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.17
Hypopharynx	0	0.00	1	3.15	0	0.00	0	0.00	1	0.74	1.35	0.22
<b>Digestive system</b>	7	1.00	27	1.37	12	0.97	12	1.32	58	48.28	1.20	8.21
Esophagus	1	2.15	0	0.00	0	0.00	0	0.00	1	3.16	0.32	-1.83
Stomach	1	1.21	2	0.87	0	0.00	0	0.00	3	5.53	0.54	-2.14
Small intestine	0	0.00	4	13.92*	1	5.42	1	7.03	6	0.72	8.37*	4.46
Colon	3	1.02	15	1.79	4	0.74	5	1.26	27	20.68	1.31	5.34
Rectum, rectosigmoid junction	0	0.00	2	0.57	2	0.93	3	1.98	7	8.46	0.83	-1.23
Anus, anal canal	0	0.00	0	0.00	1	11.66	0	0.00	1	0.33	2.99	0.56
Liver	1	3.36	0	0.00	0	0.00	1	2.54	2	2.07	0.96	-0.06
Gallbladder	0	0.00	0	0.00	1	9.98	0	0.00	1	0.39	2.55	0.51
Bile ducts, other biliary	0	0.00	1	2.39	2	7.21	1	4.62	4	1.06	3.79*	2.49
Pancreas	1	1.24	3	1.33	1	0.71	1	0.97	6	5.50	1.09	0.42
<b>Respiratory system</b>	9	1.39	13	0.71	6	0.54	3	0.37	31	43.86	0.71	-10.86
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.28
Larynx	0	0.00	1	0.69	0	0.00	0	0.00	1	3.42	0.29	-2.04
Lung, bronchus	9	1.53	12	0.72	6	0.59	3	0.41	30	40.00	0.75	-8.45
<b>Male breast</b>	0	0.00	1	5.60	0	0.00	0	0.00	1	0.44	2.26	0.47
<b>Male genital system</b>	13	1.30	34	1.14	27	1.38	17	1.10	91	74.95	1.21	13.56
Prostate	13	1.31	32	1.08	27	1.39	17	1.11	89	74.20	1.20	12.51
Testis	0	0.00	2	14.34*	0	0.00	0	0.00	2	0.30	6.75	1.44
<b>Urinary system</b>	9	2.92*	9	1.02	10	1.76	4	0.94	32	21.87	1.46*	8.56
Urinary bladder	6	2.74*	3	0.48	7	1.71	3	0.97	19	15.67	1.21	2.81
Kidney parenchyma	3	4.20	4	1.95	3	2.33	0	0.00	10	5.00	2.00	4.22
Renal pelvis, other urinary	0	0.00	2	4.06	0	0.00	1	4.46	3	1.20	2.50	1.52
Ureter	0	0.00	1	6.06	0	0.00	1	13.42	2	0.40	4.98	1.35
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.15
<b>Soft tissue including heart</b>	1	7.90	1	2.80	1	4.50	0	0.00	3	0.87	3.44	1.80
<b>Kaposi sarcoma</b>	0	0.00	2	9.92*	0	0.00	0	0.00	2	0.45	4.49	1.31
<b>Melanoma of skin</b>	1	1.35	4	1.84	1	0.71	2	1.83	8	5.42	1.48	2.18
<b>Eye, orbit</b>	0	0.00	0	0.00	1	12.82	0	0.00	1	0.31	3.28	0.59
<b>Brain, central nervous system</b>	1	3.03	1	1.09	1	1.80	1	2.56	4	2.19	1.82	1.53
<b>Thyroid</b>	0	0.00	1	3.12	0	0.00	0	0.00	1	0.75	1.33	0.21
<b>Lymphatic, hematopoietic</b>	3	1.27	9	1.33	5	1.16	3	0.93	20	16.68	1.20	2.81
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.44
Non-Hodgkin lymphoma	2	1.98	3	1.03	3	1.59	2	1.41	10	7.23	1.38	2.34
Myeloma	0	0.00	3	2.51	1	1.32	0	0.00	4	2.95	1.36	0.89
Leukemia	1	1.17	3	1.23	1	0.65	1	0.87	6	5.99	1.00	0.01
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.13
Chronic lymphocytic	1	2.88	2	2.02	0	0.00	0	0.00	3	2.43	1.24	0.49
Acute non-lymphocytic	0	0.00	1	1.24	0	0.00	1	2.58	2	1.99	1.01	0.01
Chronic myeloid	0	0.00	0	0.00	1	4.73	0	0.00	1	0.82	1.23	0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Small Intestine Both Sexes, <50 Years of Age

**Table 4.3.5:** Risk of subsequent primary cancers after cancer of the small intestine, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	8	4.45*	15	2.29*	16	2.41*	20	1.76*	59	26.36	2.24*	57.78
All excluding same site	8	4.47*	15	2.30*	15	2.26*	18	1.59	56	26.26	2.13*	52.65
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	1	3.08	1	0.88	1.13	0.21
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.12
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.36
Salivary gland	0	0.00	0	0.00	0	0.00	1	36.92	1	0.07	13.50	1.64
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.40
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.22
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.14
<b>Digestive system</b>	3	12.37*	6	6.41*	4	3.84*	6	3.14*	19	4.13	4.60*	26.32
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.49
Stomach	1	37.19	2	20.70*	0	0.00	0	0.00	3	0.38	7.92*	4.64
Small intestine	0	0.00	0	0.00	1	37.33	2	49.43*	3	0.10	29.43*	5.13
Colon	2	22.95*	3	8.74*	3	7.65*	1	1.27	9	1.61	5.60*	13.09
Rectum, rectosigmoid junction	0	0.00	1	5.46	0	0.00	2	5.47	3	0.80	3.74	3.89
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.15
Liver	0	0.00	0	0.00	0	0.00	1	11.55	1	0.21	4.71	1.39
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.08
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.14
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.86
<b>Respiratory system</b>	0	0.00	0	0.00	0	0.00	1	0.53	1	3.90	0.26	-5.14
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.08
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.59
Lung, bronchus	0	0.00	0	0.00	0	0.00	1	0.58	1	3.51	0.28	-4.44
<b>Female breast</b>	0	0.00	2	1.25	3	2.07	2	0.99	7	5.51	1.27	5.25
<b>Female genital system</b>	1	5.71	3	4.82	0	0.00	2	2.46	6	2.18	2.75*	13.44
Cervix uteri	0	0.00	1	5.78	0	0.00	0	0.00	1	0.45	2.21	1.93
Corpus uteri	1	18.10	2	8.84	0	0.00	1	2.41	4	0.94	4.24*	10.75
Ovary	0	0.00	0	0.00	0	0.00	1	4.09	1	0.66	1.53	1.21
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.23
<b>Male genital system</b>	0	0.00	1	2.60	1	1.57	1	0.55	3	2.92	1.03	0.28
Prostate	0	0.00	1	3.33	1	1.69	1	0.56	3	2.73	1.10	0.97
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.59
<b>Urinary system</b>	1	10.78	0	0.00	2	5.05	0	0.00	3	1.60	1.87	2.47
Urinary bladder	1	22.01	0	0.00	2	9.58*	0	0.00	3	0.88	3.40	3.75
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-1.16
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.13
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.03
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.08
<b>Soft tissue including heart</b>	1	63.08	1	19.49	1	24.30	1	19.80	4	0.16	25.19*	6.80
<b>Kaposi sarcoma</b>	0	0.00	1	9.37	0	0.00	0	0.00	1	0.23	4.37	1.37
<b>Melanoma of skin</b>	1	9.07	1	2.75	0	0.00	3	7.64*	5	1.17	4.27*	6.78
<b>Eye, orbit</b>	0	0.00	0	0.00	1	81.88*	0	0.00	1	0.05	21.36	1.69
<b>Brain, central nervous system</b>	1	26.20	0	0.00	1	9.18	0	0.00	2	0.41	4.83	2.81
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.86
<b>Lymphatic, hematopoietic</b>	0	0.00	0	0.00	3	5.72*	2	2.50	5	2.08	2.41	5.18
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.29
Non-Hodgkin lymphoma	0	0.00	0	0.00	3	10.93*	2	4.86	5	1.08	4.62*	6.93
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.49
Leukemia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.98
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.32
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.34
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,843 PYR and for male cancers on 2,805 PYR.

**Table 4.3.6:** Risk of subsequent primary cancers after cancer of the small intestine, both sexes, ≥50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	60	1.15	150	1.00	88	0.98	65	1.04	363	353.43	1.03	5.27
All excluding same site	60	1.15	145	0.97	87	0.98	65	1.05	357	352.29	1.01	2.60
<b>Buccal cavity, pharynx</b>	0	0.00	4	1.10	3	1.47	1	0.79	8	8.29	0.97	-0.16
Lip	0	0.00	1	1.92	0	0.00	0	0.00	1	1.21	0.83	-0.12
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.66	0.00	-0.91
Salivary gland	0	0.00	0	0.00	1	5.11	0	0.00	1	0.77	1.30	0.13
Mouth	0	0.00	0	0.00	1	1.85	1	2.98	2	2.22	0.90	-0.12
Nasopharynx	0	0.00	0	0.00	1	13.84	0	0.00	1	0.30	3.31	0.38
Tonsil	0	0.00	1	2.97	0	0.00	0	0.00	1	0.74	1.35	0.14
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.13
Hypopharynx	0	0.00	1	2.69	0	0.00	0	0.00	1	0.84	1.20	0.09
<b>Digestive system</b>	12	1.01	34	1.02	19	0.95	18	1.29	83	79.33	1.05	2.02
Esophagus	1	1.69	0	0.00	0	0.00	0	0.00	1	3.89	0.26	-1.59
Stomach	0	0.00	0	0.00	0	0.00	1	0.74	1	7.83	0.13*	-3.76
Small intestine	0	0.00	5	10.48*	1	3.49	0	0.00	6	1.14	5.25*	2.67
Colon	6	1.11	18	1.17	8	0.86	9	1.36	41	36.78	1.11	2.32
Rectum, rectosigmoid junction	2	0.99	5	0.90	3	0.92	3	1.40	13	13.00	1.00	0.00
Anus, anal canal	0	0.00	1	3.25	1	5.58	1	8.28	3	0.72	4.19	1.26
Liver	1	2.55	1	0.90	0	0.00	1	2.14	3	2.63	1.14	0.20
Gallbladder	1	5.89	0	0.00	1	3.65	0	0.00	2	1.11	1.81	0.49
Bile ducts, other biliary	0	0.00	1	1.38	3	6.66*	1	2.94	5	1.76	2.84	1.78
Pancreas	1	0.69	3	0.73	2	0.82	2	1.16	8	9.70	0.82	-0.94
<b>Respiratory system</b>	12	1.32	19	0.74	11	0.72	6	0.58	48	60.43	0.79	-6.84
Nose, nasal cavity, ear	0	0.00	0	0.00	1	8.03	0	0.00	1	0.50	2.01	0.28
Larynx	1	1.66	1	0.61	0	0.00	0	0.00	2	3.72	0.54	-0.95
Lung, bronchus	11	1.31	18	0.76	10	0.71	6	0.62	45	56.07	0.80	-6.10
<b>Female breast</b>	4	0.71	13	0.81	4	0.45	5	0.80	26	36.93	0.70	-11.98
<b>Female genital system</b>	0	0.00	7	0.97	2	0.51	3	1.17	12	16.21	0.74	-4.62
Cervix uteri	0	0.00	1	1.40	0	0.00	0	0.00	1	1.55	0.65	-0.60
Corpus uteri	0	0.00	3	0.81	2	1.00	2	1.53	7	8.36	0.84	-1.49
Ovary	0	0.00	3	1.42	0	0.00	1	1.25	4	4.82	0.83	-0.90
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.30
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.91
<b>Male genital system</b>	13	1.31	33	1.12	26	1.38	16	1.18	88	72.03	1.22	17.69
Prostate	13	1.32	31	1.06	26	1.39	16	1.18	86	71.47	1.20	16.09
Testis	0	0.00	2	32.02*	0	0.00	0	0.00	2	0.13	15.43*	2.07
<b>Urinary system</b>	10	2.49*	15	1.30	11	1.55	5	1.00	41	27.60	1.49*	7.38
Urinary bladder	6	2.18	6	0.76	8	1.62	3	0.86	23	19.11	1.20	2.14
Kidney parenchyma	4	3.97*	6	2.09	3	1.75	1	0.85	14	6.76	2.07*	3.98
Renal pelvis, other urinary	0	0.00	3	4.14	0	0.00	1	3.27	4	1.73	2.32	1.25
Ureter	0	0.00	1	4.21	0	0.00	1	10.05	2	0.56	3.54	0.79
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	3.05	0	0.00	1	1.32	0.76	-0.17
<b>Kaposi sarcoma</b>	0	0.00	1	8.33	0	0.00	0	0.00	1	0.28	3.62	0.40
<b>Melanoma of skin</b>	3	2.91	5	1.66	1	0.55	2	1.56	11	7.15	1.54	2.12
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.26
<b>Brain, central nervous system</b>	0	0.00	2	1.41	0	0.00	1	1.85	3	3.28	0.91	-0.16
<b>Thyroid</b>	2	7.82	1	1.43	0	0.00	0	0.00	3	1.56	1.92	0.79
<b>Lymphatic, hematopoietic</b>	4	1.04	9	0.82	7	1.05	5	1.05	25	26.31	0.95	-0.72
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.38
Non-Hodgkin lymphoma	2	1.18	3	0.61	2	0.67	2	0.92	9	11.77	0.76	-1.53
Myeloma	0	0.00	3	1.50	2	1.67	0	0.00	5	4.75	1.05	0.14
Leukemia	2	1.49	3	0.79	3	1.30	3	1.84	11	9.10	1.21	1.05
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.13
Chronic lymphocytic	1	1.85	2	1.30	1	1.08	1	1.54	5	3.66	1.37	0.74
Acute non-lymphocytic	1	2.22	1	0.77	0	0.00	1	1.76	3	3.09	0.97	-0.05
Chronic myeloid	0	0.00	0	0.00	2	6.41	1	4.50	3	1.23	2.44	0.98

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 9,129 PYR and for male cancers on 9,032 PYR.

## Small Intestine Adenocarcinoma, Both Sexes

**Table 4.3.7:** Risk of subsequent primary cancers after adenocarcinoma of the small intestine, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	2,110	1,308								2,110	6,587	
<b>All subsequent cancers</b>	23	1.19	55	1.35*	28	1.07	31	1.32	137	109.60	1.25*	41.59
All excluding same site	23	1.20	51	1.26	27	1.03	30	1.29	131	109.24	1.20*	33.03
<b>Buccal cavity, pharynx</b>	0	0.00	1	0.98	1	1.64	1	2.03	3	2.62	1.14	0.57
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.57
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.80
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.36
Mouth	0	0.00	0	0.00	1	6.22	1	7.55	2	0.70	2.85	1.97
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.16
Tonsil	0	0.00	1	10.40	0	0.00	0	0.00	1	0.24	4.13	1.15
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.11
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.40
<b>Digestive system</b>	8	1.80	24	2.60*	9	1.54	9	1.70	50	24.81	2.01*	38.23
Esophagus	1	4.56	0	0.00	0	0.00	0	0.00	1	1.19	0.84	-0.29
Stomach	0	0.00	2	2.11	0	0.00	0	0.00	2	2.49	0.80	-0.75
Small intestine	0	0.00	4	30.61*	1	11.85	1	12.51	6	0.36	16.72*	8.56
Colon	6	2.97*	13	3.08*	5	1.84	6	2.39	30	11.46	2.62*	28.14
Rectum, rectosigmoid junction	0	0.00	4	2.58	0	0.00	2	2.43	6	4.09	1.47	2.90
Anus, anal canal	0	0.00	0	0.00	1	18.56	0	0.00	1	0.23	4.41	1.17
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-1.26
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.54
Bile ducts, other biliary	0	0.00	0	0.00	2	15.39*	0	0.00	2	0.54	3.68	2.21
Pancreas	1	1.84	1	0.89	0	0.00	0	0.00	2	3.03	0.66	-1.56
<b>Respiratory system</b>	5	1.51	7	1.01	3	0.69	4	1.05	19	18.44	1.03	0.85
Nose, nasal cavity, ear	0	0.00	0	0.00	1	26.42	0	0.00	1	0.16	6.30	1.28
Larynx	0	0.00	1	2.22	0	0.00	0	0.00	1	1.15	0.87	-0.23
Lung, bronchus	5	1.63	6	0.94	2	0.49	4	1.12	17	17.08	1.00	-0.13
<b>Female breast</b>	2	0.96	1	0.22	1	0.37	2	0.76	6	11.92	0.50	-18.06
<b>Female genital system</b>	0	0.00	7	3.42*	1	0.84	1	0.93	9	5.28	1.70	11.33
Cervix uteri	0	0.00	2	8.03	0	0.00	0	0.00	2	0.59	3.38	4.29
Corpus uteri	0	0.00	2	1.94	1	1.67	1	1.85	4	2.66	1.50	4.09
Ovary	0	0.00	3	5.10*	0	0.00	0	0.00	3	1.55	1.93	4.41
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.28
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.80
<b>Male genital system</b>	2	0.56	7	0.90	6	1.10	5	1.08	20	21.42	0.93	-4.29
Prostate	2	0.57	7	0.91	6	1.11	5	1.08	20	21.21	0.94	-3.66
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.23
<b>Urinary system</b>	5	3.40*	2	0.65	3	1.44	3	1.64	13	8.48	1.53	6.87
Urinary bladder	4	3.98*	2	0.94	2	1.39	2	1.58	10	5.83	1.71	6.32
Kidney parenchyma	1	2.71	0	0.00	1	1.96	0	0.00	2	2.11	0.95	-0.16
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	8.94	1	0.53	1.87	0.71
Ureter	0	0.00	0	0.00	0	0.00	1	27.32	1	0.17	5.72	1.25
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	11.16	1	0.42	2.37	0.88
<b>Kaposi sarcoma</b>	0	0.00	1	18.02	0	0.00	0	0.00	1	0.14	7.28	1.31
<b>Melanoma of skin</b>	0	0.00	1	1.23	0	0.00	2	3.94	3	2.26	1.33	1.12
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.22
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	1	4.66	1	1.05	0.95	-0.08
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.84
<b>Lymphatic, hematopoietic</b>	1	0.70	3	1.00	4	2.04	0	0.00	8	8.23	0.97	-0.35
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.36
Non-Hodgkin lymphoma	1	1.60	2	1.51	4	4.53*	0	0.00	7	3.68	1.90	5.05
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.48	0.00	-2.25
Leukemia	0	0.00	1	0.96	0	0.00	0	0.00	1	2.83	0.35	-2.78
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.12
Chronic lymphocytic	0	0.00	1	2.41	0	0.00	0	0.00	1	1.12	0.89	-0.19
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.97	0.00	-1.47
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.59

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,281 PYR and for male cancers on 3,306 PYR.

**Table 4.4.1:** Characteristics of patients with an initial cancer of the liver or intrahepatic bile duct, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	7,511	100.0	3,989	100.0	11,500	100.0
<b>Initial treatment</b>						
Any radiation	875	11.6	450	11.3	1,325	11.5
With surgery	100	1.3	74	1.9	174	1.5
Without surgery	775	10.3	376	9.4	1,151	10.0
No radiation	6,636	88.4	3,539	88.7	10,175	88.5
With surgery	1,023	13.6	674	16.9	1,697	14.8
Without surgery	5,613	74.7	2,865	71.8	8,478	73.7
<b>Race</b>						
White	4,813	64.1	2,862	71.7	7,675	66.7
Black	855	11.4	366	9.2	1,221	10.6
Other	1,832	24.4	756	19.0	2,588	22.5
Unknown	11	0.1	5	0.1	16	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	243	3.2	211	5.3	454	3.9
30–49	1,047	13.9	436	10.9	1,483	12.9
50–69	3,708	49.4	1,456	36.5	5,164	44.9
70–79	1,846	24.6	1,179	29.6	3,025	26.3
≥ 80	667	8.9	707	17.7	1,374	11.9
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	7,408	98.6	3,937	98.7	11,345	98.7
1st and 2nd cancers	96	1.3	46	1.2	142	1.2
1st, 2nd, and 3rd cancers	7	0.1	6	0.2	13	0.1
1st, 2nd, 3rd, and additional cancers	0	0.0	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	64.6	—	68.8	—	65.8	—
Median year of 1st cancer diagnosis	1992.8	—	1992.0	—	1992.5	—
Median person-years at risk	0.3	—	0.4	—	0.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	85.4	—	86.5	—	85.8
1st, 2nd, and additional cancers	—	85.4	—	86.5	—	85.8
1st cancer only	—	3.9	—	7.7	—	5.2

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



# Liver

## Both Sexes

**Table 4.4.2:** Risk of subsequent primary cancers after cancer of the liver or intrahepatic bile duct, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	11,500	4,644	3,414	5,059	498	1,594	200	1,066	11,500	12,363		
<b>All subsequent cancers</b>	67	0.99	65	0.98	21	1.29	15	1.64	168	159.83	1.05	6.60
All excluding same site	67	1.00	64	0.98	21	1.31	14	1.55	166	157.62	1.05	6.78
<b>Buccal cavity, pharynx</b>	3	1.70	4	2.43	0	0.00	0	0.00	7	3.97	1.76	2.45
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.38
Tongue	1	2.84	1	3.00	0	0.00	0	0.00	2	0.80	2.50	0.97
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.29
Mouth	1	2.27	3	7.28*	0	0.00	0	0.00	4	1.00	3.99*	2.42
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.24
Tonsil	1	6.05	0	0.00	0	0.00	0	0.00	1	0.37	2.71	0.51
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.09
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.34
<b>Digestive system</b>	12	0.76	13	0.85	5	1.34	3	1.44	33	36.97	0.89	-3.21
Esophagus	1	1.20	2	2.55	2	11.48*	0	0.00	5	1.88	2.67	2.53
Stomach	1	0.53	1	0.54	0	0.00	0	0.00	2	4.37	0.46	-1.91
Small intestine	1	4.72	1	4.80	0	0.00	0	0.00	2	0.51	3.96	1.21
Colon	5	0.74	4	0.61	3	1.82	1	1.05	13	15.83	0.82	-2.29
Rectum, rectosigmoid junction	1	0.38	1	0.40	0	0.00	0	0.00	2	6.06	0.33	-3.28
Anus, anal canal	0	0.00	1	7.92	0	0.00	0	0.00	1	0.31	3.24	0.56
Liver	0	0.00	1	1.20	0	0.00	1	11.54	2	1.92	1.04	0.06
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.42
Bile ducts, other biliary	1	2.65	0	0.00	0	0.00	0	0.00	1	0.91	1.10	0.08
Pancreas	2	1.09	2	1.12	0	0.00	1	3.79	5	4.34	1.15	0.54
<b>Respiratory system</b>	13	1.10	8	0.71	3	1.14	4	2.81	28	27.12	1.03	0.71
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.20
Larynx	1	1.29	2	2.86	0	0.00	0	0.00	3	1.69	1.78	1.06
Lung, bronchus	12	1.10	6	0.58	3	1.22	4	2.99	25	25.11	1.00	-0.09
<b>Female breast</b>	4	0.77	6	1.02	3	1.50	3	1.82	16	14.74	1.09	2.32
<b>Female genital system</b>	1	0.43	4	1.55	3	3.43	0	0.00	8	6.45	1.24	2.87
Cervix uteri	0	0.00	1	3.07	0	0.00	0	0.00	1	0.81	1.24	0.36
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	3.17	0.00	-5.86
Ovary	1	1.48	3	3.95	2	7.63	0	0.00	6	1.91	3.15*	7.57
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.19
Vulva	0	0.00	0	0.00	1	23.32	0	0.00	1	0.31	3.23	1.28
<b>Male genital system</b>	14	0.89	10	0.68	0	0.00	1	0.90	25	34.56	0.72	-13.74
Prostate	14	0.90	10	0.68	0	0.00	1	0.91	25	34.19	0.73	-13.21
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.22
<b>Urinary system</b>	9	1.69	7	1.39	2	1.73	0	0.00	18	12.10	1.49	4.77
Urinary bladder	2	0.55	5	1.47	2	2.59	0	0.00	9	8.18	1.10	0.67
Kidney parenchyma	6	4.40*	2	1.51	0	0.00	0	0.00	8	3.16	2.53*	3.91
Renal pelvis, other urinary	1	3.00	0	0.00	0	0.00	0	0.00	1	0.76	1.31	0.19
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.21
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.11
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.53
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.16
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	1	5.16	1	3.21	0.31	-1.79
<b>Eye, orbit</b>	0	0.00	0	0.00	1	49.13	0	0.00	1	0.20	5.07	0.65
<b>Brain, central nervous system</b>	1	1.57	1	1.59	0	0.00	0	0.00	2	1.53	1.31	0.38
<b>Thyroid</b>	1	2.57	4	9.67*	1	8.69	0	0.00	6	1.00	6.01*	4.05
<b>Lymphatic, hematopoietic</b>	6	1.20	8	1.64	2	1.62	2	2.82	18	11.82	1.52	5.00
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.30
Non-Hodgkin lymphoma	3	1.32	2	0.88	1	1.74	1	2.97	7	5.46	1.28	1.25
Myeloma	2	2.28	3	3.56	0	0.00	0	0.00	5	2.05	2.44	2.39
Leukemia	1	0.59	3	1.84	1	2.47	1	4.53	6	3.94	1.52	1.67
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.13
Chronic lymphocytic	0	0.00	0	0.00	1	6.96	0	0.00	1	1.43	0.70	-0.34
Acute non-lymphocytic	0	0.00	3	5.13*	0	0.00	1	12.29	4	1.41	2.84	2.10
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.45

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,409 PYR and for male cancers on 6,954 PYR.

**Table 4.4.3:** Risk of subsequent primary cancers after cancer of the liver or intrahepatic bile duct, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	15	0.79	21	0.99	11	1.52	11	1.85	58	53.17	1.09	8.93
All excluding same site	15	0.80	21	1.00	11	1.54	11	1.87	58	52.68	1.10	9.84
<b>Buccal cavity, pharynx</b>	0	0.00	1	2.72	0	0.00	0	0.00	1	0.92	1.08	0.14
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
Tongue	0	0.00	1	12.07	0	0.00	0	0.00	1	0.21	4.81	1.46
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.19
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.58
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.14
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
<b>Digestive system</b>	4	0.86	3	0.59	3	1.73	2	1.43	12	12.92	0.93	-1.69
Esophagus	0	0.00	1	7.48	0	0.00	0	0.00	1	0.34	2.93	1.22
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	1.21	0.00	-2.24
Small intestine	1	15.78	0	0.00	0	0.00	0	0.00	1	0.18	5.54	1.51
Colon	3	1.33	1	0.41	3	3.56	1	1.48	8	6.23	1.28	3.27
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	1.91	0.00	-3.53
Rectum	0	0.00	0	0.00	0	0.00	0	0.00	0	1.27	0.00	-2.34
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.29
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.72
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.55
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.60
Pancreas	0	0.00	1	1.50	0	0.00	1	5.36	2	1.70	1.18	0.56
<b>Respiratory system</b>	1	0.40	3	1.07	1	1.03	3	3.61	8	7.10	1.13	1.67
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.14
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.38
Lung, bronchus	1	0.42	3	1.12	1	1.08	3	3.77	8	6.79	1.18	2.23
<b>Female breast</b>	4	0.77	6	1.02	3	1.50	3	1.82	16	14.74	1.09	2.32
<b>Female genital system</b>	1	0.43	4	1.55	3	3.43	0	0.00	8	6.45	1.24	2.87
Cervix uteri	0	0.00	1	3.07	0	0.00	0	0.00	1	0.81	1.24	0.36
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	3.17	0.00	-5.86
Ovary	1	1.48	3	3.95	2	7.63	0	0.00	6	1.91	3.15*	7.57
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.19
Vulva	0	0.00	0	0.00	1	23.32	0	0.00	1	0.31	3.23	1.28
<b>Urinary system</b>	1	1.11	2	2.00	0	0.00	0	0.00	3	2.53	1.19	0.87
Urinary bladder	0	0.00	1	1.72	0	0.00	0	0.00	1	1.47	0.68	-0.88
Kidney parenchyma	1	3.38	1	3.00	0	0.00	0	0.00	2	0.84	2.38	2.14
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.40
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.13
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.42
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.04
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	1	8.02	1	0.99	1.01	0.03
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.13
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.99
<b>Thyroid</b>	1	5.22	2	8.76	0	0.00	0	0.00	3	0.57	5.29*	4.50
<b>Lymphatic, hematopoietic</b>	2	1.37	0	0.00	1	1.75	1	2.14	4	4.13	0.97	-0.25
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.25
Non-Hodgkin lymphoma	2	2.83	0	0.00	1	3.64	0	0.00	3	2.00	1.50	1.85
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-1.34
Leukemia	0	0.00	0	0.00	0	0.00	1	7.09	1	1.27	0.78	-0.51
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.83
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	1	18.94	1	0.47	2.12	0.98
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.33

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.4.4:** Risk of subsequent primary cancers after cancer of the liver or intrahepatic bile duct, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	7,511		2,089		245		83		7,511			
<b>Person-years in interval</b>	2,932		2,884		729		410		6,954			
<b>All subsequent cancers</b>	52	1.06	44	0.97	10	1.10	4	1.24	110	106.66	1.03	4.80
All excluding same site	52	1.08	43	0.97	10	1.12	3	0.94	108	104.95	1.03	4.39
<b>Buccal cavity, pharynx</b>	3	2.09	3	2.34	0	0.00	0	0.00	6	3.05	1.97	4.24
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.60
Tongue	1	3.59	0	0.00	0	0.00	0	0.00	1	0.59	1.68	0.58
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.36
Mouth	1	3.04	3	10.41*	0	0.00	0	0.00	4	0.69	5.79*	4.76
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.35
Tonsil	1	7.20	0	0.00	0	0.00	0	0.00	1	0.29	3.41	1.02
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.13
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.53
<b>Digestive system</b>	8	0.72	10	0.97	2	1.00	1	1.46	21	24.05	0.87	-4.39
Esophagus	1	1.40	1	1.54	2	15.70*	0	0.00	4	1.54	2.61	3.54
Stomach	1	0.69	1	0.74	0	0.00	0	0.00	2	3.16	0.63	-1.66
Small intestine	0	0.00	1	7.27	0	0.00	0	0.00	1	0.32	3.08	0.97
Colon	2	0.45	3	0.74	0	0.00	0	0.00	5	9.59	0.52	-6.60
Rectum, rectosigmoid junction	1	0.52	1	0.57	0	0.00	0	0.00	2	4.14	0.48	-3.08
Anus, anal canal	0	0.00	1	15.70	0	0.00	0	0.00	1	0.15	6.66	1.22
Liver	0	0.00	1	1.48	0	0.00	1	22.42	2	1.53	1.31	0.68
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.32
Bile ducts, other biliary	1	3.82	0	0.00	0	0.00	0	0.00	1	0.58	1.72	0.60
Pancreas	2	1.63	1	0.89	0	0.00	0	0.00	3	2.64	1.14	0.52
<b>Respiratory system</b>	12	1.29	5	0.59	2	1.20	1	1.69	20	20.02	1.00	-0.04
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.25
Larynx	1	1.43	2	3.23	0	0.00	0	0.00	3	1.48	2.02	2.18
Lung, bronchus	11	1.29	3	0.39	2	1.31	1	1.84	17	18.32	0.93	-1.90
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.27
<b>Male genital system</b>	14	0.89	10	0.68	0	0.00	1	0.90	25	34.56	0.72	-13.74
Prostate	14	0.90	10	0.68	0	0.00	1	0.91	25	34.19	0.73	-13.21
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.22
<b>Urinary system</b>	8	1.80	5	1.24	2	2.45	0	0.00	15	9.57	1.57	7.81
Urinary bladder	2	0.64	4	1.42	2	3.50	0	0.00	8	6.70	1.19	1.87
Kidney parenchyma	5	4.69*	1	1.01	0	0.00	0	0.00	6	2.32	2.58	5.29
Renal pelvis, other urinary	1	3.93	0	0.00	0	0.00	0	0.00	1	0.55	1.83	0.65
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.27
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.13
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.62
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.25
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.23	0.00	-3.20
<b>Eye, orbit</b>	0	0.00	0	0.00	1	94.57*	0	0.00	1	0.13	7.93	1.26
<b>Brain, central nervous system</b>	1	2.21	1	2.39	0	0.00	0	0.00	2	0.99	2.01	1.45
<b>Thyroid</b>	0	0.00	2	10.79*	1	27.39	0	0.00	3	0.43	6.96*	3.69
<b>Lymphatic, hematopoietic</b>	4	1.14	8	2.46*	1	1.51	1	4.14	14	7.68	1.82	9.08
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.34
Non-Hodgkin lymphoma	1	0.64	2	1.35	0	0.00	1	9.21	4	3.46	1.16	0.78
Myeloma	2	3.25	3	5.37*	0	0.00	0	0.00	5	1.32	3.77*	5.28
Leukemia	1	0.81	3	2.67	1	4.38	0	0.00	5	2.66	1.88	3.36
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.15
Chronic lymphocytic	0	0.00	0	0.00	1	12.28	0	0.00	1	0.98	1.03	0.04
Acute non-lymphocytic	0	0.00	3	7.53*	0	0.00	0	0.00	3	0.94	3.20	2.97
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.54

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.4.5:** Risk of subsequent primary cancers after cancer of the liver or intrahepatic bile duct, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4	2.44	12	4.89*	1	0.84	6	2.97*	23	7.31	3.15*	39.57
All excluding same site	4	2.49	11	4.56*	1	0.85	6	3.00*	22	7.20	3.05*	37.32
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.62
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.03
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.13
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.06
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.13
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.08
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.02
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.05
<b>Digestive system</b>	1	3.78	5	13.64*	0	0.00	1	3.14	7	1.11	6.29*	14.85
Esophagus	0	0.00	1	44.69	0	0.00	0	0.00	1	0.06	15.82	2.36
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.29
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.07
Colon	1	12.08	2	16.64*	0	0.00	1	7.50	4	0.40	10.08*	9.09
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.54
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.06
Liver	0	0.00	1	25.99	0	0.00	0	0.00	1	0.10	10.08	2.27
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.03
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.06
Pancreas	0	0.00	1	26.84	0	0.00	0	0.00	1	0.12	8.37	2.22
<b>Respiratory system</b>	1	5.35	0	0.00	0	0.00	0	0.00	1	0.86	1.16	0.34
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.04
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.17
Lung, bronchus	1	6.19	0	0.00	0	0.00	0	0.00	1	0.77	1.29	0.57
<b>Female breast</b>	0	0.00	1	1.92	0	0.00	1	1.73	2	1.75	1.14	1.28
<b>Female genital system</b>	1	7.64	3	13.76*	0	0.00	0	0.00	4	0.73	5.47*	16.78
Cervix uteri	0	0.00	1	15.44	0	0.00	0	0.00	1	0.19	5.37	4.18
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-1.45
Ovary	1	25.46	2	30.14*	0	0.00	0	0.00	3	0.22	13.55*	14.26
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.04
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.11
<b>Male genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-2.15
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-1.69
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.42
<b>Urinary system</b>	0	0.00	2	14.81*	1	19.45	0	0.00	3	0.37	8.14*	6.64
Urinary bladder	0	0.00	1	16.17	1	41.02	0	0.00	2	0.17	11.46*	4.60
Kidney parenchyma	0	0.00	1	14.61	0	0.00	0	0.00	1	0.18	5.59	2.07
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.04
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	-0.01
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.17
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.20
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	1	14.33	1	0.36	2.75	1.60
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.05
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.43
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.54
<b>Lymphatic, hematopoietic</b>	1	5.68	1	3.96	0	0.00	2	12.70*	4	0.70	5.75*	8.33
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.22
Non-Hodgkin lymphoma	1	11.39	0	0.00	0	0.00	1	13.95	2	0.32	6.17	4.23
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.17
Leukemia	0	0.00	1	11.81	0	0.00	1	22.66	2	0.22	9.24*	4.50
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.16
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.09
Acute non-lymphocytic	0	0.00	1	37.61	0	0.00	1	59.27	2	0.07	27.37*	4.86
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,948 PYR and for male cancers on 2,016 PYR.

# Liver

## Both Sexes, ≥50 Years of Age

**Table 4.4.6:** Risk of subsequent primary cancers after cancer of the liver or intrahepatic bile duct, both sexes, ≥50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	9,563		2,607		294		86		9,563			
<b>Person-years in interval</b>	3,697		3,538		804		359		8,398			
<b>All subsequent cancers</b>	63	0.95	53	0.83	20	1.32	9	1.26	145	152.52	0.95	-8.96
All excluding same site	63	0.96	53	0.84	20	1.34	8	1.13	144	150.42	0.96	-7.64
<b>Buccal cavity, pharynx</b>	3	1.77	4	2.57	0	0.00	0	0.00	7	3.73	1.88	3.90
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.55
Tongue	1	2.98	1	3.20	0	0.00	0	0.00	2	0.75	2.67	1.49
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.39
Mouth	1	2.35	3	7.64*	0	0.00	0	0.00	4	0.95	4.21*	3.63
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.31
Tonsil	1	6.48	0	0.00	0	0.00	0	0.00	1	0.34	2.98	0.79
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.13
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.48
<b>Digestive system</b>	11	0.71	8	0.53	5	1.40	2	1.13	26	35.86	0.73	-11.74
Esophagus	1	1.22	1	1.31	2	12.04*	0	0.00	4	1.81	2.21	2.60
Stomach	1	0.54	1	0.56	0	0.00	0	0.00	2	4.25	0.47	-2.68
Small intestine	1	4.88	1	5.02	0	0.00	0	0.00	2	0.48	4.18	1.81
Colon	4	0.60	2	0.31	3	1.89	0	0.00	9	15.43	0.58	-7.65
Rectum, rectosigmoid junction	1	0.39	1	0.41	0	0.00	0	0.00	2	5.84	0.34	-4.57
Anus, anal canal	0	0.00	1	8.46	0	0.00	0	0.00	1	0.28	3.51	0.85
Liver	0	0.00	0	0.00	0	0.00	1	14.38	1	1.82	0.55	-0.98
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.60
Bile ducts, other biliary	1	2.69	0	0.00	0	0.00	0	0.00	1	0.88	1.13	0.14
Pancreas	2	1.10	1	0.57	0	0.00	1	4.45	4	4.22	0.95	-0.26
<b>Respiratory system</b>	12	1.03	8	0.73	3	1.20	4	3.49	27	26.26	1.03	0.88
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.28
Larynx	1	1.33	2	2.96	0	0.00	0	0.00	3	1.62	1.85	1.64
Lung, bronchus	11	1.02	6	0.59	3	1.28	4	3.70	24	24.34	0.99	-0.41
<b>Female breast</b>	4	0.82	5	0.93	3	1.81	2	1.87	14	12.99	1.08	2.91
<b>Female genital system</b>	0	0.00	1	0.42	3	4.10	0	0.00	4	5.72	0.70	-4.96
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-1.79
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	2.89	0.00	-8.34
Ovary	0	0.00	1	1.44	2	9.15*	0	0.00	3	1.69	1.78	3.80
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.28
Vulva	0	0.00	0	0.00	1	25.62	0	0.00	1	0.29	3.46	2.05
<b>Male genital system</b>	14	0.90	10	0.69	0	0.00	1	0.98	25	34.12	0.73	-18.48
Prostate	14	0.91	10	0.69	0	0.00	1	0.99	25	33.85	0.74	-17.92
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.13
<b>Urinary system</b>	9	1.72	5	1.02	1	0.90	0	0.00	15	11.73	1.28	3.89
Urinary bladder	2	0.56	4	1.20	1	1.34	0	0.00	7	8.00	0.87	-1.19
Kidney parenchyma	6	4.57*	1	0.80	0	0.00	0	0.00	7	2.98	2.35	4.78
Renal pelvis, other urinary	1	3.03	0	0.00	0	0.00	0	0.00	1	0.75	1.34	0.30
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.30
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.70
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.14
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.85	0.00	-3.39
<b>Eye, orbit</b>	0	0.00	0	0.00	1	55.81	0	0.00	1	0.18	5.59	0.98
<b>Brain, central nervous system</b>	1	1.68	1	1.77	0	0.00	0	0.00	2	1.36	1.47	0.77
<b>Thyroid</b>	1	2.99	4	11.93*	1	12.99	0	0.00	6	0.78	7.66*	6.21
<b>Lymphatic, hematopoietic</b>	5	1.04	7	1.51	2	1.78	0	0.00	14	11.12	1.26	3.43
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.34
Non-Hodgkin lymphoma	2	0.91	2	0.93	1	1.90	0	0.00	5	5.13	0.97	-0.16
Myeloma	2	2.32	3	3.65	0	0.00	0	0.00	5	1.98	2.52	3.59
Leukemia	1	0.61	2	1.30	1	2.71	0	0.00	4	3.72	1.08	0.33
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.12
Chronic lymphocytic	0	0.00	0	0.00	1	7.23	0	0.00	1	1.39	0.72	-0.47
Acute non-lymphocytic	0	0.00	2	3.58	0	0.00	0	0.00	2	1.34	1.50	0.79
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.62

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,461 PYR and for male cancers on 4,937 PYR.

**Table 4.5.1:** Characteristics of patients with an initial cancer of the gallbladder, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	1,413	100.0	3,930	100.0	5,343	100.0
<b>Initial treatment</b>						
Any radiation	268	19.0	705	17.9	973	18.2
With surgery	190	13.4	520	13.2	710	13.3
Without surgery	78	5.5	185	4.7	263	4.9
No radiation	1,145	81.0	3,225	82.1	4,370	81.8
With surgery	764	54.1	2,237	56.9	3,001	56.2
Without surgery	381	27.0	988	25.1	1,369	25.6
<b>Race</b>						
White	1,125	79.6	3,339	85.0	4,464	83.5
Black	98	6.9	241	6.1	339	6.3
Other	189	13.4	345	8.8	534	10.0
Unknown	1	0.1	5	0.1	6	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	1	0.1	5	0.1	6	0.1
30–49	79	5.6	191	4.9	270	5.1
50–69	603	42.7	1,467	37.3	2,070	38.7
70–79	484	34.3	1,286	32.7	1,770	33.1
≥ 80	246	17.4	981	25.0	1,227	23.0
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	1,356	96.0	3,832	97.5	5,188	97.1
1st and 2nd cancers	52	3.7	91	2.3	143	2.7
1st, 2nd, and 3rd cancers	5	0.4	7	0.2	12	0.2
1st, 2nd, 3rd, and additional cancers	0	0.0	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	70.5	—	72.4	—	71.8	—
Median year of 1st cancer diagnosis	1987.0	—	1987.0	—	1987.0	—
Median person-years at risk	0.4	—	0.4	—	0.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	91.2	—	84.7	—	87.1
1st, 2nd, and additional cancers	—	91.2	—	84.7	—	87.1
1st cancer only	—	7.0	—	15.3	—	12.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



## Gallbladder Both Sexes

**Table 4.5.2:** Risk of subsequent primary cancers after cancer of the gallbladder, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	41	1.09	65	1.10	43	1.31	18	0.80	167	152.46	1.10	16.15
All excluding same site	40	1.07	65	1.10	43	1.31	18	0.80	166	151.71	1.09	15.88
<b>Buccal cavity, pharynx</b>	1	1.23	0	0.00	0	0.00	0	0.00	1	3.13	0.32	-2.37
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.45
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.71
Salivary gland	1	12.68	0	0.00	0	0.00	0	0.00	1	0.32	3.11	0.75
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.93	0.00	-1.03
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.16
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.27
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.09
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.29
<b>Digestive system</b>	15	1.57	22	1.45	19	2.23*	7	1.24	63	38.89	1.62*	26.79
Esophagus	0	0.00	1	1.89	0	0.00	0	0.00	1	1.36	0.74	-0.40
Stomach	2	2.04	1	0.64	2	2.37	2	3.75	7	3.93	1.78	3.42
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.53
Colon	3	0.66	8	1.10	6	1.45	2	0.73	19	18.70	1.02	0.33
Rectum, rectosigmoid junction	1	0.65	4	1.66	1	0.78	1	1.23	7	6.04	1.16	1.06
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.40
Liver	1	3.64	0	0.00	1	3.98	1	5.57	3	1.16	2.59	2.05
Gallbladder	1	5.10	0	0.00	0	0.00	0	0.00	1	0.76	1.32	0.27
Bile ducts, other biliary	3	14.18*	4	11.47*	3	14.60*	1	6.72	11	0.91	12.03*	11.21
Pancreas	4	3.42	4	2.16	6	5.69*	0	0.00	14	4.78	2.93*	10.24
<b>Respiratory system</b>	5	0.91	6	0.70	5	1.06	0	0.00	16	22.18	0.72	-6.87
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.25
Larynx	0	0.00	0	0.00	1	4.70	0	0.00	1	1.06	0.94	-0.07
Lung, bronchus	5	0.97	6	0.74	4	0.90	0	0.00	15	20.84	0.72	-6.49
<b>Female breast</b>	6	0.95	5	0.51	4	0.72	1	0.27	16	25.32	0.63	-14.01
<b>Female genital system</b>	6	2.06	16	3.71*	2	0.86	2	1.33	26	11.06	2.35*	22.46
Cervix uteri	1	3.04	3	6.48*	0	0.00	0	0.00	4	1.15	3.48	4.29
Corpus uteri	1	0.68	5	2.34	0	0.00	1	1.37	7	5.45	1.28	2.33
Ovary	4	4.74*	8	6.25*	2	2.80	1	2.10	15	3.31	4.53*	17.57
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.31
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.98
<b>Male genital system</b>	4	0.95	3	0.43	6	1.59	3	1.04	16	17.85	0.90	-7.87
Prostate	4	0.96	3	0.43	6	1.60	3	1.05	16	17.69	0.90	-7.21
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.16
<b>Urinary system</b>	1	0.40	6	1.51	2	0.91	3	1.96	12	10.20	1.18	2.00
Urinary bladder	0	0.00	3	1.11	2	1.35	1	0.97	6	6.91	0.87	-1.01
Kidney parenchyma	0	0.00	2	2.04	0	0.00	1	2.55	3	2.54	1.18	0.51
Renal pelvis, other urinary	1	5.32	1	3.38	0	0.00	1	9.43	3	0.75	3.99	2.50
Ureter	0	0.00	1	10.07	0	0.00	0	0.00	1	0.25	4.01	0.83
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.66
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.13
<b>Melanoma of skin</b>	0	0.00	1	0.98	1	1.72	0	0.00	2	2.69	0.74	-0.76
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.22
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	1	5.20	1	1.35	0.74	-0.39
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-0.96
<b>Lymphatic, hematopoietic</b>	2	0.69	5	1.09	4	1.53	1	0.55	12	11.94	1.00	0.07
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.34
Non-Hodgkin lymphoma	1	0.78	4	1.93	4	3.35	0	0.00	9	5.40	1.67	4.00
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	2.08	0.00	-2.31
Leukemia	1	0.98	1	0.62	0	0.00	1	1.63	3	4.16	0.72	-1.29
Acute lymphocytic	0	0.00	1	22.96	0	0.00	0	0.00	1	0.11	9.01	0.99
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-1.78
Acute non-lymphocytic	1	2.85	0	0.00	0	0.00	1	4.63	2	1.44	1.39	0.62
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.63

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 6,652 PYR and for male cancers on 2,347 PYR.

**Table 4.5.3:** Risk of subsequent primary cancers after cancer of the gallbladder, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	26	1.09	43	1.16	27	1.26	9	0.63	105	96.85	1.08	12.25
All excluding same site	25	1.05	43	1.16	27	1.27	9	0.63	104	96.22	1.08	11.69
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.66	0.00	-2.50
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.20
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.55
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.29
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.89
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.14
<b>Digestive system</b>	10	1.57	11	1.09	13	2.22*	4	1.06	38	26.07	1.46*	17.93
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.95
Stomach	1	1.77	1	1.12	0	0.00	1	3.32	3	2.26	1.33	1.11
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.48
Colon	1	0.31	3	0.59	6	2.01	1	0.52	11	13.19	0.83	-3.29
Rectum, rectosigmoid junction	1	1.02	3	1.98	0	0.00	1	1.92	5	3.87	1.29	1.71
Rectum	0	0.00	3	3.00	0	0.00	1	2.83	4	2.56	1.56	2.17
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.44
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.87
Gallbladder	1	6.15	0	0.00	0	0.00	0	0.00	1	0.63	1.59	0.56
Bile ducts, other biliary	3	21.15*	2	8.59	2	13.97*	1	9.86	8	0.62	12.92*	11.10
Pancreas	3	3.68	2	1.55	5	6.56*	0	0.00	10	3.37	2.97*	9.97
<b>Respiratory system</b>	3	1.05	3	0.67	3	1.14	0	0.00	9	11.88	0.76	-4.33
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.21
Larynx	0	0.00	0	0.00	1	14.67	0	0.00	1	0.33	3.04	1.01
Lung, bronchus	3	1.10	3	0.70	2	0.79	0	0.00	8	11.38	0.70	-5.08
<b>Female breast</b>	6	0.95	5	0.51	4	0.72	1	0.27	16	25.32	0.63	-14.01
<b>Female genital system</b>	6	2.06	16	3.71*	2	0.86	2	1.33	26	11.06	2.35*	22.46
Cervix uteri	1	3.04	3	6.48*	0	0.00	0	0.00	4	1.15	3.48	4.29
Corpus uteri	1	0.68	5	2.34	0	0.00	1	1.37	7	5.45	1.28	2.33
Ovary	4	4.74*	8	6.25*	2	2.80	1	2.10	15	3.31	4.53*	17.57
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.31
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.98
<b>Urinary system</b>	1	0.83	5	2.64	1	0.90	0	0.00	7	4.95	1.41	3.08
Urinary bladder	0	0.00	2	1.70	1	1.45	0	0.00	3	3.06	0.98	-0.10
Kidney parenchyma	0	0.00	2	3.64	0	0.00	0	0.00	2	1.45	1.38	0.82
Renal pelvis, other urinary	1	9.28	1	5.90	0	0.00	0	0.00	2	0.44	4.57	2.35
Ureter	0	0.00	1	18.04	0	0.00	0	0.00	1	0.14	7.03	1.29
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.13
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.58
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.08
<b>Melanoma of skin</b>	0	0.00	1	1.63	1	2.71	0	0.00	2	1.64	1.22	0.54
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.20
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	1	7.78	1	0.89	1.12	0.17
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-1.05
<b>Lymphatic, hematopoietic</b>	0	0.00	2	0.66	3	1.68	1	0.83	6	7.94	0.76	-2.92
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.30
Non-Hodgkin lymphoma	0	0.00	2	1.42	3	3.54	0	0.00	5	3.73	1.34	1.91
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.36	0.00	-2.04
Leukemia	0	0.00	0	0.00	0	0.00	1	2.52	1	2.65	0.38	-2.49
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.02	0.00	-1.53
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	1	7.13	1	0.93	1.08	0.11
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.55

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Gallbladder Males

**Table 4.5.4:** Risk of subsequent primary cancers after cancer of the gallbladder, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	1,413 624		482 957		148 464		59 302		1,413 2,347			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	15	1.09	22	1.00	16	1.38	9	1.08	62	55.61	1.11	27.20
All excluding same site	15	1.10	22	1.00	16	1.39	9	1.09	62	55.49	1.12	27.75
<b>Buccal cavity, pharynx</b>	1	2.55	0	0.00	0	0.00	0	0.00	1	1.46	0.68	-1.98
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-1.15
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-1.15
Salivary gland	1	31.30	0	0.00	0	0.00	0	0.00	1	0.13	7.64	3.70
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-1.44
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.32
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.52
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.17
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.71
<b>Digestive system</b>	5	1.56	11	2.15*	6	2.26	3	1.63	25	12.82	1.95*	51.90
Esophagus	0	0.00	1	3.49	0	0.00	0	0.00	1	0.72	1.38	1.17
Stomach	1	2.42	0	0.00	2	5.82	1	4.32	4	1.67	2.40	9.95
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.67
Colon	2	1.47	5	2.29	0	0.00	1	1.24	8	5.51	1.45	10.62
Rectum, rectosigmoid junction	0	0.00	1	1.13	1	2.26	0	0.00	2	2.18	0.92	-0.76
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.30
Liver	1	7.34	0	0.00	1	8.26	1	10.85	3	0.58	5.20*	10.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.55
Bile ducts, other biliary	0	0.00	2	17.24*	1	16.05	0	0.00	3	0.30	10.16*	11.52
Pancreas	1	2.81	2	3.54	1	3.42	0	0.00	4	1.42	2.82	11.00
<b>Respiratory system</b>	2	0.76	3	0.73	2	0.95	0	0.00	7	10.30	0.68	-14.08
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.36
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-3.12
Lung, bronchus	2	0.83	3	0.79	2	1.03	0	0.00	7	9.46	0.74	-10.49
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.43
<b>Male genital system</b>	4	0.95	3	0.43	6	1.59	3	1.04	16	17.85	0.90	-7.87
Prostate	4	0.96	3	0.43	6	1.60	3	1.05	16	17.69	0.90	-7.21
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.16
<b>Urinary system</b>	0	0.00	1	0.48	1	0.92	3	3.86	5	5.25	0.95	-1.05
Urinary bladder	0	0.00	1	0.66	1	1.26	1	1.75	3	3.84	0.78	-3.59
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	6.09	1	1.09	0.92	-0.38
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	23.29	1	0.31	3.19	2.92
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.46
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.17
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.87
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.30
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-4.46
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.28
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-1.96
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.71
<b>Lymphatic, hematopoietic</b>	2	2.02	3	1.90	1	1.21	0	0.00	6	4.00	1.50	8.52
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.45
Non-Hodgkin lymphoma	1	2.46	2	3.04	1	2.89	0	0.00	4	1.67	2.39	9.93
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-3.08
Leukemia	1	2.64	1	1.68	0	0.00	0	0.00	2	1.50	1.33	2.11
Acute lymphocytic	0	0.00	1	64.55	0	0.00	0	0.00	1	0.04	26.10	4.10
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-2.50
Acute non-lymphocytic	1	7.87	0	0.00	0	0.00	0	0.00	1	0.51	1.95	2.07
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.87

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.6.1:** Characteristics of patients with an initial cancer of the extrahepatic bile duct or other biliary tract, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	2,817	100.0	2,681	100.0	5,498	100.0
<b>Initial treatment</b>						
Any radiation	705	25.0	587	21.9	1,292	23.5
With surgery	323	11.5	226	8.4	549	10.0
Without surgery	382	13.6	361	13.5	743	13.5
No radiation	2,112	75.0	2,094	78.1	4,206	76.5
With surgery	1,057	37.5	874	32.6	1,931	35.1
Without surgery	1,055	37.5	1,220	45.5	2,275	41.4
<b>Race</b>						
White	2,372	84.2	2,246	83.8	4,618	84.0
Black	137	4.9	157	5.9	294	5.3
Other	306	10.9	276	10.3	582	10.6
Unknown	2	0.1	2	0.1	4	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	16	0.6	4	0.1	20	0.4
30–49	246	8.7	165	6.2	411	7.5
50–69	1,279	45.4	975	36.4	2,254	41.0
70–79	830	29.5	843	31.4	1,673	30.4
≥ 80	446	15.8	694	25.9	1,140	20.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	2,710	96.2	2,619	97.7	5,329	96.9
1st and 2nd cancers	102	3.6	61	2.3	163	3.0
1st, 2nd, and 3rd cancers	5	0.2	1	0.0	6	0.1
1st, 2nd, 3rd, and additional cancers	0	0.0	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	68.5	—	72.3	—	70.3	—
Median year of 1st cancer diagnosis	1988.4	—	1988.3	—	1988.4	—
Median person-years at risk	0.9	—	0.7	—	0.8	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	90.7	—	93.5	—	91.7
1st, 2nd, and additional cancers	—	90.7	—	91.9	—	91.1
1st cancer only	—	2.8	—	0.0	—	1.8

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Other Biliary Tract Both Sexes

**Table 4.6.2:** Risk of subsequent primary cancers after cancer of the extrahepatic bile duct or other biliary tract, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	5,498	3,115	37	0.70*	73	0.88	46	1.23	19	0.63*	175	203.42	0.86*	-24.89
All excluding same site			37	0.70*	73	0.88	45	1.20	18	0.60*	173	202.62	0.85*	-25.94
<b>Buccal cavity, pharynx</b>			2	1.50	1	0.47	0	0.00	0	0.00	3	5.00	0.60	-1.75
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	0.78	0.00	-0.68
Tongue			1	3.88	1	2.41	0	0.00	0	0.00	2	0.98	2.03	0.89
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.40
Mouth			0	0.00	0	0.00	0	0.00	0	0.00	0	1.31	0.00	-1.15
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.20
Tonsil			1	8.76	0	0.00	0	0.00	0	0.00	1	0.43	2.33	0.50
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.12
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.44
<b>Digestive system</b>			13	1.02	17	0.88	15	1.73	6	0.87	51	47.75	1.07	2.84
Esophagus			0	0.00	0	0.00	1	2.45	0	0.00	1	2.20	0.45	-1.05
Stomach			1	0.71	1	0.47	2	2.17	0	0.00	4	5.16	0.77	-1.02
Small intestine			0	0.00	2	7.96	0	0.00	1	10.32	3	0.62	4.82	2.08
Colon			6	1.04	6	0.68	7	1.77	3	0.94	22	21.71	1.01	0.25
Rectum, rectosigmoid junction			4	1.86	5	1.52	3	2.09	1	0.91	13	7.96	1.63	4.41
Anus, anal canal			1	9.55	0	0.00	0	0.00	0	0.00	1	0.40	2.51	0.53
Liver			0	0.00	1	1.43	0	0.00	0	0.00	1	1.73	0.58	-0.64
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.62
Bile ducts, other biliary			0	0.00	0	0.00	1	4.81	1	5.54	2	1.12	1.78	0.77
Pancreas			1	0.66	2	0.87	1	0.96	0	0.00	4	5.68	0.70	-1.47
<b>Respiratory system</b>			1	0.11*	13	0.92	10	1.57	3	0.60	27	34.32	0.79	-6.41
Nose, nasal cavity, ear			0	0.00	0	0.00	2	36.35*	0	0.00	2	0.30	6.60	1.49
Larynx			0	0.00	0	0.00	0	0.00	0	0.00	0	2.15	0.00	-1.89
Lung, bronchus			1	0.12*	13	1.00	8	1.36	3	0.64	25	31.78	0.79	-5.94
<b>Female breast</b>			5	0.97	5	0.62	4	1.15	2	0.84	16	19.13	0.84	-6.11
<b>Female genital system</b>			1	0.42	2	0.55	3	2.04	1	1.04	7	8.44	0.83	-2.81
Cervix uteri			0	0.00	0	0.00	1	6.81	1	11.77	2	0.90	2.23	2.15
Corpus uteri			1	0.83	0	0.00	0	0.00	0	0.00	1	4.23	0.24	-6.30
Ovary			0	0.00	2	1.87	2	4.47	0	0.00	4	2.51	1.60	2.92
Vagina			0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.29
Vulva			0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.88
<b>Male genital system</b>			7	0.69	12	0.74	7	0.89	3	0.42	29	41.23	0.70	-19.42
Prostate			7	0.70	12	0.75	7	0.90	3	0.43	29	40.85	0.71	-18.81
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.19
<b>Urinary system</b>			6	1.42	6	0.90	4	1.31	2	0.78	18	16.47	1.09	1.34
Urinary bladder			4	1.35	3	0.65	2	0.93	2	1.10	11	11.55	0.95	-0.48
Kidney parenchyma			1	1.03	3	1.90	2	2.75	0	0.00	6	3.86	1.55	1.87
Renal pelvis, other urinary			1	3.57	0	0.00	0	0.00	0	0.00	1	1.05	0.95	-0.05
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.31
<b>Bone, joints</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.14
<b>Soft tissue including heart</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.69
<b>Kaposi sarcoma</b>			0	0.00	1	11.13	0	0.00	0	0.00	1	0.21	4.86	0.70
<b>Melanoma of skin</b>			0	0.00	1	0.59	0	0.00	2	3.00	3	4.20	0.71	-1.05
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.24
<b>Brain, central nervous system</b>			0	0.00	1	1.24	0	0.00	0	0.00	1	1.92	0.52	-0.81
<b>Thyroid</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.99	0.00	-0.87
<b>Lymphatic, hematopoietic</b>			1	0.25	10	1.60	2	0.70	0	0.00	13	15.40	0.84	-2.10
Hodgkin lymphoma			0	0.00	1	5.44	0	0.00	0	0.00	1	0.43	2.32	0.50
Non-Hodgkin lymphoma			0	0.00	2	0.72	0	0.00	0	0.00	2	6.91	0.29	-4.30
Myeloma			0	0.00	3	2.81	0	0.00	0	0.00	3	2.63	1.14	0.32
Leukemia			1	0.70	4	1.82	2	2.02	0	0.00	7	5.42	1.29	1.38
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.13
Chronic lymphocytic			1	1.77	1	1.16	0	0.00	0	0.00	2	2.13	0.94	-0.11
Acute non-lymphocytic			0	0.00	1	1.33	2	5.85	0	0.00	3	1.86	1.61	0.99
Chronic myeloid			0	0.00	2	6.80	0	0.00	0	0.00	2	0.73	2.73	1.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,124 PYR and for male cancers on 6,298 PYR.

**Table 4.6.3:** Risk of subsequent primary cancers after cancer of the extrahepatic bile duct or other biliary tract, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	2,681	1,455	16	0.82	24	0.79	15	1.14	8	0.86	63	72.17	0.87	-17.90
All excluding same site	2,681	1,455	16	0.82	24	0.80	15	1.15	7	0.76	62	71.85	0.86	-19.22
<b>Buccal cavity, pharynx</b>	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	1.25	0.00	-2.45
Lip	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.18
Tongue	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.54
Salivary gland	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.28
Mouth	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.86
Nasopharynx	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
Tonsil	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.19
Oropharynx	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.06
Hypopharynx	1,265	2,228	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.15
<b>Digestive system</b>	283	889	9	1.75	7	0.90	3	0.88	2	0.81	21	18.78	1.12	4.33
Esophagus	283	889	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.93
Stomach	283	889	1	2.15	0	0.00	0	0.00	0	0.00	1	1.66	0.60	-1.30
Small intestine	283	889	0	0.00	2	19.89*	0	0.00	0	0.00	2	0.24	8.21	3.43
Colon	283	889	5	1.95	3	0.78	2	1.17	1	0.80	11	9.36	1.17	3.19
Rectum, rectosigmoid junction	283	889	2	2.55	2	1.71	1	2.01	0	0.00	5	2.79	1.79	4.31
Rectum	283	889	2	3.90	2	2.61	1	3.05	0	0.00	5	1.84	2.72	6.18
Anus, anal canal	283	889	1	17.12	0	0.00	0	0.00	0	0.00	1	0.22	4.61	1.53
Liver	283	889	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.88
Gallbladder	283	889	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.87
Bile ducts, other biliary	283	889	0	0.00	0	0.00	0	0.00	1	15.12	1	0.45	2.21	1.07
Pancreas	283	889	0	0.00	0	0.00	0	0.00	0	0.00	0	2.45	0.00	-4.77
<b>Respiratory system</b>	112	552	0	0.00	3	0.77	3	1.73	1	0.79	7	9.33	0.75	-4.55
Nose, nasal cavity, ear	112	552	0	0.00	0	0.00	2	105.32*	0	0.00	2	0.10	19.33*	3.70
Larynx	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.52
Lung, bronchus	112	552	0	0.00	3	0.80	1	0.60	1	0.82	5	8.94	0.56	-7.69
<b>Female breast</b>	112	552	5	0.97	5	0.62	4	1.15	2	0.84	16	19.13	0.84	-6.11
<b>Female genital system</b>	112	552	1	0.42	2	0.55	3	2.04	1	1.04	7	8.44	0.83	-2.81
Cervix uteri	112	552	0	0.00	0	0.00	1	6.81	1	11.77	2	0.90	2.23	2.15
Corpus uteri	112	552	1	0.83	0	0.00	0	0.00	0	0.00	1	4.23	0.24	-6.30
Ovary	112	552	0	0.00	2	1.87	2	4.47	0	0.00	4	2.51	1.60	2.92
Vagina	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.29
Vulva	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.88
<b>Urinary system</b>	112	552	0	0.00	1	0.67	0	0.00	0	0.00	1	3.63	0.28	-5.13
Urinary bladder	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	2.20	0.00	-4.29
Kidney parenchyma	112	552	0	0.00	1	2.15	0	0.00	0	0.00	1	1.11	0.90	-0.21
Renal pelvis, other urinary	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.62
Ureter	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.20
<b>Bone, joints</b>	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.12
<b>Soft tissue including heart</b>	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.56
<b>Kaposi sarcoma</b>	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.06
<b>Melanoma of skin</b>	112	552	0	0.00	0	0.00	0	0.00	2	12.28*	2	1.22	1.64	1.52
<b>Eye, orbit</b>	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.19
<b>Brain, central nervous system</b>	112	552	0	0.00	1	3.41	0	0.00	0	0.00	1	0.69	1.46	0.61
<b>Thyroid</b>	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-1.08
<b>Lymphatic, hematopoietic</b>	112	552	0	0.00	3	1.26	2	1.88	0	0.00	5	5.80	0.86	-1.56
Hodgkin lymphoma	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.29
Non-Hodgkin lymphoma	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	2.76	0.00	-5.38
Myeloma	112	552	0	0.00	2	4.73	0	0.00	0	0.00	2	1.02	1.97	1.92
Leukemia	112	552	0	0.00	1	1.30	2	5.86	0	0.00	3	1.87	1.60	2.20
Acute lymphocytic	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.10
Chronic lymphocytic	112	552	0	0.00	1	3.41	0	0.00	0	0.00	1	0.71	1.40	0.56
Acute non-lymphocytic	112	552	0	0.00	0	0.00	2	16.39*	0	0.00	2	0.67	2.99	2.60
Chronic myeloid	112	552	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.50

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Other Biliary Tract Males

**Table 4.6.4:** Risk of subsequent primary cancers after cancer of the extrahepatic bile duct or other biliary tract, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	2,817	1,660	21	0.63*	49	0.93	31	1.27	11	0.53*	112	131.25	0.85	-30.57
All excluding same site			21	0.63*	49	0.93	30	1.23	11	0.53*	111	130.78	0.85	-31.40
<b>Buccal cavity, pharynx</b>	2,817	1,660	2	2.02	1	0.64	0	0.00	0	0.00	3	3.75	0.80	-1.18
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-1.09
Tongue			1	5.48	1	3.36	0	0.00	0	0.00	2	0.71	2.82	2.05
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.51
Mouth			0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-1.38
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.28
Tonsil			1	11.53	0	0.00	0	0.00	0	0.00	1	0.33	3.02	1.06
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.17
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.67
<b>Digestive system</b>	2,817	1,660	4	0.53	10	0.86	12	2.28*	4	0.90	30	28.97	1.04	1.64
Esophagus			0	0.00	0	0.00	1	3.11	0	0.00	1	1.73	0.58	-1.15
Stomach			0	0.00	1	0.71	2	3.21	0	0.00	3	3.50	0.86	-0.79
Small intestine			0	0.00	0	0.00	0	0.00	1	16.17	1	0.38	2.64	0.99
Colon			1	0.31	3	0.61	5	2.22	2	1.03	11	12.35	0.89	-2.14
Rectum, rectosigmoid junction			2	1.47	3	1.42	2	2.13	1	1.32	8	5.17	1.55	4.49
Anus, anal canal			0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.29
Liver			0	0.00	1	1.95	0	0.00	0	0.00	1	1.28	0.78	-0.44
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.42
Bile ducts, other biliary			0	0.00	0	0.00	1	8.17	0	0.00	1	0.67	1.49	0.52
Pancreas			1	1.18	2	1.53	1	1.71	0	0.00	4	3.23	1.24	1.22
<b>Respiratory system</b>	2,817	1,660	1	0.16*	10	0.98	7	1.51	2	0.54	20	24.99	0.80	-7.93
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.32
Larynx			0	0.00	0	0.00	0	0.00	0	0.00	0	1.89	0.00	-3.00
Lung, bronchus			1	0.17*	10	1.07	7	1.65	2	0.58	20	22.84	0.88	-4.51
<b>Male breast</b>	2,817	1,660	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.39
<b>Male genital system</b>	2,817	1,660	7	0.69	12	0.74	7	0.89	3	0.42	29	41.23	0.70	-19.42
Prostate			7	0.70	12	0.75	7	0.90	3	0.43	29	40.85	0.71	-18.81
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.19
<b>Urinary system</b>	2,817	1,660	6	1.85	5	0.97	4	1.67	2	0.97	17	12.84	1.32	6.60
Urinary bladder			4	1.68	3	0.81	2	1.15	2	1.31	11	9.35	1.18	2.62
Kidney parenchyma			1	1.47	2	1.79	2	3.83	0	0.00	5	2.75	1.82	3.57
Renal pelvis, other urinary			1	5.17	0	0.00	0	0.00	0	0.00	1	0.74	1.36	0.42
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.40
<b>Bone, joints</b>	2,817	1,660	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.16
<b>Soft tissue including heart</b>	2,817	1,660	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.80
<b>Kaposi sarcoma</b>	2,817	1,660	0	0.00	1	13.05	0	0.00	0	0.00	1	0.17	5.80	1.31
<b>Melanoma of skin</b>	2,817	1,660	0	0.00	1	0.84	0	0.00	0	0.00	1	2.97	0.34	-3.14
<b>Eye, orbit</b>	2,817	1,660	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.28
<b>Brain, central nervous system</b>	2,817	1,660	0	0.00	0	0.00	0	0.00	0	0.00	0	1.24	0.00	-1.96
<b>Thyroid</b>	2,817	1,660	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.69
<b>Lymphatic, hematopoietic</b>	2,817	1,660	1	0.41	7	1.82	0	0.00	0	0.00	8	9.60	0.83	-2.54
Hodgkin lymphoma			0	0.00	1	8.40	0	0.00	0	0.00	1	0.28	3.56	1.14
Non-Hodgkin lymphoma			0	0.00	2	1.21	0	0.00	0	0.00	2	4.16	0.48	-3.42
Myeloma			0	0.00	1	1.55	0	0.00	0	0.00	1	1.61	0.62	-0.97
Leukemia			1	1.08	3	2.10	0	0.00	0	0.00	4	3.55	1.13	0.71
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.15
Chronic lymphocytic			1	2.72	0	0.00	0	0.00	0	0.00	1	1.41	0.71	-0.66
Acute non-lymphocytic			0	0.00	1	2.10	0	0.00	0	0.00	1	1.20	0.84	-0.31
Chronic myeloid			0	0.00	2	10.53*	0	0.00	0	0.00	2	0.48	4.19	2.42

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.7.1:** Characteristics of patients with an initial cancer of the pancreas, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	18,914	100.0	19,437	100.0	38,351	100.0
<b>Initial treatment</b>						
Any radiation	4,602	24.3	4,014	20.7	8,616	22.5
With surgery	817	4.3	760	3.9	1,577	4.1
Without surgery	3,785	20.0	3,254	16.7	7,039	18.4
No radiation	14,312	75.7	15,423	79.3	29,735	77.5
With surgery	1,610	8.5	1,725	8.9	3,335	8.7
Without surgery	12,702	67.2	13,698	70.5	26,400	68.8
<b>Race</b>						
White	15,717	83.1	16,192	83.3	31,909	83.2
Black	1,981	10.5	2,140	11.0	4,121	10.7
Other	1,196	6.3	1,083	5.6	2,279	5.9
Unknown	20	0.1	22	0.1	42	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	40	0.2	72	0.4	112	0.3
30–49	1,699	9.0	1,168	6.0	2,867	7.5
50–69	9,799	51.8	7,833	40.3	17,632	46.0
70–79	5,262	27.8	6,187	31.8	11,449	29.9
≥ 80	2,114	11.2	4,177	21.5	6,291	16.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	18,705	98.9	19,288	99.2	37,993	99.1
1st and 2nd cancers	201	1.1	139	0.7	340	0.9
1st, 2nd, and 3rd cancers	7	0.0	10	0.1	17	0.0
1st, 2nd, 3rd, and additional cancers	1	0.0	0	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	66.8	—	71.0	—	68.8	—
Median year of 1st cancer diagnosis	1988.0	—	1988.5	—	1988.2	—
Median person-years at risk	0.3	—	0.3	—	0.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	79.9	—	75.2	—	77.9
1st, 2nd, and additional cancers	—	79.9	—	74.5	—	77.7
1st cancer only	—	2.4	—	5.4	—	3.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Pancreas**  
**Both Sexes**

**Table 4.7.2:** Risk of subsequent primary cancers after cancer of the pancreas, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	38,351	14,736	141	0.59*	149	0.87	64	1.07	23	0.62*	377	505.82	0.75*	-40.92
All excluding same site			140	0.61*	149	0.90	64	1.11	23	0.64*	376	491.26	0.77*	-36.61
<b>Buccal cavity, pharynx</b>			1	0.16*	3	0.71	2	1.45	1	1.25	7	12.51	0.56	-1.75
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	1.83	0.00	-0.58
Tongue			0	0.00	0	0.00	0	0.00	0	0.00	0	2.48	0.00	-0.79
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	1.11	0.00	-0.35
Mouth			0	0.00	2	1.74	0	0.00	1	4.61	3	3.39	0.88	-0.12
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.16
Tonsil			1	1.78	1	2.52	1	7.92	0	0.00	3	1.16	2.60	0.59
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.11
Hypopharynx			0	0.00	0	0.00	1	7.42	0	0.00	1	1.25	0.80	-0.08
<b>Digestive system</b>			35	0.62*	38	0.95	8	0.57	2	0.24*	83	118.59	0.70*	-11.31
Esophagus			2	0.76	4	2.13	0	0.00	1	2.55	7	5.55	1.26	0.46
Stomach			7	1.19	3	0.72	3	2.06	1	1.17	14	12.38	1.13	0.52
Small intestine			2	2.74	5	9.31*	0	0.00	0	0.00	7	1.59	4.39*	1.72
Colon			17	0.66	16	0.87	3	0.46	0	0.00*	36	54.48	0.66*	-5.87
Rectum, rectosigmoid junction			3	0.32*	9	1.36	2	0.91	0	0.00	14	19.58	0.72	-1.77
Anus, anal canal			1	2.00	1	2.73	0	0.00	0	0.00	2	1.07	1.87	0.29
Liver			0	0.00	0	0.00	0	0.00	0	0.00	0	3.87	0.00*	-1.23
Gallbladder			1	1.15	0	0.00	0	0.00	0	0.00	1	1.80	0.56	-0.25
Bile ducts, other biliary			1	0.85	0	0.00	0	0.00	0	0.00	1	2.56	0.39	-0.50
Pancreas			1	0.15*	0	0.00*	0	0.00	0	0.00	1	14.57	0.07*	-4.31
<b>Respiratory system</b>			14	0.35*	23	0.81	22	2.29*	6	1.01	65	84.26	0.77*	-6.12
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.24
Larynx			1	0.38	0	0.00	1	1.72	0	0.00	2	5.36	0.37	-1.07
Lung, bronchus			12	0.32*	23	0.87	21	2.35*	6	1.08	62	77.95	0.80	-5.07
<b>Female breast</b>			13	0.48*	25	1.27	5	0.71	4	0.93	47	57.95	0.81	-6.63
<b>Female genital system</b>			6	0.48	11	1.25	2	0.67	1	0.57	20	26.02	0.77	-3.65
Cervix uteri			1	0.69	0	0.00	0	0.00	0	0.00	1	3.06	0.33	-1.24
Corpus uteri			0	0.00*	2	0.46	1	0.69	0	0.00	3	12.97	0.23*	-6.04
Ovary			4	1.12	8	3.10*	1	1.11	0	0.00	13	7.59	1.71	3.27
Vagina			1	4.68	0	0.00	0	0.00	0	0.00	1	0.46	2.20	0.33
Vulva			0	0.00	1	2.27	0	0.00	1	9.94	2	1.31	1.53	0.42
<b>Male genital system</b>			42	1.00	23	0.75	13	1.18	1	0.14*	79	91.21	0.87	-8.16
Prostate			42	1.01	22	0.72	12	1.10	1	0.14*	77	90.27	0.85	-8.87
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.22
<b>Urinary system</b>			8	0.44*	7	0.54	5	1.12	1	0.35	21	38.38	0.55*	-5.52
Urinary bladder			4	0.32*	4	0.45	4	1.31	0	0.00	12	26.40	0.45*	-4.58
Kidney parenchyma			4	0.90	2	0.62	1	0.90	1	1.39	8	9.46	0.85	-0.46
Renal pelvis, other urinary			0	0.00	1	1.18	0	0.00	0	0.00	1	2.51	0.40	-0.48
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.26
<b>Bone, joints</b>			1	4.96	0	0.00	0	0.00	0	0.00	1	0.42	2.38	0.18
<b>Soft tissue including heart</b>			0	0.00	2	2.98	0	0.00	0	0.00	2	1.97	1.02	0.01
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.19
<b>Melanoma of skin</b>			3	0.67	1	0.30	0	0.00	2	2.49	6	9.88	0.61	-1.23
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.22
<b>Brain, central nervous system</b>			0	0.00	2	1.23	0	0.00	0	0.00	2	4.78	0.42	-0.88
<b>Thyroid</b>			11	8.95*	0	0.00	1	3.10	0	0.00	12	2.68	4.48*	2.96
<b>Lymphatic, hematopoietic</b>			4	0.23*	8	0.62	6	1.33	5	1.76	23	38.01	0.61*	-4.77
Hodgkin lymphoma			0	0.00	0	0.00	0	0.00	0	0.00	0	1.15	0.00	-0.36
Non-Hodgkin lymphoma			3	0.39	6	1.06	3	1.52	2	1.55	14	16.65	0.84	-0.84
Myeloma			0	0.00	0	0.00	0	0.00	1	1.93	1	6.87	0.15*	-1.87
Leukemia			1	0.16*	2	0.44	3	1.90	2	2.08	8	13.34	0.60	-1.70
Acute lymphocytic			0	0.00	0	0.00	1	22.46	0	0.00	1	0.36	2.77	0.20
Chronic lymphocytic			1	0.40	1	0.56	0	0.00	0	0.00	2	5.30	0.38	-1.05
Acute non-lymphocytic			0	0.00	1	0.66	2	3.76	2	6.01	5	4.50	1.11	0.16
Chronic myeloid			0	0.00	0	0.00	0	0.00	0	0.00	0	1.82	0.00	-0.58

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 16,515 PYR and for male cancers on 14,964 PYR.

**Table 4.7.3:** Risk of subsequent primary cancers after cancer of the pancreas, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	47	0.47*	72	0.99	27	1.04	13	0.82	159	214.06	0.74*	-33.34
All excluding same site	46	0.48*	72	1.03	27	1.08	13	0.85	158	206.86	0.76*	-29.59
<b>Buccal cavity, pharynx</b>	0	0.00	2	1.59	0	0.00	0	0.00	2	3.72	0.54	-1.04
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.16
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.81	0.00	-0.49
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.25
Mouth	0	0.00	2	4.54	0	0.00	0	0.00	2	1.31	1.53	0.42
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.19
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.15
<b>Digestive system</b>	12	0.47*	17	0.93	4	0.61	1	0.25	34	54.21	0.63*	-12.24
Esophagus	1	1.45	2	4.00	0	0.00	0	0.00	3	1.48	2.02	0.92
Stomach	0	0.00	1	0.65	1	1.78	1	2.95	3	4.57	0.66	-0.95
Small intestine	1	3.04	2	8.13	0	0.00	0	0.00	3	0.73	4.10	1.37
Colon	7	0.55	9	0.99	1	0.30	0	0.00	17	27.14	0.63	-6.14
Rectum, rectosigmoid junction	0	0.00*	2	0.73	2	2.13	0	0.00	4	8.13	0.49	-2.50
Rectum	0	0.00	1	0.56	1	1.62	0	0.00	2	5.33	0.38	-2.02
Anus, anal canal	0	0.00	1	4.50	0	0.00	0	0.00	1	0.65	1.53	0.21
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.20	0.00	-0.73
Gallbladder	1	1.67	0	0.00	0	0.00	0	0.00	1	1.23	0.81	-0.14
Bile ducts, other biliary	1	1.83	0	0.00	0	0.00	0	0.00	1	1.20	0.84	-0.12
Pancreas	1	0.30	0	0.00	0	0.00	0	0.00	1	7.20	0.14*	-3.76
<b>Respiratory system</b>	7	0.55	9	0.96	13	3.86*	4	1.88	33	27.47	1.20	3.35
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.18
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-0.52
Lung, bronchus	7	0.58	9	1.01	13	4.03*	4	1.96	33	26.25	1.26	4.09
<b>Female breast</b>	13	0.48*	25	1.27	5	0.71	4	0.93	47	57.95	0.81	-6.63
<b>Female genital system</b>	6	0.48	11	1.25	2	0.67	1	0.57	20	26.02	0.77	-3.65
Cervix uteri	1	0.69	0	0.00	0	0.00	0	0.00	1	3.06	0.33	-1.24
Corpus uteri	0	0.00*	2	0.46	1	0.69	0	0.00	3	12.97	0.23*	-6.04
Ovary	4	1.12	8	3.10*	1	1.11	0	0.00	13	7.59	1.71	3.27
Vagina	1	4.68	0	0.00	0	0.00	0	0.00	1	0.46	2.20	0.33
Vulva	0	0.00	1	2.27	0	0.00	1	9.94	2	1.31	1.53	0.42
<b>Urinary system</b>	1	0.20	1	0.28	1	0.78	0	0.00	3	10.58	0.28*	-4.59
Urinary bladder	0	0.00	1	0.47	1	1.30	0	0.00	2	6.35	0.31	-2.64
Kidney parenchyma	1	0.66	0	0.00	0	0.00	0	0.00	1	3.32	0.30	-1.41
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.90	0.00	-0.55
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.17
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.11
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.52
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.06
<b>Melanoma of skin</b>	2	1.21	0	0.00	0	0.00	2	7.09	4	3.66	1.09	0.21
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.18
<b>Brain, central nervous system</b>	0	0.00	2	2.87	0	0.00	0	0.00	2	2.05	0.98	-0.03
<b>Thyroid</b>	3	3.88	0	0.00	0	0.00	0	0.00	3	1.72	1.74	0.77
<b>Lymphatic, hematopoietic</b>	1	0.13*	3	0.52	2	0.96	1	0.78	7	16.92	0.41*	-6.00
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.29
Non-Hodgkin lymphoma	1	0.28	2	0.75	0	0.00	1	1.66	4	7.83	0.51	-2.32
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.15	0.00	-1.91
Leukemia	0	0.00	1	0.54	2	3.00	0	0.00	3	5.47	0.55	-1.49
Acute lymphocytic	0	0.00	0	0.00	1	50.49	0	0.00	1	0.15	6.48	0.51
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	2.11	0.00	-1.28
Acute non-lymphocytic	0	0.00	1	1.55	1	4.25	0	0.00	2	1.92	1.04	0.05
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.46

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Pancreas**  
**Males**

**Table 4.7.4:** Risk of subsequent primary cancers after cancer of the pancreas, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	18,914		4,436		531		183		18,914			
<b>Person-years in interval</b>	7,186		5,172		1,628		977		14,964			
<b>All subsequent cancers</b>	94	0.68*	77	0.78*	37	1.10	10	0.47*	218	291.76	0.75*	-49.29
All excluding same site	94	0.70*	77	0.80	37	1.13	10	0.48*	218	284.40	0.77*	-44.37
<b>Buccal cavity, pharynx</b>	1	0.23	1	0.33	2	2.11	1	1.83	5	8.79	0.57	-2.53
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.56	0.00	-1.04
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.67	0.00	-1.11
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.46
Mouth	0	0.00	0	0.00	0	0.00	1	7.91	1	2.09	0.48	-0.73
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.23
Tonsil	1	2.44	1	3.45	1	10.97	0	0.00	3	0.84	3.55	1.44
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.17
Hypopharynx	0	0.00	0	0.00	1	9.26	0	0.00	1	1.01	0.99	0.00
<b>Digestive system</b>	23	0.75	21	0.96	4	0.54	1	0.22	49	64.38	0.76	-10.28
Esophagus	1	0.51	2	1.45	0	0.00	1	3.58	4	4.07	0.98	-0.04
Stomach	7	1.86	2	0.76	2	2.23	0	0.00	11	7.81	1.41	2.13
Small intestine	1	2.49	3	10.30*	0	0.00	0	0.00	4	0.86	4.64*	2.10
Colon	10	0.77	7	0.76	2	0.62	0	0.00	19	27.34	0.69	-5.57
Rectum, rectosigmoid junction	3	0.54	7	1.81	0	0.00	0	0.00	10	11.44	0.87	-0.96
Anus, anal canal	1	5.09	0	0.00	0	0.00	0	0.00	1	0.42	2.39	0.39
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	2.67	0.00	-1.79
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.38
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.36	0.00	-0.91
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	7.37	0.00*	-4.92
<b>Respiratory system</b>	7	0.25*	14	0.73	9	1.44	2	0.52	32	56.79	0.56*	-16.57
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.30
Larynx	1	0.45	0	0.00	1	2.07	0	0.00	2	4.50	0.44	-1.67
Lung, bronchus	5	0.20*	14	0.80	8	1.40	2	0.57	29	51.70	0.56*	-15.17
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.37
<b>Male genital system</b>	42	1.00	23	0.75	13	1.18	1	0.14*	79	91.21	0.87	-8.16
Prostate	42	1.01	22	0.72	12	1.10	1	0.14*	77	90.27	0.85	-8.87
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.22
<b>Urinary system</b>	7	0.53	6	0.64	4	1.26	1	0.49	18	27.80	0.65	-6.55
Urinary bladder	4	0.42	3	0.44	3	1.31	0	0.00	10	20.05	0.50*	-6.72
Kidney parenchyma	3	1.04	2	0.96	1	1.42	1	2.19	7	6.14	1.14	0.57
Renal pelvis, other urinary	0	0.00	1	1.84	0	0.00	0	0.00	1	1.61	0.62	-0.41
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.36
<b>Bone, joints</b>	1	8.91	0	0.00	0	0.00	0	0.00	1	0.23	4.33	0.51
<b>Soft tissue including heart</b>	0	0.00	2	5.30	0	0.00	0	0.00	2	1.10	1.81	0.60
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.33
<b>Melanoma of skin</b>	1	0.35	1	0.47	0	0.00	0	0.00	2	6.22	0.32	-2.82
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.26
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.73	0.00	-1.83
<b>Thyroid</b>	8	17.58*	0	0.00	1	9.52	0	0.00	9	0.96	9.39*	5.37
<b>Lymphatic, hematopoietic</b>	3	0.30*	5	0.70	4	1.64	4	2.56	16	21.10	0.76	-3.41
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.45
Non-Hodgkin lymphoma	2	0.49	4	1.33	3	2.95	1	1.45	10	8.82	1.13	0.79
Myeloma	0	0.00	0	0.00	0	0.00	1	3.65	1	3.73	0.27	-1.82
Leukemia	1	0.27	1	0.37	1	1.10	2	3.57	5	7.87	0.64	-1.92
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.14
Chronic lymphocytic	1	0.66	1	0.93	0	0.00	0	0.00	2	3.19	0.63	-0.79
Acute non-lymphocytic	0	0.00	0	0.00	1	3.36	2	10.66*	3	2.58	1.16	0.28
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.07	0.00	-0.71

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 4.7.5:** Risk of subsequent primary cancers after cancer of the pancreas, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4	1.13	6	1.17	2	0.49	12	1.97*	24	18.85	1.27	10.35
All excluding same site	4	1.15	6	1.19	2	0.50	12	2.01*	24	18.50	1.30	11.05
<b>Buccal cavity, pharynx</b>	0	0.00	1	4.73	0	0.00	0	0.00	1	0.69	1.45	0.62
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.12
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.31
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.12
Mouth	0	0.00	1	18.43	0	0.00	0	0.00	1	0.18	5.60	1.65
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.20
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.13
<b>Digestive system</b>	0	0.00	1	1.32	0	0.00	1	0.96	2	2.95	0.68	-1.90
Esophagus	0	0.00	0	0.00	0	0.00	1	14.75	1	0.21	4.67	1.58
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.59
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.14
Colon	0	0.00	1	3.67	0	0.00	0	0.00	1	1.12	0.89	-0.24
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-1.14
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.12
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.29
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.06
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.11
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.70
<b>Respiratory system</b>	0	0.00	1	1.43	2	3.24	4	4.02*	7	2.77	2.53*	8.51
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.07
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.51
Lung, bronchus	0	0.00	1	1.63	2	3.64	4	4.40*	7	2.47	2.84*	9.11
<b>Female breast</b>	0	0.00	1	0.86	0	0.00	3	2.70	4	4.03	0.99	-0.11
<b>Female genital system</b>	2	6.11	0	0.00	0	0.00	1	2.24	3	1.61	1.86	5.31
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-1.58
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-2.40
Ovary	2	20.61*	0	0.00	0	0.00	0	0.00	2	0.48	4.21	5.83
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.07
Vulva	0	0.00	0	0.00	0	0.00	1	72.01	1	0.05	21.22	3.64
<b>Male genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.69	0.00	-7.16
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	1.53	0.00	-6.47
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.60
<b>Urinary system</b>	0	0.00	0	0.00	0	0.00	1	2.51	1	1.12	0.89	-0.25
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-1.22
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	6.88	1	0.47	2.15	1.07
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.10
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.02
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.25
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.38
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	2	9.45*	2	0.90	2.22	2.21
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.07
<b>Brain, central nervous system</b>	0	0.00	1	9.80	0	0.00	0	0.00	1	0.32	3.10	1.36
<b>Thyroid</b>	2	19.36*	0	0.00	0	0.00	0	0.00	2	0.41	4.91	3.20
<b>Lymphatic, hematopoietic</b>	0	0.00	1	2.22	0	0.00	0	0.00	1	1.53	0.65	-1.06
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.29
Non-Hodgkin lymphoma	0	0.00	1	4.34	0	0.00	0	0.00	1	0.78	1.28	0.44
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.40
Leukemia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.82
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.25
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.29
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.14

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,615 PYR and for male cancers on 2,361 PYR.



# Pancreas

## Both Sexes, ≥50 Years of Age

**Table 4.7.6:** Risk of subsequent primary cancers after cancer of the pancreas, both sexes, ≥50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	35,372	13,342	137	0.58*	143	0.86	62	1.12	11	0.35*	353	486.97	0.72*	-50.55
All excluding same site			136	0.60*	143	0.89	62	1.15	11	0.36*	352	472.75	0.74*	-45.56
<b>Buccal cavity, pharynx</b>			1	0.17*	2	0.50	2	1.63	1	1.60	6	11.82	0.51	-2.20
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	1.77	0.00	-0.67
Tongue			0	0.00	0	0.00	0	0.00	0	0.00	0	2.33	0.00	-0.88
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.40
Mouth			0	0.00	1	0.91	0	0.00	1	5.84	2	3.21	0.62	-0.46
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.17
Tonsil			1	1.86	1	2.74	1	9.60	0	0.00	3	1.06	2.84	0.73
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.12
Hypopharynx			0	0.00	0	0.00	1	8.36	0	0.00	1	1.19	0.84	-0.07
<b>Digestive system</b>			35	0.63*	37	0.94	8	0.60	1	0.13*	81	115.64	0.70*	-13.07
Esophagus			2	0.77	4	2.20	0	0.00	0	0.00	6	5.33	1.12	0.25
Stomach			7	1.20	3	0.73	3	2.15	1	1.31	14	12.08	1.16	0.72
Small intestine			2	2.79	5	9.67*	0	0.00	0	0.00	7	1.52	4.60*	2.07
Colon			17	0.67	15	0.83	3	0.48	0	0.00	35	53.36	0.66*	-6.93
Rectum, rectosigmoid junction			3	0.32*	9	1.39	2	0.97	0	0.00	14	19.01	0.74	-1.89
Anus, anal canal			1	2.05	1	2.87	0	0.00	0	0.00	2	1.01	1.98	0.37
Liver			0	0.00	0	0.00	0	0.00	0	0.00	0	3.73	0.00*	-1.41
Gallbladder			1	1.16	0	0.00	0	0.00	0	0.00	1	1.77	0.57	-0.29
Bile ducts, other biliary			1	0.86	0	0.00	0	0.00	0	0.00	1	2.50	0.40	-0.57
Pancreas			1	0.15*	0	0.00*	0	0.00	0	0.00	1	14.22	0.07*	-4.99
<b>Respiratory system</b>			14	0.35*	22	0.79	20	2.22*	2	0.40	58	81.50	0.71*	-8.87
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.27
Larynx			1	0.39	0	0.00	1	1.91	0	0.00	2	5.10	0.39	-1.17
Lung, bronchus			12	0.33*	22	0.86	19	2.27*	2	0.43	55	75.48	0.73*	-7.73
<b>Female breast</b>			13	0.50*	24	1.29	5	0.82	1	0.32	43	53.92	0.80	-7.86
<b>Female genital system</b>			4	0.33*	11	1.32	2	0.76	0	0.00	17	24.41	0.70	-5.33
Cervix uteri			1	0.74	0	0.00	0	0.00	0	0.00	1	2.64	0.38	-1.18
Corpus uteri			0	0.00*	2	0.47	1	0.77	0	0.00	3	12.34	0.24*	-6.72
Ovary			2	0.57	8	3.28*	1	1.27	0	0.00	11	7.12	1.55	2.79
Vagina			1	4.74	0	0.00	0	0.00	0	0.00	1	0.44	2.28	0.40
Vulva			0	0.00	1	2.35	0	0.00	0	0.00	1	1.26	0.79	-0.19
<b>Male genital system</b>			42	1.00	23	0.76	13	1.22	1	0.15*	79	89.52	0.88	-8.35
Prostate			42	1.01	22	0.73	12	1.13	1	0.16*	77	88.74	0.87	-9.31
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.15
<b>Urinary system</b>			8	0.45*	7	0.55	5	1.19	0	0.00	20	37.25	0.54*	-6.51
Urinary bladder			4	0.32*	4	0.46	4	1.36	0	0.00	12	25.80	0.47*	-5.21
Kidney parenchyma			4	0.92	2	0.65	1	0.99	0	0.00	7	9.00	0.78	-0.75
Renal pelvis, other urinary			0	0.00	1	1.20	0	0.00	0	0.00	1	2.46	0.41	-0.55
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.30
<b>Bone, joints</b>			1	5.19	0	0.00	0	0.00	0	0.00	1	0.39	2.59	0.23
<b>Soft tissue including heart</b>			0	0.00	2	3.17	0	0.00	0	0.00	2	1.84	1.08	0.06
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.15
<b>Melanoma of skin</b>			3	0.70	1	0.32	0	0.00	0	0.00	4	8.98	0.45	-1.88
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.24
<b>Brain, central nervous system</b>			0	0.00	1	0.66	0	0.00	0	0.00	1	4.46	0.22	-1.31
<b>Thyroid</b>			9	8.00*	0	0.00	1	4.19	0	0.00	10	2.27	4.40*	2.92
<b>Lymphatic, hematopoietic</b>			4	0.23*	7	0.56	6	1.43	5	2.08	22	36.49	0.60*	-5.47
Hodgkin lymphoma			0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-0.38
Non-Hodgkin lymphoma			3	0.40	5	0.92	3	1.65	2	1.88	13	15.87	0.82	-1.08
Myeloma			0	0.00	0	0.00	0	0.00	1	2.23	1	6.68	0.15*	-2.14
Leukemia			1	0.16*	2	0.45	3	2.01	2	2.39	8	12.93	0.62	-1.86
Acute lymphocytic			0	0.00	0	0.00	1	25.78	0	0.00	1	0.33	3.00	0.25
Chronic lymphocytic			1	0.40	1	0.57	0	0.00	0	0.00	2	5.18	0.39	-1.20
Acute non-lymphocytic			0	0.00	1	0.68	2	3.97	2	6.89	5	4.35	1.15	0.24
Chronic myeloid			0	0.00	0	0.00	0	0.00	0	0.00	0	1.75	0.00	-0.66

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 13,899 PYR and for male cancers on 12,603 PYR.

# Chapter 5

## New Malignancies Following Cancer of the Colon, Rectum, and Anus

Pauline A. Mysliwiec, Kathleen A. Cronin, Arthur Schatzkin

### Synopsis

The risk of subsequent primary cancer was evaluated in more than 260,000 men and women diagnosed with cancer of the colon, rectum, or anus between 1973 and 2000. The overall risk of subsequent cancers was increased among survivors of both colon cancer (O/E=1.07, O=20,847, EAR=13 per 10,000 person-years) and anal cancer (O/E=1.24, O=509, EAR=36), but not among those with rectal cancer (O/E=1.00, O=8,117). Shared lifestyle and environmental risk factors—such as diet, obesity, and physical inactivity—possibly contributed to the increased risks of other digestive tract cancers seen after colon and rectal cancer. In addition, genetic factors likely influenced the elevated risks of new tumors among younger colorectal cancer patients (ages <40 years). In particular, the constellation of subsequent tumors—including cancers of the stomach, small intestine, colon, rectum, bile ducts, uterine corpus, ovary, renal pelvis/ureter, and brain—was suggestive of hereditary nonpolyposis colon cancer, familial adenomatous polyposis, or Turcot syndrome. The excess of lung cancer occurring after rectal cancer may be related to an effect of cigarette smoking on both tumors. Long-term survivors of rectal cancer initially treated with radiation had increased risks of cancers of the uterine corpus and urinary bladder, suggesting a carcinogenic effect of treatment. Patients with anal cancer had elevated risks for cancers of the buccal cavity and pharynx (tongue and tonsil), lung, vulva, and vagina, as well as for Kaposi sarcoma. These associations pointed to underlying risk factors, including infection with human papillomaviruses and the human immunodeficiency virus (HIV).

### Colon Cancer

Colon cancer is the fourth most frequent cancer in both men and women in the U.S., and colon and rectal cancers combined account for 10% of all cancer deaths (Jemal et al, 2005). The incidence of colon cancer is higher among American men than women, and the overall 5-year relative survival rate for the most recent time period is 63.0% (Ries et al, 2004). The primary treatment for the vast majority of colon cancers is surgical (or endoscopic) exci-

sion. In those with stage III disease, risk of recurrence is high and adjuvant chemotherapy is recommended (NIH Consensus Conference, 1990).

The 20-fold international variation in incidence and mortality rates for colon cancer and the rapid rise in incidence among persons migrating from low- to high-incidence areas indicate the importance of lifestyle and environmental determinants (Potter, 1999; Giovannucci, 2002; Martinez, 2005). A growing body of evidence points to the role of energy balance, with obesity and physical inactivity shown as risk factors for colon cancer in most studies. In addition to caloric intake, several studies have reported elevated risks associated with the high consumption of red and processed meat, and with low intake of vegetables and fruits. An inverse association between dietary fiber intake and colon cancer risk has been reported, but the evidence to date is not conclusive. High alcohol consumption, particularly in the presence of a diet low in micronutrients such as folate, and cigarette smoking early in life have been associated with modest elevations of colorectal cancer risk in several recent studies (Giovannucci, 2001; Cho et al, 2004; Corrao et al, 2004). An excess of colon cancer has been noted among persons with chronic inflammatory bowel disease, including ulcerative colitis and Crohn's disease (Ekbom et al, 1990a,b). Use of nonsteroidal anti-inflammatory drugs, postmenopausal hormone replacement therapy, and calcium and vitamin D intake are considered to be protective for colon cancer.

Approximately 10% to 20% of colon cancers are associated with familial occurrences involving a first-degree relative (Burt, 2000). Some of the familial cases are attributable to hereditary syndromes such as familial adenomatous polyposis (FAP), which is due to germline mutations of the APC gene, and hereditary nonpolyposis colon cancer (HNPCC), which is caused by inherited mutations in mismatch repair genes (Burt et al, 1995; Marra and Boland, 1995; Peltomaki and Vasen, 1997; Lynch and de la Chapelle, 1999). Both syndromes are characterized by early onset of multiple colorectal cancers, but account for only a small percentage (3%) of these malignancies (Burt, 2000).

### Results and Discussion

Overall, 179,370 patients who survived 2 months or longer after a diagnosis of colon cancer were reported to

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000).*

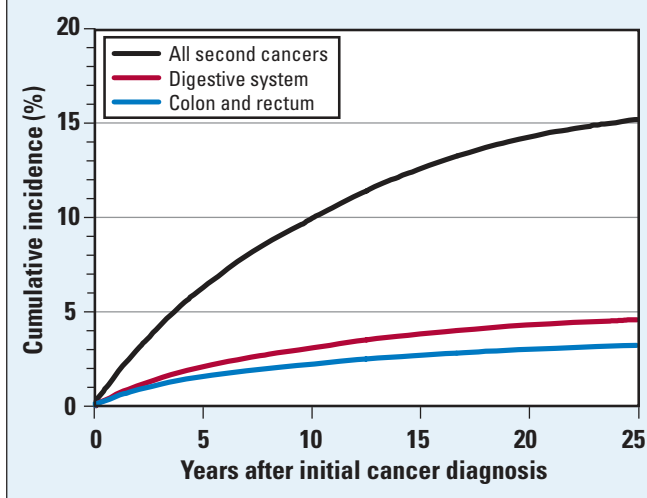
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the SEER Program during 1973-2000. There was an overall 7% increased risk of developing a subsequent primary cancer (O/E=1.07, O=20,847, 95% CI=1.05-1.08, EAR=13 per 10,000 person-years), but risk diminished to levels prevailing in the general population when subsequent cancers of the colon, rectum, and anus were excluded (O/E=0.98). In an analysis adjusted for the competing risk of death, the cumulative incidence of all second cancers combined was 15.2% at 25 years (95% CI=15.0%-15.5%), with a 3.2% incidence of second colorectal cancers (Figure 5.1). The relative and excess absolute risks of developing a new malignancy varied inversely with age at diagnosis of colon cancer, with O/E ratios of 3.19, 1.27, and 1.07 and EARs of 55, 32, and 15 observed for ages younger than 40 years, 40-59 years, and 60-69 years, respectively (Figure 5.2). This decreasing trend in relative and excess absolute risks with increasing age remained evident when subsequent cancers of the colon, rectum, and anus were excluded. No excess was observed among patients diagnosed with colon cancer at ages older than 70 years. The relative risk of all new cancers combined was slightly higher in females and in blacks. Risks were increased by about 10% in the first 5 years after initial diagnosis, and then decreased to near normal levels for later follow-up intervals. The risks of subsequent malignancies were significantly increased for cancers of the tongue, oropharynx, stomach, small intestine, colon, rectum, anus, bile ducts, uterine corpus, kidney, and ureter. In contrast, deficits in risk were seen for cancers of the lip, larynx, lung, liver, and gallbladder, as well as for chronic lymphocytic leukemia. In earlier SEER surveys of colorectal cancer, there were reciprocally increased risks associated with cancers of the small intestine, female breast, colon, and rectum (Neugut et al, 1991; Neugut and Santos, 1993; Shureiqi et al, 2001). Other registry-based studies of colon cancer have reported elevations in risk for second cancers of the larynx, breast, uterine corpus, ovary, prostate, bladder, and kidney (Hoar et al, 1985; Lynge et al, 1985; Levi et al, 1993; McCredie et al, 1997; Evans et al, 2002).

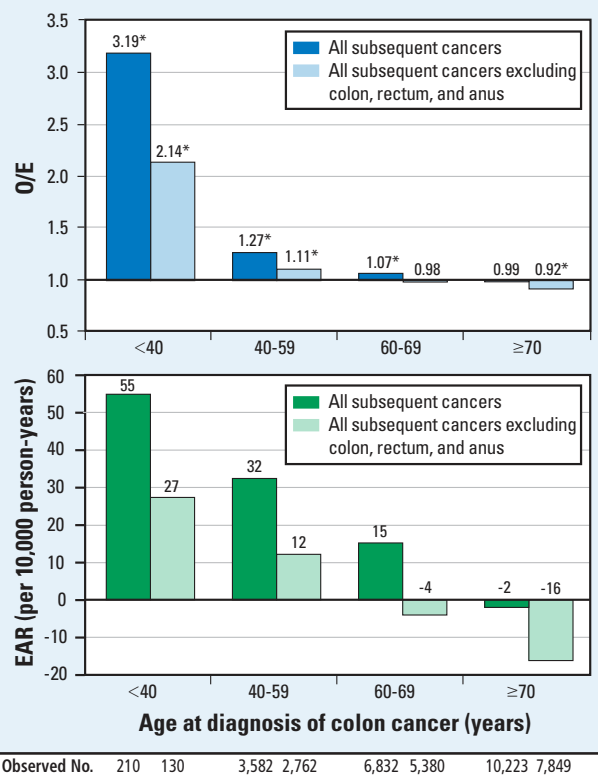
Most excesses of new malignancies after colon cancer occurred in the digestive tract and may be related to shared lifestyle factors, including diet, obesity, and physical inactivity (Giovannucci, 2002). The effect of these risk factors on hormonal metabolism, along with genetic susceptibility (Potter, 1999; Kaaks and Lukanova, 2002; Brinton et al, 2004), may explain the elevated risk of uterine corpus cancer seen among younger (ages <60 years) women diagnosed with colon cancer, as well as the reciprocal increased risk of colon cancer among younger women with uterine corpus cancer. Obesity may also have contributed to the elevated risk of cancer of the kidney parenchyma after colon cancer (Calle et al, 2003). However, the excesses were limited to the first 5 years of follow-up with no reciprocal increase in risk of colon cancer observed after cancer of the kidney parenchyma, suggesting that medical surveillance may have played a role.

Consistent with previous studies (Hoar et al, 1985; Lynge et al, 1985; Teppo et al, 1985; Enblad et al, 1990;

**Figure 5.1:** Cumulative incidence of developing a second cancer among patients with cancer of the colon, both sexes, SEER 1973-2000.



**Figure 5.2:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after cancer of the colon, both sexes, SEER 1973-2000.



\*P <0.05.

Note: EAR = Excess number of subsequent cancers per 10,000 person-years.

McCredie et al, 1997; Evans et al, 2002), we found either deficits in risk or no excesses for most smoking- and alcohol-related cancers (lip, mouth, esophagus, larynx, and lung), although risks for subsequent cancers of the tongue and oropharynx were increased. While recent studies have suggested that cigarette smoking and alcohol use are risk factors for colorectal cancer (Giovannucci,

2001; Corrao et al, 2004; Wei et al, 2004), the association with smoking appears only after an induction period of at least 35 years.

The heritable syndrome HNPCC predisposes not only to multicentric cancers of the colon and rectum, but also to early-onset cancers of the small intestine, stomach, bile ducts, uterine corpus, ovary, renal pelvis/ureter, and brain (Watson and Lynch, 1993). Similarly, the extra-colonic tumors associated with the FAP syndrome include the stomach and small intestine (duodenal and periampullary) in addition to thyroid and brain tumors (Burt, 2000). These syndromes or variants, such as Turcotte syndrome (colon polyps and brain tumors), may be implicated in the notably high risks for subsequent tumors of diverse sites among younger patients (ages <40 years) with colon cancer, although excess risks were also seen to a limited extent among older persons. The role of genetic susceptibility suggesting HNPCC is also evident in the reciprocally increased risks for colon cancer following cancers of the uterine corpus, ovary, and renal pelvis/ureter diagnosed at young ages.

## Cancers of the Rectum and Rectosigmoid Junction

Rectal cancer, including tumors of the rectosigmoid junction, accounts for 3% of cancers in the U.S. (Jemal et al, 2005), with a higher incidence among men than women. The overall 5-year relative survival rate is 64.2% (Ries et al, 2004). Surgery alone is the primary treatment for localized-stage disease, with the addition of radiotherapy and chemotherapy for more advanced stages (NIH Consensus Conference, 1990).

The risk factors for rectal cancer are similar to those for colon cancer, although the evidence generally is less clear-cut (Mao et al, 2003; Slattery et al, 2003; Wei et al, 2004; Martinez, 2005). Some studies have suggested that cigarette smoking and alcohol consumption may play a greater role in rectal cancer risk (Potter, 1999; Giovannucci, 2001).

### Results and Discussion

The overall risk of subsequent primary cancers was not increased among the 77,436 persons who survived 2 months or longer following a diagnosis of rectal cancer, including cancers of the rectosigmoid junction (O/E=1.00, O=8,117, 95% CI=0.98-1.02). A significant deficit in overall risk was seen after excluding subsequent cancers of the colon, rectum, and anus (O/E=0.94, 95% CI=0.92-0.97). The cumulative incidence of all second cancers combined was 14.4% at 25 years (95% CI=14.1%-14.8%), with new malignancies of the colon and rectum accounting for 2.7% of the cancer incidence. Increased relative risks of subsequent cancer were confined to women (O/E=1.07) and blacks (O/E=1.17). Individuals diagnosed with rectal cancer at ages younger than 50 years had a 51% increase in risk of subsequent cancer, but risk dropped to lower levels at older ages. An 8% elevation in risk of subsequent cancers was found in the first year after diagnosis,

but no excess was seen in subsequent time intervals. Observed risks were significantly increased over those expected for subsequent cancers of the small intestine, colon, anus, lung, vagina, and kidney. In contrast, significantly reduced risks were observed for cancers of the tongue, liver, pancreas, ovary, and prostate, as well as chronic lymphocytic leukemia. Several registry-based surveys have noted that patients with rectal cancer have generally lower risks of second cancers than patients with an initial colon cancer, although increased risks have been reported for new malignancies of the colon, uterine corpus, and prostate (Hoar, 1985; Lynge et al, 1985; McCredie et al, 1997).

Digestive system malignancies accounted for 27% of subsequent primary cancers following rectal cancer, with significantly increased risks for cancers of the small intestine and colon, which are likely due to shared risk factors (McCredie et al, 1997). The elevated risk for lung cancer after rectal cancer may be related to the effects of cigarette smoking on both tumors. Among rectal cancer patients diagnosed at younger ages (<50 years), elevated risks were observed for subsequent cancers of the small intestine, colon, bile ducts, and uterine corpus; this pattern resembles the spectrum of tumors associated with colon cancer and with genetic susceptibility syndromes such as HNPCC (Watson and Lynch, 1993).

Rectal cancer patients receiving radiation as part of their initial course of therapy had high doses delivered to the pelvic area. Therefore, it is not surprising that excess risks of uterine corpus and urinary bladder cancers among long-term survivors were confined to irradiated patients. This finding is consistent with earlier studies on radiation-related excesses of bladder and endometrial cancers among women receiving pelvic radiotherapy for cancers of the cervix or ovary (Boice et al, 1988; Travis et al, 1996). Although the vagina also received high radiation doses, the increases in risk of vaginal malignancies following rectal cancer were seen in all therapy groups. As with initial colon cancer, there was an increased risk of cancer of the kidney parenchyma after rectal cancer. The elevated risk was most pronounced in the first year of follow-up and then gradually declined over time to normal levels, suggesting the role of heightened medical surveillance.

## Cancers of the Anus, Anal Canal, and Anorectum

Anal cancer constitutes only 0.3% of all malignancies diagnosed in the U.S. and an estimated 0.1% of all cancer deaths (Jemal et al, 2005). The overall 5-year relative survival rate is 67.5% (Ries et al, 2004). Squamous cell carcinoma is the predominant histologic type. Current treatment for anal cancer includes surgical resection and either radiation, chemotherapy, or both (Ryan et al, 2000).

The major causal factor for anal cancer is human papillomavirus (HPV) infection. The risk is greatest for HPV types 16 and 18—the predominant causes of tumors along the anogenital tract, including cancers of the cervix,



vagina, vulva, penis, and the anal canal (Schiffman and Kjaer, 2003). The risk of anal cancer is increased among individuals with impaired cellular immunity (caused by HIV infection or organ transplantation), high-risk sexual behaviors, or a history of other HPV-related cancers (Fairley et al, 1994; Birkeland et al, 1995; Frisch, 2002; Palefsky and Holly, 2003).

## Results and Discussion

The overall risk of developing a new primary cancer among 4,905 patients who survived 2 months or more after anal cancer was significantly increased by 24% (O/E=1.24, O=509, 95% CI=1.13-1.35, EAR=36). The estimated cumulative incidence of a second cancer was 16.6% at 25 years (95% CI=15.0%-18.4%). Relative risks of subsequent cancers were similar among men (O/E=1.27) and women (O/E=1.21), although men had substantially higher excess absolute risks (EAR=50) than women (EAR=28). The risk of new cancers decreased with increasing age at anal cancer diagnosis, with a 5-fold increase in risk of new cancers observed for patients diagnosed at ages younger than 40 years and a 2.5-fold increase in risk for those younger than 50 years. Excess risks were also observed among those diagnosed at ages 50 to 69 years; risks then diminished to lower levels at older ages. Significantly increased risks were observed for subsequent cancers of the buccal cavity and pharynx (tongue, tonsil), lung, vagina, vulva, and anus, as well as for Kaposi sarcoma, while lower-than-expected risks were apparent for prostate cancer. An earlier SEER survey of patients with *in situ* and invasive anal cancer reported excesses of second cancers of the lung and prostate (Rabkin et al, 1992), and a Danish study noted increased risks of new malignancies of the lung, bladder, breast, vulva/vagina, and small intestine (Frisch et al, 1994).

In the current survey, 5- to 8-fold increased risks of subsequent cancers of the tongue, tonsil, and anogenital tract were observed, consistent with previous studies suggesting a carcinogenic effect of HPV infection at these sites (Frisch and Biggar, 1999; Gillison et al, 2000; Schiffman and Kjaer, 2003). As noted previously (Frisch et al, 1994; Schiffman and Kjaer, 2003), women with anal cancer experienced significant increases in the risk of vulvar and vaginal cancers, which share a causal relationship to HPV. In particular, the basaloid/warty form of squamous cell vulvar cancer has been associated with HPV infection, especially in younger, sexually active women (Trimble et al, 1996). The available evidence suggests that cancers of the vagina, vulva, and anus arise as a multicentric field effect due to HPV infection (Brinton et al, 2004). However, as shown in an earlier SEER survey (Rabkin et al, 1992), there was no overall increase in cervical cancer risk following anal cancer (O/E=0.69, O=2), whereas a 3-fold excess of anal cancer was seen after cervical cancer (O/E=3.24, O=19).

Excesses were also observed for several subsequent cancers that are associated with HIV infection. A 13-fold increased risk of Kaposi sarcoma was found among men

but not among women, and a 5-fold increase of non-Hodgkin lymphoma (NHL) was seen in persons diagnosed with anal cancer at ages younger than 50 years. It is well established that HIV-infected individuals are prone to anogenital cancers (Ferenczy et al, 2003; Palefsky and Holly, 2003), caused by HIV-related immunosuppression that predisposes to the carcinogenic effects of the sexually transmitted HPV. The role of HIV infection is apparent also from the increased risk of anal cancer seen among men diagnosed before age 50 years with Kaposi sarcoma or NHL.

In addition, we observed 2- to 3-fold significantly increased risks for subsequent cancers of the lung and buccal cavity, which may be due to the high frequency of smoking in patients with HIV infection. Cigarette smoking may also be a cofactor with HPV infection in the development of anal cancer, reminiscent of the combined effect of smoking and HPV infection in the etiology of cervical cancer (Daling et al, 1992, 1996; Giulian et al, 2002; Castellsague and Munoz, 2003).

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**Table 5.1.1:** Characteristics of patients with an initial cancer of the colon, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	85,768	100.0	93,602	100.0	179,370	100.0
<b>Initial treatment</b>						
Any radiation	3,528	4.1	3,185	3.4	6,713	3.7
With surgery	3,052	3.6	2,783	3.0	5,835	3.3
Without surgery	476	0.6	402	0.4	878	0.5
No radiation	82,240	95.9	90,417	96.6	172,657	96.3
With surgery	76,137	88.8	83,069	88.7	159,206	88.8
Without surgery	6,103	7.1	7,348	7.9	13,451	7.5
<b>Race</b>						
White	73,673	85.9	80,765	86.3	154,438	86.1
Black	6,641	7.7	8,089	8.6	14,730	8.2
Other	5,222	6.1	4,519	4.8	9,741	5.4
Unknown	232	0.3	229	0.2	461	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	376	0.4	401	0.4	777	0.4
30–49	6,019	7.0	5,858	6.3	11,877	6.6
50–69	38,302	44.7	33,258	35.5	71,560	39.9
70–79	27,170	31.7	29,746	31.8	56,916	31.7
≥ 80	13,901	16.2	24,339	26.0	38,240	21.3
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	75,213	87.7	85,597	91.4	160,810	89.7
1st and 2nd cancers	9,361	10.9	7,171	7.7	16,532	9.2
1st, 2nd, and 3rd cancers	1,072	1.2	738	0.8	1,810	1.0
1st, 2nd, 3rd, and additional cancers	122	0.1	96	0.1	218	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	69.4	—	72.6	—	70.9	—
Median year of 1st cancer diagnosis	1988.0	—	1987.6	—	1987.8	—
Median person-years at risk	3.2	—	3.2	—	3.2	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.6	—	94.7	—	94.6
1st, 2nd, and additional cancers	—	93.9	—	94.2	—	94.0
1st cancer only	—	4.9	—	4.9	—	4.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Colon Both Sexes

**Table 5.1.2:** Risk of subsequent primary cancers after cancer of the colon, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	179,370	129,484	2,522	1.09*	8,266	1.11*	5,487	1.02	4,572	1.03	20,847	19,563.96	1.07*	13.07
All excluding same site			1,844	0.94*	6,190	0.99	4,431	0.98	3,656	0.97	16,121	16,523.81	0.98*	-4.10
<b>Buccal cavity, pharynx</b>			50	0.89	171	0.99	126	1.08	83	0.93	430	435.20	0.99	-0.05
Lip			3	0.32*	19	0.67	18	0.95	6	0.42*	46	70.98	0.65*	-0.25
Tongue			15	1.39	36	1.08	33	1.45*	22	1.26	106	84.49	1.25*	0.22
Salivary gland			10	1.96	17	1.03	9	0.74	7	0.67	43	44.24	0.97	-0.01
Mouth			9	0.59	49	1.04	32	1.02	21	0.86	111	118.03	0.94	-0.07
Nasopharynx			1	0.47	4	0.62	4	0.96	1	0.32	10	15.79	0.63	-0.06
Tonsil			4	0.83	12	0.83	7	0.76	9	1.38	32	34.90	0.92	-0.03
Oropharynx			2	1.35	7	1.54	5	1.68	5	2.27	19	11.20	1.70*	0.08
Hypopharynx			6	1.10	22	1.33	12	1.13	8	1.07	48	40.11	1.20	0.08
<b>Digestive system</b>			868	1.54*	2,782	1.55*	1,548	1.19*	1,370	1.28*	6,568	4,726.44	1.39*	18.76
Esophagus			23	0.94	81	1.05	61	1.12	46	1.02	211	200.97	1.05	0.10
Stomach			55	0.93	207	1.12	154	1.18*	140	1.34*	556	478.38	1.16*	0.79
Small intestine			33	4.76*	89	3.96*	43	2.56*	45	3.02*	210	61.05	3.44*	1.52
Colon			519	1.98*	1,529	1.81*	857	1.38*	725	1.40*	3,630	2,247.46	1.62*	14.08
Rectum, rectosigmoid junction			152	1.62*	518	1.76*	187	0.91	178	1.11	1,035	753.17	1.37*	2.87
Anus, anal canal			7	1.49	29	1.94*	12	1.11	13	1.43	61	39.52	1.54*	0.22
Liver			9	0.53	39	0.72*	20	0.51*	31	0.91	99	144.86	0.68*	-0.47
Gallbladder			8	0.89	12	0.43*	12	0.60	11	0.70	43	72.76	0.59*	-0.30
Bile ducts, other biliary			10	0.83	46	1.16	46	1.52*	38	1.38	140	109.58	1.28*	0.31
Pancreas			49	0.72*	220	1.02	148	0.94	133	1.01	550	573.04	0.96	-0.23
<b>Respiratory system</b>			276	0.73*	1,149	0.96	854	1.01	588	0.85*	2,867	3,113.40	0.92*	-2.51
Nose, nasal cavity, ear			3	0.88	14	1.31	9	1.18	3	0.48	29	27.96	1.04	0.01
Larynx			17	0.72	60	0.83	43	0.90	31	0.90	151	178.32	0.85*	-0.28
Lung, bronchus			255	0.73*	1,074	0.97	801	1.01	552	0.85*	2,682	2,899.22	0.93*	-2.21
<b>Female breast</b>			218	0.88	826	1.06	580	1.02	494	1.00	2,118	2,087.78	1.01	0.58
<b>Female genital system</b>			132	1.16	422	1.21*	251	1.04	215	1.07	1,020	905.34	1.13*	2.18
Cervix uteri			16	1.25	36	0.97	30	1.29	11	0.64	93	90.19	1.03	0.05
Corpus uteri			62	1.09	220	1.27*	135	1.14	121	1.25*	538	445.45	1.21*	1.76
Ovary			47	1.42*	138	1.34*	64	0.87	56	0.89	305	273.33	1.12	0.60
Vagina			2	0.97	5	0.77	3	0.65	8	2.06	18	17.02	1.06	0.02
Vulva			4	0.65	17	0.85	15	0.98	14	1.00	50	55.26	0.90	-0.10
<b>Male genital system</b>			453	1.07	1,409	1.00	1,023	0.98	837	0.99	3,722	3,718.79	1.00	0.07
Prostate			448	1.07	1,403	1.01	1,012	0.98	826	0.98	3,689	3,687.31	1.00	0.04
Testis			0	0.00	1	0.30	1	0.54	1	0.91	3	7.45	0.40	-0.10
<b>Urinary system</b>			223	1.23*	623	1.06	407	0.95	367	1.02	1,620	1,553.50	1.04	0.68
Urinary bladder			124	0.97	412	0.99	287	0.95	241	0.95	1,064	1,100.52	0.97	-0.37
Kidney parenchyma			85	2.05*	161	1.21*	88	0.91	90	1.11	424	351.94	1.20*	0.73
Renal pelvis, other urinary			14	1.15	50	1.29	32	1.16	36	1.60*	132	101.04	1.31*	0.32
Ureter			4	0.98	23	1.78*	11	1.20	17	2.33*	55	33.43	1.65*	0.22
<b>Bone, joints</b>			0	0.00	6	1.02	2	0.50	4	1.25	12	15.00	0.80	-0.03
<b>Soft tissue including heart</b>			13	1.48	25	0.89	24	1.17	12	0.67	74	75.32	0.98	-0.01
<b>Kaposi sarcoma</b>			1	0.43	8	1.09	4	0.78	4	1.01	17	18.71	0.91	-0.02
<b>Melanoma of skin</b>			56	1.33*	146	1.05	74	0.70*	92	0.97	368	381.24	0.97	-0.13
<b>Eye, orbit</b>			3	0.93	11	1.09	6	0.86	5	0.89	25	25.84	0.97	-0.01
<b>Brain, central nervous system</b>			18	0.85	56	0.84	45	0.96	33	0.87	152	172.49	0.88	-0.21
<b>Thyroid</b>			19	1.78*	33	1.01	29	1.31	16	0.90	97	83.34	1.16	0.14
<b>Lymphatic, hematopoietic</b>			150	0.85	499	0.88*	414	0.99	352	0.99	1,415	1,516.58	0.93*	-1.03
Hodgkin lymphoma			7	1.37	15	0.98	6	0.60	5	0.66	33	37.92	0.87	-0.05
Non-Hodgkin lymphoma			66	0.88	220	0.89	181	0.98	168	1.03	635	667.80	0.95	-0.33
Myeloma			27	0.87	81	0.81	78	1.07	57	0.92	243	265.29	0.92	-0.23
Leukemia			50	0.78	183	0.89	149	0.99	122	0.97	504	545.57	0.92	-0.42
Acute lymphocytic			2	1.21	3	0.57	8	2.11	1	0.33	14	13.73	1.02	0.00
Chronic lymphocytic			13	0.51*	55	0.67*	48	0.81	39	0.80	155	216.12	0.72*	-0.62
Acute non-lymphocytic			25	1.17	70	1.01	52	1.03	44	1.02	191	184.49	1.04	0.07
Chronic myeloid			8	0.92	31	1.11	20	0.98	22	1.26	81	74.45	1.09	0.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 525,390 PYR and for male cancers on 456,404 PYR.

**Table 5.1.3:** Risk of subsequent primary cancers after cancer of the colon, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	16,275	1.08*	2,919	1.03	1,263	1.03	390	0.94	20,847	19,563.96	1.07*	13.07
All excluding same site	12,465	0.98*	2,356	0.99	1,010	0.98	290	0.83*	16,121	16,523.81	0.98*	-4.10
<b>Buccal cavity, pharynx</b>	347	1.00	53	0.92	22	0.93	8	1.02	430	435.20	0.99	-0.05
Lip	40	0.70*	5	0.54	1	0.27	0	0.00	46	70.98	0.65*	-0.25
Tongue	84	1.25*	14	1.24	5	1.07	3	1.92	106	84.49	1.25*	0.22
Salivary gland	36	1.07	5	0.77	1	0.35	1	0.96	43	44.24	0.97	-0.01
Mouth	90	0.96	14	0.90	5	0.76	2	0.92	111	118.03	0.94	-0.07
Nasopharynx	9	0.71	1	0.50	0	0.00	0	0.00	10	15.79	0.63	-0.06
Tonsil	23	0.81	6	1.40	2	1.19	1	1.89	32	34.90	0.92	-0.03
Oropharynx	14	1.56	1	0.70	4	6.92*	0	0.00	19	11.20	1.70*	0.08
Hypopharynx	40	1.23	7	1.41	1	0.52	0	0.00	48	40.11	1.20	0.08
<b>Digestive system</b>	5,198	1.42*	862	1.27*	373	1.28*	135	1.33*	6,568	4,726.44	1.39*	18.76
Esophagus	165	1.06	32	1.12	12	0.98	2	0.47	211	200.97	1.05	0.10
Stomach	416	1.11*	79	1.19	47	1.67*	14	1.46	556	478.38	1.16*	0.79
Small intestine	165	3.57*	25	2.71*	14	3.37*	6	4.01*	210	61.05	3.44*	1.52
Colon	2,905	1.68*	447	1.37*	194	1.37*	84	1.71*	3,630	2,247.46	1.62*	14.08
Rectum, rectosigmoid junction	857	1.44*	109	1.06	53	1.24	16	1.11	1,035	753.17	1.37*	2.87
Anus, anal canal	48	1.58*	7	1.23	6	2.38	0	0.00	61	39.52	1.54*	0.22
Liver	68	0.61*	22	1.04	7	0.74	2	0.59	99	144.86	0.68*	-0.47
Gallbladder	32	0.56*	7	0.70	3	0.70	1	0.69	43	72.76	0.59*	-0.30
Bile ducts, other biliary	102	1.24*	28	1.65*	7	0.90	3	1.05	140	109.58	1.28*	0.31
Pancreas	417	0.95	100	1.21	26	0.72	7	0.55	550	573.04	0.96	-0.23
<b>Respiratory system</b>	2,279	0.94*	375	0.86*	157	0.83*	56	0.87	2,867	3,113.40	0.92*	-2.51
Nose, nasal cavity, ear	26	1.20	2	0.51	1	0.58	0	0.00	29	27.96	1.04	0.01
Larynx	120	0.83*	22	0.97	6	0.67	3	1.06	151	178.32	0.85*	-0.28
Lung, bronchus	2,130	0.95*	349	0.85*	150	0.85*	53	0.87	2,682	2,899.22	0.93*	-2.21
<b>Female breast</b>	1,624	1.02	308	1.00	135	0.99	51	1.04	2,118	2,087.78	1.01	0.58
<b>Female genital system</b>	805	1.14*	144	1.15	61	1.10	10	0.51*	1,020	905.34	1.13*	2.18
Cervix uteri	82	1.12	5	0.45	4	0.88	2	1.34	93	90.19	1.03	0.05
Corpus uteri	417	1.20*	77	1.27*	41	1.54*	3	0.32*	538	445.45	1.21*	1.76
Ovary	249	1.18*	42	1.07	12	0.68	2	0.32	305	273.33	1.12	0.60
Vagina	10	0.76	8	3.29*	0	0.00	0	0.00	18	17.02	1.06	0.02
Vulva	36	0.87	9	1.06	4	1.01	1	0.69	50	55.26	0.90	-0.10
<b>Male genital system</b>	2,885	1.01	558	1.02	230	0.99	49	0.72*	3,722	3,718.79	1.00	0.07
Prostate	2,863	1.01	550	1.01	227	0.99	49	0.72*	3,689	3,687.31	1.00	0.04
Testis	2	0.32	1	1.32	0	0.00	0	0.00	3	7.45	0.40	-0.10
<b>Urinary system</b>	1,253	1.05	239	1.06	98	1.00	30	0.88	1,620	1,553.50	1.04	0.68
Urinary bladder	823	0.97	158	0.98	64	0.92	19	0.79	1,064	1,100.52	0.97	-0.37
Kidney parenchyma	334	1.23*	60	1.17	22	0.99	8	1.03	424	351.94	1.20*	0.73
Renal pelvis, other urinary	96	1.22	21	1.48	12	1.97*	3	1.40	132	101.04	1.31*	0.32
Ureter	38	1.45*	8	1.72	6	3.07*	3	4.46	55	33.43	1.65*	0.22
<b>Bone, joints</b>	8	0.68	1	0.50	1	1.13	2	6.53	12	15.00	0.80	-0.03
<b>Soft tissue including heart</b>	62	1.08	6	0.54	6	1.20	0	0.00	74	75.32	0.98	-0.01
<b>Kaposi sarcoma</b>	13	0.88	3	1.16	1	0.95	0	0.00	17	18.71	0.91	-0.02
<b>Melanoma of skin</b>	276	0.96	59	1.01	29	1.09	4	0.41	368	381.24	0.97	-0.13
<b>Eye, orbit</b>	20	0.99	2	0.56	3	1.96	0	0.00	25	25.84	0.97	-0.01
<b>Brain, central nervous system</b>	119	0.88	22	0.91	8	0.78	3	0.85	152	172.49	0.88	-0.21
<b>Thyroid</b>	81	1.24	9	0.80	6	1.24	1	0.59	97	83.34	1.16	0.14
<b>Lymphatic, hematopoietic</b>	1,063	0.92*	220	0.98	101	1.02	31	0.89	1,415	1,516.58	0.93*	-1.03
Hodgkin lymphoma	28	0.92	2	0.41	2	0.99	1	1.53	33	37.92	0.87	-0.05
Non-Hodgkin lymphoma	467	0.92	106	1.05	48	1.06	14	0.86	635	667.80	0.95	-0.33
Myeloma	186	0.91	39	1.01	12	0.71	6	1.02	243	265.29	0.92	-0.23
Leukemia	382	0.91	73	0.92	39	1.14	10	0.84	504	545.57	0.92	-0.42
Acute lymphocytic	13	1.21	1	0.51	0	0.00	0	0.00	14	13.73	1.02	0.00
Chronic lymphocytic	116	0.69*	27	0.87	7	0.53	5	1.13	155	216.12	0.72*	-0.62
Acute non-lymphocytic	147	1.04	28	1.04	15	1.26	1	0.23	191	184.49	1.04	0.07
Chronic myeloid	59	1.03	6	0.55	13	2.72*	3	1.81	81	74.45	1.09	0.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 525,390 PYR and for male cancers on 456,404 PYR.

**Table 5.1.4:** Risk of subsequent primary cancers after cancer of the colon, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,019	1.08*	3,533	1.18*	2,316	1.05*	2,086	1.08*	8,954	8,073.34	1.11*	16.76
All excluding same site	736	0.95	2,500	1.02	1,779	0.99	1,566	0.99	6,581	6,611.03	1.00	-0.57
<b>Buccal cavity, pharynx</b>	16	0.97	50	0.97	37	1.00	28	0.90	131	136.47	0.96	-0.10
Lip	0	0.00	6	1.46	3	0.96	2	0.71	11	11.36	0.97	-0.01
Tongue	7	1.96	12	1.07	12	1.48	6	0.88	37	29.78	1.24	0.14
Salivary gland	4	2.16	7	1.19	4	0.93	3	0.79	18	15.84	1.14	0.04
Mouth	1	0.17*	17	0.92	15	1.13	11	0.96	44	49.22	0.89	-0.10
Nasopharynx	0	0.00	2	1.03	0	0.00	1	0.93	3	4.96	0.60	-0.04
Tonsil	1	0.76	2	0.51	1	0.38	1	0.52	5	9.78	0.51	-0.09
Oropharynx	1	2.59	1	0.83	0	0.00	1	1.53	3	3.06	0.98	0.00
Hypopharynx	2	1.94	2	0.63	2	0.95	2	1.24	8	7.91	1.01	0.00
<b>Digestive system</b>	371	1.47*	1,318	1.63*	721	1.20*	728	1.39*	3,138	2,184.51	1.44*	18.15
Esophagus	10	1.55	25	1.22	12	0.79	18	1.34	65	55.53	1.17	0.18
Stomach	20	0.94	76	1.13	48	0.99	59	1.43*	203	178.38	1.14	0.47
Small intestine	15	4.89*	51	5.14*	20	2.62*	20	2.77*	106	27.85	3.81*	1.49
Colon	227	1.77*	781	1.89*	446	1.44*	415	1.53*	1,869	1,121.34	1.67*	14.23
Rectum, rectosigmoid junction	51	1.33	237	1.96*	82	0.95	93	1.31*	463	316.37	1.46*	2.79
Rectum	36	1.43*	154	1.94*	60	1.06	74	1.55*	324	209.01	1.55*	2.19
Anus, anal canal	5	1.75	15	1.65	9	1.34	12	2.03*	41	24.59	1.67*	0.31
Liver	3	0.59	9	0.55	5	0.41*	8	0.70	25	45.16	0.55*	-0.38
Gallbladder	3	0.49	8	0.42*	7	0.52	11	1.01	29	49.62	0.58*	-0.39
Bile ducts, other biliary	6	1.09	9	0.50*	20	1.42	17	1.28	52	50.77	1.02	0.02
Pancreas	29	0.88	103	0.98	66	0.83	69	0.98	267	288.56	0.93	-0.41
<b>Respiratory system</b>	89	0.79*	392	1.07	299	1.09	231	0.91	1,011	1,004.39	1.01	0.13
Nose, nasal cavity, ear	1	0.76	5	1.19	3	0.96	2	0.72	11	11.46	0.96	-0.01
Larynx	1	0.29	8	0.75	8	1.08	3	0.49	20	27.69	0.72	-0.15
Lung, bronchus	87	0.81*	379	1.09	288	1.10	225	0.93	979	962.60	1.02	0.31
<b>Female breast</b>	218	0.88	826	1.06	580	1.02	494	1.00	2,118	2,087.78	1.01	0.58
<b>Female genital system</b>	132	1.16	422	1.21*	251	1.04	215	1.07	1,020	905.34	1.13*	2.18
Cervix uteri	16	1.25	36	0.97	30	1.29	11	0.64	93	90.19	1.03	0.05
Corpus uteri	62	1.09	220	1.27*	135	1.14	121	1.25*	538	445.45	1.21*	1.76
Ovary	47	1.42*	138	1.34*	64	0.87	56	0.89	305	273.33	1.12	0.60
Vagina	2	0.97	5	0.77	3	0.65	8	2.06	18	17.02	1.06	0.02
Vulva	4	0.65	17	0.85	15	0.98	14	1.00	50	55.26	0.90	-0.10
<b>Urinary system</b>	54	1.13	161	1.05	121	1.05	103	1.00	439	419.04	1.05	0.38
Urinary bladder	25	0.85	90	0.95	75	1.05	64	1.00	254	259.35	0.98	-0.10
Kidney parenchyma	25	1.79*	55	1.22	31	0.92	31	1.01	142	123.55	1.15	0.35
Renal pelvis, other urinary	4	0.95	16	1.19	15	1.52	8	0.93	43	36.14	1.19	0.13
Ureter	0	0.00	7	1.64	4	1.28	2	0.75	13	11.39	1.14	0.03
<b>Bone, joints</b>	0	0.00	4	1.52	1	0.54	3	1.93	8	6.87	1.16	0.02
<b>Soft tissue including heart</b>	6	1.61	8	0.67	12	1.36	4	0.50	30	32.42	0.93	-0.05
<b>Kaposi sarcoma</b>	0	0.00	1	0.62	2	1.54	0	0.00	3	4.53	0.66	-0.03
<b>Melanoma of skin</b>	18	1.18	48	0.98	28	0.76	37	1.07	131	136.14	0.96	-0.10
<b>Eye, orbit</b>	2	1.46	4	0.95	2	0.68	3	1.19	11	11.06	0.99	0.00
<b>Brain, central nervous system</b>	8	0.90	28	1.00	27	1.35	15	0.87	78	74.08	1.05	0.07
<b>Thyroid</b>	11	1.65	19	0.94	22	1.59	9	0.78	61	52.40	1.16	0.16
<b>Lymphatic, hematopoietic</b>	75	0.98	216	0.88	180	0.97	176	1.06	647	672.61	0.96	-0.49
Hodgkin lymphoma	2	0.96	7	1.11	4	0.93	2	0.57	15	16.17	0.93	-0.02
Non-Hodgkin lymphoma	35	1.01	106	0.94	85	0.99	83	1.05	309	312.96	0.99	-0.08
Myeloma	12	0.87	33	0.75	40	1.23	27	0.94	112	118.85	0.94	-0.13
Leukemia	26	1.01	70	0.85	51	0.83	64	1.17	211	224.63	0.94	-0.26
Acute lymphocytic	1	1.48	1	0.46	2	1.23	1	0.70	5	5.89	0.85	-0.02
Chronic lymphocytic	7	0.69	18	0.56*	18	0.75	21	1.00	64	87.42	0.73*	-0.45
Acute non-lymphocytic	15	1.70	31	1.09	17	0.80	28	1.46	91	77.65	1.17	0.25
Chronic myeloid	3	0.85	11	0.97	7	0.83	10	1.32	31	30.87	1.00	0.00

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 5.1.5:** Risk of subsequent primary cancers after cancer of the colon, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,503	1.10*	4,733	1.07*	3,171	1.00	2,486	0.98	11,893	11,490.62	1.04*	8.82
All excluding same site	1,108	0.94*	3,690	0.97*	2,652	0.97	2,090	0.95*	9,540	9,912.78	0.96*	-8.17
<b>Buccal cavity, pharynx</b>	34	0.85	121	0.99	89	1.12	55	0.95	299	298.73	1.00	0.01
Lip	3	0.37	13	0.53*	15	0.94	4	0.35*	35	59.63	0.59*	-0.54
Tongue	8	1.10	24	1.08	21	1.44	16	1.50	69	54.70	1.26	0.31
Salivary gland	6	1.84	10	0.94	5	0.64	4	0.60	25	28.40	0.88	-0.07
Mouth	8	0.85	32	1.13	17	0.94	10	0.78	67	68.80	0.97	-0.04
Nasopharynx	1	0.67	2	0.44	4	1.41	0	0.00	7	10.83	0.65	-0.08
Tonsil	3	0.86	10	0.95	6	0.91	8	1.75	27	25.11	1.08	0.04
Oropharynx	1	0.91	6	1.80	5	2.32	4	2.57	16	8.14	1.97*	0.17
Hypopharynx	4	0.91	20	1.49	10	1.17	6	1.02	40	32.19	1.24	0.17
<b>Digestive system</b>	497	1.61*	1,464	1.48*	827	1.19*	642	1.17*	3,430	2,541.93	1.35*	19.46
Esophagus	13	0.73	56	0.99	49	1.24	28	0.89	146	145.44	1.00	0.01
Stomach	35	0.93	131	1.11	106	1.30*	81	1.29*	353	300.00	1.18*	1.16
Small intestine	18	4.66*	38	3.03*	23	2.52*	25	3.26*	104	33.20	3.13*	1.55
Colon	292	2.17*	748	1.72*	411	1.32*	310	1.25*	1,761	1,126.12	1.56*	13.91
Rectum, rectosigmoid junction	101	1.82*	281	1.61*	105	0.89	85	0.96	572	436.80	1.31*	2.96
Anus, anal canal	2	1.09	14	2.40*	3	0.74	1	0.31	20	14.92	1.34	0.11
Liver	6	0.51	30	0.79	15	0.55*	23	1.02	74	99.69	0.74*	-0.56
Gallbladder	5	1.75	4	0.44	5	0.79	0	0.00*	14	23.13	0.61	-0.20
Bile ducts, other biliary	4	0.61	37	1.71*	26	1.59*	21	1.46	88	58.81	1.50*	0.64
Pancreas	20	0.57*	117	1.05	82	1.06	64	1.05	283	284.48	0.99	-0.03
<b>Respiratory system</b>	187	0.71*	757	0.91*	555	0.97	357	0.82*	1,856	2,109.01	0.88*	-5.54
Nose, nasal cavity, ear	2	0.97	9	1.39	6	1.34	1	0.29	18	16.50	1.09	0.03
Larynx	16	0.79	52	0.84	35	0.87	28	0.98	131	150.63	0.87	-0.43
Lung, bronchus	168	0.70*	695	0.91*	513	0.97	327	0.81*	1,703	1,936.62	0.88*	-5.12
<b>Male breast</b>	3	1.17	3	0.37	3	0.52	8	1.67	17	21.31	0.80	-0.09
<b>Male genital system</b>	453	1.07	1,409	1.00	1,023	0.98	837	0.99	3,722	3,718.79	1.00	0.07
Prostate	448	1.07	1,403	1.01	1,012	0.98	826	0.98	3,689	3,687.31	1.00	0.04
Testis	0	0.00	1	0.30	1	0.54	1	0.91	3	7.45	0.40	-0.10
<b>Urinary system</b>	169	1.26*	462	1.07	286	0.92	264	1.03	1,181	1,134.46	1.04	1.02
Urinary bladder	99	1.01	322	1.01	212	0.91	177	0.93	810	841.17	0.96	-0.68
Kidney parenchyma	60	2.19*	106	1.20	57	0.91	59	1.17	282	228.40	1.23*	1.17
Renal pelvis, other urinary	10	1.25	34	1.34	17	0.96	28	2.02*	89	64.90	1.37*	0.53
Ureter	4	1.47	16	1.84*	7	1.16	15	3.24*	42	22.04	1.91*	0.44
<b>Bone, joints</b>	0	0.00	2	0.61	1	0.46	1	0.61	4	8.13	0.49	-0.09
<b>Soft tissue including heart</b>	7	1.38	17	1.05	12	1.03	8	0.81	44	42.90	1.03	0.02
<b>Kaposi sarcoma</b>	1	0.54	7	1.23	2	0.53	4	1.42	14	14.18	0.99	0.00
<b>Melanoma of skin</b>	38	1.41	98	1.09	46	0.68*	55	0.91	237	245.10	0.97	-0.18
<b>Eye, orbit</b>	1	0.54	7	1.20	4	1.00	2	0.65	14	14.79	0.95	-0.02
<b>Brain, central nervous system</b>	10	0.81	28	0.72	18	0.68	18	0.87	74	98.41	0.75*	-0.53
<b>Thyroid</b>	8	2.00	14	1.12	7	0.85	7	1.12	36	30.95	1.16	0.11
<b>Lymphatic, hematopoietic</b>	75	0.76*	283	0.88*	234	1.01	176	0.92	768	843.97	0.91*	-1.66
Hodgkin lymphoma	5	1.65	8	0.89	2	0.35	3	0.74	18	21.74	0.83	-0.08
Non-Hodgkin lymphoma	31	0.77	114	0.86	96	0.98	85	1.02	326	354.84	0.92	-0.63
Myeloma	15	0.87	48	0.86	38	0.95	30	0.91	131	146.44	0.89	-0.34
Leukemia	24	0.62*	113	0.91	98	1.11	58	0.82	293	320.94	0.91	-0.61
Acute lymphocytic	1	1.02	2	0.64	6	2.77*	0	0.00	9	7.83	1.15	0.03
Chronic lymphocytic	6	0.38*	37	0.74	30	0.85	18	0.65	91	128.70	0.71*	-0.83
Acute non-lymphocytic	10	0.79	39	0.96	35	1.19	16	0.67	100	106.85	0.94	-0.15
Chronic myeloid	5	0.97	20	1.20	13	1.09	12	1.22	50	43.59	1.15	0.14

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Colon Both Sexes, <40 Years of Age

**Table 5.1.6:** Risk of subsequent primary cancers after cancer of the colon, both sexes, <40 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	3,722	2,769	14	4.78*	52	4.58*	43	3.17*	101	2.66*	210	65.78	3.19*	55.28
All excluding same site			9	3.24*	31	2.90*	27	2.14*	63	1.82*	130	60.73	2.14*	26.55
<b>Buccal cavity, pharynx</b>			1	13.29	1	3.10	0	0.00	1	0.83	3	2.04	1.47	0.37
Lip			1	107.84*	0	0.00	0	0.00	0	0.00	1	0.17	5.80	0.32
Tongue			0	0.00	1	14.45	0	0.00	0	0.00	1	0.47	2.12	0.20
Salivary gland			0	0.00	0	0.00	0	0.00	1	9.23	1	0.23	4.38	0.30
Mouth			0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.18
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.07
Tonsil			0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.11
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.02
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.05
<b>Digestive system</b>			5	19.48*	26	23.25*	20	12.67*	49	8.89*	100	8.46	11.82*	35.08
Esophagus			0	0.00	0	0.00	0	0.00	1	2.83	1	0.50	2.01	0.19
Stomach			0	0.00	0	0.00	0	0.00	4	8.09*	4	0.85	4.73*	1.21
Small intestine			0	0.00	4	104.90*	1	19.99	2	13.80*	7	0.24	28.95*	2.59
Colon			4	40.04*	15	35.89*	12	21.20*	29	14.08*	60	3.14	19.08*	21.79
Rectum, rectosigmoid junction			1	21.73	6	29.38*	4	12.96*	8	7.14*	19	1.68	11.31*	6.64
Anus, anal canal			0	0.00	0	0.00	0	0.00	1	7.95	1	0.22	4.50	0.30
Liver			0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.19
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.03
Bile ducts, other biliary			0	0.00	0	0.00	2	63.15*	3	26.74*	5	0.17	29.10*	1.85
Pancreas			0	0.00	1	9.57	1	6.10	1	1.56	3	0.93	3.23	0.79
<b>Respiratory system</b>			2	13.64*	2	2.73	2	1.67	5	1.00	11	7.06	1.56	1.51
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.05
Larynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.24
Lung, bronchus			2	16.41*	2	3.21	2	1.91	5	1.12	11	6.26	1.76	1.82
<b>Female breast</b>			0	0.00	0	0.00	0	0.00*	14	1.54	14	16.32	0.86	-1.69
<b>Female genital system</b>			3	8.43*	10	7.74*	8	5.62*	12	3.61*	33	6.39	5.16*	19.40
Cervix uteri			0	0.00	2	3.33	0	0.00	0	0.00	2	2.00	1.00	0.00
Corpus uteri			1	16.31	2	7.50	8	20.62*	7	4.98*	18	2.12	8.49*	11.58
Ovary			2	21.78*	5	14.37*	0	0.00	4	3.89*	11	1.89	5.81*	6.64
Vagina			0	0.00	1	81.83*	0	0.00	1	31.35	2	0.06	32.75*	1.41
Vulva			0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.14
<b>Male genital system</b>			0	0.00	1	2.12	2	4.07	4	1.02	7	5.05	1.39	1.58
Prostate			0	0.00	0	0.00	2	9.54*	4	1.08	6	3.96	1.52	1.65
Testis			0	0.00	1	2.45	0	0.00	0	0.00	1	1.03	0.98	-0.02
<b>Urinary system</b>			0	0.00	2	4.48	3	4.76	5	2.26	10	3.39	2.95*	2.53
Urinary bladder			0	0.00	1	4.64	2	6.57	2	1.70	5	1.75	2.86	1.25
Kidney parenchyma			0	0.00	0	0.00	1	3.31	1	1.05	2	1.52	1.32	0.19
Renal pelvis, other urinary			0	0.00	1	58.13	0	0.00	2	23.18*	3	0.13	22.82*	1.10
Ureter			0	0.00	0	0.00	0	0.00	1	47.32	1	0.03	34.76	0.37
<b>Bone, joints</b>			0	0.00	1	19.60	0	0.00	0	0.00	1	0.17	5.81	0.32
<b>Soft tissue including heart</b>			0	0.00	1	7.18	0	0.00	0	0.00	1	0.54	1.86	0.18
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	1.28	0.00	-0.49
<b>Melanoma of skin</b>			1	3.48	0	0.00	2	1.95	1	0.52	4	4.24	0.94	-0.09
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.05
<b>Brain, central nervous system</b>			0	0.00	1	3.00	2	6.36	2	3.34	5	1.34	3.72*	1.40
<b>Thyroid</b>			1	5.48	1	1.69	1	1.93	1	1.23	4	2.11	1.90	0.73
<b>Lymphatic, hematopoietic</b>			1	2.65	3	2.28	3	2.28	6	2.05	13	5.93	2.19*	2.71
Hodgkin lymphoma			0	0.00	1	3.53	1	5.02	0	0.00	2	0.81	2.48	0.46
Non-Hodgkin lymphoma			1	5.70	0	0.00	1	1.42	4	2.55	6	3.11	1.93	1.11
Myeloma			0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.21
Leukemia			0	0.00	2	6.42	1	3.14	2	2.63	5	1.48	3.38*	1.35
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.05
Chronic lymphocytic			0	0.00	0	0.00	1	18.57	0	0.00	1	0.33	3.00	0.26
Acute non-lymphocytic			0	0.00	2	14.93*	0	0.00	2	7.52	4	0.57	7.03*	1.32
Chronic myeloid			0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 13,716 PYR and for male cancers on 12,375 PYR.

**Table 5.1.7:** Risk of subsequent primary cancers after cancer of the colon, both sexes, 40-59 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	278	1.75*	990	1.58*	899	1.26*	1,415	1.08*	3,582	2,816.13	1.27*	32.33
All excluding same site	183	1.30*	693	1.24*	728	1.15*	1,158	1.00	2,762	2,483.41	1.11*	11.76
<b>Buccal cavity, pharynx</b>	6	0.92	26	1.09	30	1.32	28	0.93	90	83.31	1.08	0.28
Lip	1	1.62	3	1.33	3	1.31	1	0.28	8	8.74	0.92	-0.03
Tongue	2	1.45	4	0.78	12	2.47*	10	1.55	28	17.77	1.58*	0.43
Salivary gland	0	0.00	2	1.29	2	1.27	2	0.74	6	6.23	0.96	-0.01
Mouth	1	0.56	9	1.38	5	0.83	8	1.02	23	22.21	1.04	0.03
Nasopharynx	0	0.00	0	0.00	2	1.83	0	0.00	2	4.04	0.50	-0.09
Tonsil	1	1.20	2	0.68	1	0.38	4	1.34	8	9.36	0.86	-0.06
Oropharynx	1	5.07	2	2.64	2	2.66	0	0.00	5	2.64	1.89	0.10
Hypopharynx	0	0.00	3	1.15	2	0.77	1	0.31	6	9.15	0.66	-0.13
<b>Digestive system</b>	118	4.09*	385	3.30*	245	1.82*	391	1.51*	1,139	538.41	2.12*	25.36
Esophagus	2	0.96	6	0.73	14	1.58	13	0.89	35	33.70	1.04	0.05
Stomach	6	2.03	22	1.88*	21	1.64*	37	1.55*	86	51.24	1.68*	1.47
Small intestine	6	10.80*	18	8.53*	9	3.95*	18	4.14*	51	9.29	5.49*	1.76
Colon	72	6.49*	205	4.45*	130	2.34*	189	1.66*	596	226.79	2.63*	15.59
Rectum, rectosigmoid junction	23	3.95*	88	3.75*	40	1.54*	63	1.43*	214	99.24	2.16*	4.85
Anus, anal canal	0	0.00	4	2.37	1	0.58	5	1.76	10	6.70	1.49	0.14
Liver	1	0.79	3	0.60	5	0.88	14	1.32	23	22.61	1.02	0.02
Gallbladder	0	0.00	1	0.78	1	0.65	1	0.31	3	6.41	0.47	-0.14
Bile ducts, other biliary	0	0.00	4	1.90	4	1.59	12	2.07*	20	10.93	1.83*	0.38
Pancreas	8	2.31	31	2.23*	19	1.17	35	1.09	93	65.71	1.42*	1.15
<b>Respiratory system</b>	26	0.89	138	1.16	163	1.20*	200	0.84*	527	522.14	1.01	0.21
Nose, nasal cavity, ear	0	0.00	2	1.77	1	0.89	2	1.14	5	4.30	1.16	0.03
Larynx	1	0.36	11	1.03	10	0.93	8	0.56	30	38.56	0.78	-0.36
Lung, bronchus	25	0.96	124	1.16	151	1.22*	189	0.85*	489	478.07	1.02	0.46
<b>Female breast</b>	25	0.91	102	1.03	107	1.10	159	1.00	393	382.40	1.03	0.90
<b>Female genital system</b>	35	2.67*	85	1.81*	67	1.51*	79	1.19	266	170.75	1.56*	8.06
Cervix uteri	6	2.73	3	0.43	8	1.50	8	1.36	25	20.31	1.23	0.40
Corpus uteri	12	1.80	48	1.96*	40	1.69*	44	1.24	144	90.52	1.59*	4.52
Ovary	16	4.43*	31	2.37*	16	1.26	19	0.95	82	49.31	1.66*	2.76
Vagina	0	0.00	0	0.00	1	1.93	3	3.26	4	2.05	1.95	0.16
Vulva	0	0.00	0	0.00	0	0.00	3	1.14	3	5.30	0.57	-0.19
<b>Male genital system</b>	23	1.49	86	1.10	129	1.05	284	1.02	522	495.24	1.05	2.26
Prostate	23	1.55	85	1.12	128	1.05	281	1.01	517	489.46	1.06	2.32
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.76	0.00	-0.23
<b>Urinary system</b>	14	1.32	73	1.70*	60	1.19	97	0.99	244	201.80	1.21*	1.78
Urinary bladder	4	0.65	37	1.43*	36	1.14	55	0.85	132	128.41	1.03	0.15
Kidney parenchyma	10	2.59*	29	1.94*	18	1.12	24	0.88	81	62.14	1.30*	0.80
Renal pelvis, other urinary	0	0.00	7	3.07*	6	2.17	18	3.18*	31	11.25	2.76*	0.83
Ureter	0	0.00	5	7.76*	2	2.32	11	6.01*	18	3.48	5.17*	0.61
<b>Bone, joints</b>	0	0.00	0	0.00	1	1.48	2	2.00	3	2.62	1.14	0.02
<b>Soft tissue including heart</b>	2	2.46	2	0.70	6	2.17	3	0.63	13	11.20	1.16	0.08
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	3.56	0.00	-0.15
<b>Melanoma of skin</b>	8	1.47	24	1.23	18	0.96	27	0.90	77	73.80	1.04	0.14
<b>Eye, orbit</b>	0	0.00	0	0.00	1	0.93	0	0.00	1	4.18	0.24	-0.13
<b>Brain, central nervous system</b>	0	0.00	11	1.26	6	0.71	14	1.08	31	32.59	0.95	-0.07
<b>Thyroid</b>	8	3.99*	8	1.21	4	0.72	6	0.86	26	21.19	1.23	0.20
<b>Lymphatic, hematopoietic</b>	11	0.96	41	0.93	51	1.06	98	1.05	201	196.70	1.02	0.18
Hodgkin lymphoma	2	2.88	2	0.89	0	0.00	1	0.41	5	7.28	0.69	-0.10
Non-Hodgkin lymphoma	4	0.72	27	1.27	29	1.25	52	1.16	112	94.77	1.18	0.73
Myeloma	3	1.69	4	0.56	13	1.56	18	1.09	38	33.76	1.13	0.18
Leukemia	2	0.59	8	0.60	9	0.60	27	0.92	46	60.89	0.76	-0.63
Acute lymphocytic	0	0.00	0	0.00	2	3.74	1	1.23	3	2.03	1.47	0.04
Chronic lymphocytic	1	0.77	3	0.56	3	0.48	13	1.11	20	24.61	0.81	-0.19
Acute non-lymphocytic	0	0.00	3	0.70	1	0.21	3	0.29*	7	20.59	0.34*	-0.57
Chronic myeloid	1	1.92	2	1.05	3	1.49	9	2.32*	15	8.33	1.80*	0.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 118,241 PYR and for male cancers on 118,616 PYR.

## Colon Both Sexes, 60-69 Years of Age

**Table 5.1.8:** Risk of subsequent primary cancers after cancer of the colon, both sexes, 60-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	654	1.19*	2,374	1.15*	1,941	1.02	1,863	1.00	6,832	6,370.41	1.07*	15.13
All excluding same site	473	0.99	1,812	1.01	1,584	0.96	1,511	0.96	5,380	5,487.80	0.98	-3.53
<b>Buccal cavity, pharynx</b>	15	0.89	53	0.94	45	1.05	35	1.00	148	151.28	0.98	-0.11
Lip	1	0.45	5	0.64	5	0.78	2	0.34	13	22.43	0.58*	-0.31
Tongue	5	1.47	14	1.23	10	1.16	7	1.02	36	30.27	1.19	0.19
Salivary gland	1	0.89	3	0.72	1	0.27	3	0.73	8	13.10	0.61	-0.17
Mouth	2	0.45	13	0.88	11	0.99	7	0.73	33	39.95	0.83	-0.23
Nasopharynx	1	1.38	1	0.43	2	1.25	1	0.91	5	5.75	0.87	-0.02
Tonsil	3	1.73	7	1.27	5	1.35	5	2.10	20	13.32	1.50	0.22
Oropharynx	1	1.82	3	1.70	2	1.62	4	4.61*	10	4.42	2.26*	0.18
Hypopharynx	1	0.50	6	0.91	6	1.28	4	1.35	17	16.27	1.04	0.02
<b>Digestive system</b>	229	2.01*	773	1.80*	532	1.31*	528	1.19*	2,062	1,391.23	1.48*	21.98
Esophagus	9	1.30	31	1.26	28	1.36	21	1.13	89	70.67	1.26*	0.60
Stomach	13	1.13	50	1.16	57	1.43*	56	1.30	176	137.29	1.28*	1.27
Small intestine	9	5.60*	35	5.71*	14	2.40*	17	2.76*	75	19.74	3.80*	1.81
Colon	133	2.75*	400	2.14*	305	1.66*	292	1.36*	1,130	633.25	1.78*	16.28
Rectum, rectosigmoid junction	45	2.07*	152	1.92*	49	0.71*	56	0.84	302	237.00	1.27*	2.13
Anus, anal canal	3	2.61	10	2.39*	3	0.83	4	1.17	20	12.36	1.62	0.25
Liver	4	0.95	12	0.76	6	0.41*	9	0.62	31	49.07	0.63*	-0.59
Gallbladder	1	0.70	1	0.18	2	0.37	6	0.96	10	18.65	0.54*	-0.28
Bile ducts, other biliary	4	1.90	17	2.05*	16	1.88*	7	0.62	44	30.25	1.45*	0.45
Pancreas	7	0.50	62	1.18	49	0.99	56	1.03	174	170.04	1.02	0.13
<b>Respiratory system</b>	84	0.77*	368	0.93	322	0.94	245	0.82*	1,019	1,146.97	0.89*	-4.19
Nose, nasal cavity, ear	1	1.20	2	0.70	5	2.06	0	0.00	8	8.70	0.92	-0.02
Larynx	7	0.83	26	0.93	17	0.83	17	1.20	67	70.79	0.95	-0.12
Lung, bronchus	76	0.76*	340	0.93	300	0.94	227	0.81*	943	1,064.83	0.89*	-3.99
<b>Female breast</b>	45	0.78	206	1.02	194	1.08	167	0.91	612	623.96	0.98	-0.81
<b>Female genital system</b>	32	1.07	115	1.16	72	0.91	76	1.02	295	282.77	1.04	0.82
Cervix uteri	2	0.61	9	0.90	8	1.17	1	0.17*	20	25.84	0.77	-0.39
Corpus uteri	16	0.95	61	1.11	39	0.91	43	1.17	159	151.35	1.05	0.51
Ovary	13	1.62	40	1.45*	20	0.85	25	1.07	98	82.48	1.19	1.04
Vagina	0	0.00	1	0.76	0	0.00	1	0.69	2	4.36	0.46	-0.16
Vulva	1	1.18	3	0.91	4	1.14	4	0.80	12	12.67	0.95	-0.05
<b>Male genital system</b>	109	1.05	435	1.00	421	0.97	371	0.98	1,336	1,355.02	0.99	-1.21
Prostate	107	1.04	434	1.00	419	0.97	366	0.97	1,326	1,345.50	0.99	-1.25
Testis	0	0.00	0	0.00	1	2.06	1	3.11	2	1.91	1.05	0.01
<b>Urinary system</b>	63	1.52*	177	1.12	140	0.94	167	1.08	547	503.30	1.09	1.43
Urinary bladder	35	1.27	113	1.06	93	0.90	110	0.99	351	348.87	1.01	0.07
Kidney parenchyma	25	2.23*	51	1.24	36	0.99	45	1.33	157	122.36	1.28*	1.14
Renal pelvis, other urinary	3	1.14	13	1.28	11	1.15	12	1.23	39	32.07	1.22	0.23
Ureter	0	0.00	6	1.75	2	0.62	5	1.55	13	10.77	1.21	0.07
<b>Bone, joints</b>	0	0.00	0	0.00	1	0.71	1	0.80	2	4.81	0.42	-0.09
<b>Soft tissue including heart</b>	3	1.58	10	1.43	12	1.87	5	0.69	30	22.58	1.33	0.24
<b>Kaposi sarcoma</b>	0	0.00	2	1.90	1	1.01	4	3.03	7	3.66	1.91	0.11
<b>Melanoma of skin</b>	17	1.56	45	1.12	26	0.72	48	1.28	136	124.64	1.09	0.37
<b>Eye, orbit</b>	1	1.21	5	1.69	3	1.21	4	1.74	13	8.58	1.52	0.14
<b>Brain, central nervous system</b>	6	0.98	21	0.97	14	0.77	13	0.82	54	61.59	0.88	-0.25
<b>Thyroid</b>	4	1.35	10	1.01	9	1.19	7	1.13	30	26.60	1.13	0.11
<b>Lymphatic, hematopoietic</b>	37	1.00	127	0.90	115	0.85	144	0.97	423	462.37	0.91	-1.29
Hodgkin lymphoma	3	2.31	4	0.92	3	0.87	3	0.99	13	12.17	1.07	0.03
Non-Hodgkin lymphoma	18	1.09	57	0.90	48	0.77	66	0.96	189	210.36	0.90	-0.70
Myeloma	7	1.04	19	0.74	22	0.90	23	0.87	71	83.20	0.85	-0.40
Leukemia	9	0.73	47	0.99	42	0.92	52	1.02	150	156.65	0.96	-0.22
Acute lymphocytic	1	2.89	0	0.00	3	2.68	0	0.00	4	3.84	1.04	0.01
Chronic lymphocytic	2	0.38	8	0.40*	8	0.43*	19	0.96	37	63.71	0.58*	-0.88
Acute non-lymphocytic	5	1.25	23	1.46	19	1.19	20	1.10	67	53.95	1.24	0.43
Chronic myeloid	0	0.00	10	1.64	7	1.18	6	0.85	23	20.71	1.11	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 148,569 PYR and for male cancers on 156,607 PYR.

**Table 5.1.9:** Risk of subsequent primary cancers after cancer of the colon, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,576	0.98	4,850	1.03	2,604	0.95*	1,193	0.96	10,223	10,311.64	0.99	-2.14
All excluding same site	1,179	0.89*	3,654	0.94*	2,092	0.93*	924	0.91*	7,849	8,491.87	0.92*	-15.54
<b>Buccal cavity, pharynx</b>	28	0.85	91	0.98	51	1.01	19	0.85	189	198.58	0.95	-0.23
Lip	0	0.00*	11	0.60	10	0.98	3	0.67	24	39.63	0.61*	-0.38
Tongue	8	1.33	17	1.00	11	1.21	5	1.27	41	35.97	1.14	0.12
Salivary gland	9	2.53*	12	1.11	6	0.88	1	0.28	28	24.69	1.13	0.08
Mouth	6	0.67	27	1.05	16	1.13	6	0.91	55	55.41	0.99	-0.01
Nasopharynx	0	0.00	3	1.07	0	0.00	0	0.00	3	5.82	0.52	-0.07
Tonsil	0	0.00	3	0.50	1	0.36	0	0.00	4	11.94	0.33*	-0.19
Oropharynx	0	0.00	2	1.00	1	1.02	1	2.72	4	4.09	0.98	0.00
Hypopharynx	5	1.82	13	1.77	4	1.20	3	2.64	25	14.55	1.72*	0.25
<b>Digestive system</b>	516	1.23*	1,598	1.28*	751	0.99	402	1.10	3,267	2,788.33	1.17*	11.57
Esophagus	12	0.78	44	0.99	19	0.76	11	0.97	86	96.10	0.89	-0.24
Stomach	36	0.81	135	1.03	76	0.98	43	1.17	290	289.00	1.00	0.02
Small intestine	18	3.78*	32	2.25*	19	2.21*	8	1.89	77	31.78	2.42*	1.09
Colon	310	1.53*	909	1.48*	410	1.08	215	1.15	1,844	1,384.27	1.33*	11.11
Rectum, rectosigmoid junction	83	1.25	272	1.42*	94	0.86	51	1.05	500	415.26	1.20*	2.05
Anus, anal canal	4	1.30	15	1.66	8	1.48	3	1.11	30	20.24	1.48	0.24
Liver	4	0.35*	24	0.71	9	0.47*	8	0.94	45	72.68	0.62*	-0.67
Gallbladder	7	0.97	10	0.47*	9	0.70	4	0.65	30	47.61	0.63*	-0.43
Bile ducts, other biliary	6	0.64	25	0.86	24	1.25	16	1.54	71	68.23	1.04	0.07
Pancreas	34	0.67*	126	0.84	79	0.87	41	0.91	280	336.36	0.83*	-1.36
<b>Respiratory system</b>	164	0.69*	641	0.94	367	1.00	138	0.93	1,310	1,437.24	0.91*	-3.08
Nose, nasal cavity, ear	2	0.89	10	1.49	3	0.75	1	0.53	16	14.85	1.08	0.03
Larynx	9	0.72	23	0.68	16	0.99	6	1.05	54	68.34	0.79	-0.35
Lung, bronchus	152	0.68*	608	0.95	348	1.01	131	0.93	1,239	1,350.07	0.92*	-2.68
<b>Female breast</b>	148	0.92	518	1.09	279	0.97	154	1.09	1,099	1,065.10	1.03	1.38
<b>Female genital system</b>	62	0.88	212	1.05	104	0.89	48	0.85	426	445.44	0.96	-0.79
Cervix uteri	8	1.12	22	1.13	14	1.33	2	0.41	46	42.04	1.09	0.16
Corpus uteri	33	0.98	109	1.16	48	0.94	27	1.18	217	201.46	1.08	0.63
Ovary	16	0.75	62	0.99	28	0.75	8	0.43*	114	139.65	0.82*	-1.05
Vagina	2	1.29	3	0.65	2	0.70	3	2.04	10	10.54	0.95	-0.02
Vulva	3	0.60	14	0.91	11	1.05	7	1.13	35	37.09	0.94	-0.09
<b>Male genital system</b>	321	1.06	887	1.00	471	0.97	178	0.96	1,857	1,863.48	1.00	-0.38
Prostate	318	1.06	884	1.00	463	0.97	175	0.95	1,840	1,848.39	1.00	-0.50
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.76	0.00	-0.10
<b>Urinary system</b>	146	1.13	371	0.96	204	0.90	98	0.94	819	845.01	0.97	-0.63
Urinary bladder	85	0.90	261	0.93	156	0.93	74	0.95	576	621.49	0.93	-1.10
Kidney parenchyma	50	1.91*	81	1.05	33	0.76	20	1.04	184	165.93	1.11	0.44
Renal pelvis, other urinary	11	1.22	29	1.10	15	0.99	4	0.58	59	57.59	1.02	0.03
Ureter	4	1.32	12	1.35	7	1.39	0	0.00	23	19.15	1.20	0.09
<b>Bone, joints</b>	0	0.00	5	1.46	0	0.00	1	1.13	6	7.40	0.81	-0.03
<b>Soft tissue including heart</b>	8	1.33	12	0.66	6	0.54	4	0.71	30	41.00	0.73	-0.27
<b>Kaposi sarcoma</b>	1	0.73	6	1.38	3	1.04	0	0.00	10	10.22	0.98	-0.01
<b>Melanoma of skin</b>	30	1.17	77	0.98	28	0.57*	16	0.63	151	178.56	0.85*	-0.67
<b>Eye, orbit</b>	2	0.96	6	1.00	2	0.59	1	0.66	11	12.95	0.85	-0.05
<b>Brain, central nervous system</b>	12	0.96	23	0.64*	23	1.16	4	0.48	62	76.97	0.81	-0.36
<b>Thyroid</b>	6	1.09	14	0.89	15	1.77	2	0.53	37	33.45	1.11	0.09
<b>Lymphatic, hematopoietic</b>	101	0.80*	328	0.86*	245	1.06	104	0.93	778	851.57	0.91*	-1.78
Hodgkin lymphoma	2	0.67	8	0.95	2	0.45	1	0.55	13	17.67	0.74	-0.11
Non-Hodgkin lymphoma	43	0.81	136	0.85	103	1.05	46	0.96	328	359.57	0.91	-0.76
Myeloma	17	0.75	58	0.87	43	1.08	16	0.87	134	147.79	0.91	-0.33
Leukemia	39	0.80	126	0.87	97	1.09	41	0.93	303	326.55	0.93	-0.57
Acute lymphocytic	1	0.87	3	0.87	3	1.42	0	0.00	7	7.72	0.91	-0.02
Chronic lymphocytic	10	0.52*	44	0.77	36	1.05	7	0.41*	97	127.46	0.76*	-0.74
Acute non-lymphocytic	20	1.23	42	0.86	32	1.08	19	1.32	113	109.38	1.03	0.09
Chronic myeloid	7	1.07	19	0.96	10	0.81	7	1.11	43	45.11	0.95	-0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 244,864 PYR and for male cancers on 168,807 PYR.

## Rectum Both Sexes

**Table 5.2.1:** Characteristics of patients with an initial cancer of the rectum or rectosigmoid junction, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	43,403	100.0	34,033	100.0	77,436	100.0
<b>Initial treatment</b>						
Any radiation	13,276	30.6	8,624	25.3	21,900	28.3
With surgery	10,997	25.3	7,008	20.6	18,005	23.3
Without surgery	2,279	5.3	1,616	4.7	3,895	5.0
No radiation	30,127	69.4	25,409	74.7	55,536	71.7
With surgery	27,151	62.6	22,398	65.8	49,549	64.0
Without surgery	2,976	6.9	3,011	8.8	5,987	7.7
<b>Race</b>						
White	37,509	86.4	29,649	87.1	67,158	86.7
Black	2,523	5.8	2,379	7.0	4,902	6.3
Other	3,245	7.5	1,907	5.6	5,152	6.7
Unknown	126	0.3	98	0.3	224	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	178	0.4	149	0.4	327	0.4
30–49	3,603	8.3	2,858	8.4	6,461	8.3
50–69	22,288	51.4	14,209	41.8	36,497	47.1
70–79	12,213	28.1	9,841	28.9	22,054	28.5
≥ 80	5,121	11.8	6,976	20.5	12,097	15.6
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	38,819	89.4	31,306	92.0	70,125	90.6
1st and 2nd cancers	4,120	9.5	2,461	7.2	6,581	8.5
1st, 2nd, and 3rd cancers	428	1.0	236	0.7	664	0.9
1st, 2nd, 3rd, and additional cancers	36	0.1	30	0.1	66	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	67.1	—	69.8	—	68.2	—
Median year of 1st cancer diagnosis	1987.5	—	1987.2	—	1987.4	—
Median person-years at risk	3.1	—	3.3	—	3.2	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.8	—	94.7	—	94.7
1st, 2nd, and additional cancers	—	94.2	—	94.0	—	94.1
1st cancer only	—	4.9	—	4.9	—	4.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 5.2.2:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,042	1.08*	3,019	0.99	2,194	1.01	1,862	0.96	8,117	8,133.64	1.00	-0.40
All excluding same site	815	0.99	2,355	0.90*	1,834	1.00	1,527	0.92*	6,531	6,923.21	0.94*	-9.34
<b>Buccal cavity, pharynx</b>	23	0.89	75	0.96	39	0.78	31	0.77	168	193.74	0.87	-0.61
Lip	4	0.93	13	1.01	4	0.48	8	1.21	29	32.11	0.90	-0.07
Tongue	4	0.81	10	0.66	6	0.61	5	0.64	25	37.63	0.66*	-0.30
Salivary gland	0	0.00	9	1.32	4	0.82	3	0.66	16	18.39	0.87	-0.06
Mouth	6	0.88	17	0.83	11	0.84	12	1.14	46	50.94	0.90	-0.12
Nasopharynx	2	1.90	4	1.29	3	1.59	0	0.00	9	7.49	1.20	0.04
Tonsil	2	0.87	8	1.18	3	0.72	2	0.66	15	16.25	0.92	-0.03
Oropharynx	1	1.44	2	0.95	0	0.00	0	0.00	3	5.15	0.58	-0.05
Hypopharynx	1	0.38	9	1.14	7	1.44	1	0.28	18	18.91	0.95	-0.02
<b>Digestive system</b>	308	1.35*	883	1.24*	519	1.04	498	1.11*	2,208	1,891.93	1.17*	7.53
Esophagus	12	1.13	29	0.88	20	0.88	12	0.60	73	86.35	0.85	-0.32
Stomach	27	1.10	59	0.79	49	0.97	56	1.27	191	194.20	0.98	-0.08
Small intestine	8	2.82*	29	3.19*	9	1.37	16	2.56*	62	24.76	2.50*	0.89
Colon	177	1.71*	527	1.61*	297	1.27*	301	1.41*	1,302	879.86	1.48*	10.05
Rectum, rectosigmoid junction	44	1.11	122	0.99	57	0.69*	32	0.46*	255	314.84	0.81*	-1.42
Anus, anal canal	6	3.19*	15	2.52*	6	1.44	2	0.54	29	15.72	1.84*	0.32
Liver	3	0.41	9	0.38*	11	0.67	7	0.46*	30	62.64	0.48*	-0.78
Gallbladder	4	1.19	6	0.58	8	1.13	3	0.48	21	27.01	0.78	-0.14
Bile ducts, other biliary	3	0.63	19	1.24	16	1.40	18	1.56	56	43.12	1.30	0.31
Pancreas	21	0.77	61	0.72*	44	0.74*	44	0.81	170	225.73	0.75*	-1.33
<b>Respiratory system</b>	135	0.81*	534	1.02	452	1.25*	318	1.02	1,439	1,361.78	1.06*	1.84
Nose, nasal cavity, ear	0	0.00	3	0.67	7	2.28	5	1.85	15	11.73	1.28	0.08
Larynx	11	0.97	38	1.10	26	1.20	11	0.67	86	83.89	1.03	0.05
Lung, bronchus	123	0.80*	493	1.02	417	1.25*	301	1.03	1,334	1,262.74	1.06*	1.70
<b>Female breast</b>	104	1.18	281	1.00	201	1.01	167	0.89	753	755.75	1.00	-0.14
<b>Female genital system</b>	25	0.60*	110	0.86	114	1.33*	71	0.93	320	331.18	0.97	-0.58
Cervix uteri	6	1.27	11	0.81	10	1.22	3	0.48	30	32.71	0.92	-0.14
Corpus uteri	11	0.52*	55	0.85	69	1.59*	42	1.11	177	167.10	1.06	0.51
Ovary	5	0.42*	32	0.86	22	0.84	17	0.71	76	99.13	0.77*	-1.19
Vagina	2	2.89	4	1.87	8	5.36*	3	2.15	17	5.72	2.97*	0.58
Vulva	0	0.00	5	0.77	3	0.62	4	0.80	12	18.35	0.65	-0.33
<b>Male genital system</b>	217	1.14	472	0.75*	380	0.82*	357	0.87*	1,426	1,692.72	0.84*	-11.81
Prostate	214	1.13	465	0.75*	376	0.82*	352	0.86*	1,407	1,677.97	0.84*	-12.00
Testis	0	0.00	1	0.56	1	1.11	0	0.00	2	3.88	0.52	-0.08
<b>Urinary system</b>	122	1.55*	300	1.20*	181	1.02	158	0.98	761	668.09	1.14*	2.21
Urinary bladder	65	1.17	208	1.18*	125	0.99	117	1.01	515	473.61	1.09	0.99
Kidney parenchyma	49	2.71*	74	1.29*	44	1.09	30	0.83	197	152.02	1.30*	1.07
Renal pelvis, other urinary	8	1.54	18	1.11	12	1.07	11	1.11	49	42.46	1.15	0.16
Ureter	2	1.15	5	0.91	6	1.59	4	1.22	17	14.27	1.19	0.07
<b>Bone, joints</b>	1	1.21	0	0.00	2	1.22	4	2.89	7	6.37	1.10	0.01
<b>Soft tissue including heart</b>	4	1.09	8	0.69	8	0.99	7	0.92	27	30.92	0.87	-0.09
<b>Kaposi sarcoma</b>	2	1.88	4	1.26	3	1.50	0	0.00	9	7.87	1.14	0.03
<b>Melanoma of skin</b>	22	1.18	65	1.07	45	1.02	45	1.06	177	166.17	1.07	0.26
<b>Eye, orbit</b>	2	1.43	2	0.46	2	0.69	3	1.21	9	11.12	0.81	-0.05
<b>Brain, central nervous system</b>	6	0.64	23	0.79	18	0.91	17	1.00	64	75.34	0.85	-0.27
<b>Thyroid</b>	5	1.08	15	1.06	8	0.88	10	1.32	38	35.45	1.07	0.06
<b>Lymphatic, hematopoietic</b>	55	0.76*	207	0.90	170	1.04	122	0.80*	554	617.43	0.90*	-1.51
Hodgkin lymphoma	1	0.44	6	0.89	5	1.20	2	0.60	14	16.50	0.85	-0.06
Non-Hodgkin lymphoma	26	0.84	94	0.94	87	1.19	65	0.93	272	274.33	0.99	-0.06
Myeloma	11	0.88	36	0.91	23	0.82	27	1.05	97	105.66	0.92	-0.21
Leukemia	17	0.65	71	0.86	55	0.94	28	0.52*	171	220.95	0.77*	-1.19
Acute lymphocytic	0	0.00	2	0.92	0	0.00	1	0.78	3	5.66	0.53	-0.06
Chronic lymphocytic	4	0.38*	16	0.48*	24	1.03	10	0.48*	54	88.02	0.61*	-0.81
Acute non-lymphocytic	8	0.91	34	1.23	21	1.06	9	0.49*	72	74.81	0.96	-0.07
Chronic myeloid	2	0.57	8	0.72	6	0.76	6	0.81	22	29.91	0.74	-0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 194,197 PYR and for male cancers on 225,744 PYR.



# Rectum

## Both Sexes, Long-term Follow-up

**Table 5.2.3:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, long-term follow-up SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	77,436		15,055		7,108		2,744		77,436			
<b>Person-years in interval</b>	334,591		53,684		23,321		8,346		419,941			
<b>All subsequent cancers</b>	6,255	1.01	1,179	0.99	480	0.88*	203	1.02	8,117	8,133.64	1.00	-0.40
All excluding same site	5,004	0.95*	982	0.96	393	0.84*	152	0.90	6,531	6,923.21	0.94*	-9.34
<b>Buccal cavity, pharynx</b>	137	0.89	24	0.95	5	0.46	2	0.52	168	193.74	0.87	-0.61
Lip	21	0.82	7	1.68	0	0.00	1	1.60	29	32.11	0.90	-0.07
Tongue	20	0.67	2	0.40	3	1.40	0	0.00	25	37.63	0.66*	-0.30
Salivary gland	13	0.94	3	1.09	0	0.00	0	0.00	16	18.39	0.87	-0.06
Mouth	34	0.84	9	1.36	2	0.69	1	0.97	46	50.94	0.90	-0.12
Nasopharynx	9	1.49	0	0.00	0	0.00	0	0.00	9	7.49	1.20	0.04
Tonsil	13	0.98	2	1.02	0	0.00	0	0.00	15	16.25	0.92	-0.03
Oropharynx	3	0.73	0	0.00	0	0.00	0	0.00	3	5.15	0.58	-0.05
Hypopharynx	17	1.11	1	0.43	0	0.00	0	0.00	18	18.91	0.95	-0.02
<b>Digestive system</b>	1,710	1.19*	296	1.08	134	1.06	68	1.42*	2,208	1,891.93	1.17*	7.53
Esophagus	61	0.92	6	0.49	5	0.90	1	0.48	73	86.35	0.85	-0.32
Stomach	135	0.90	31	1.14	18	1.46	7	1.50	191	194.20	0.98	-0.08
Small intestine	46	2.49*	11	2.91*	4	2.23	1	1.45	62	24.76	2.50*	0.89
Colon	1,001	1.50*	172	1.32*	79	1.30*	50	2.18*	1,302	879.86	1.48*	10.05
Rectum, rectosigmoid junction	223	0.91	24	0.55*	7	0.37*	1	0.14*	255	314.84	0.81*	-1.42
Anus, anal canal	27	2.25*	1	0.44	1	0.94	0	0.00	29	15.72	1.84*	0.32
Liver	23	0.49*	4	0.43	2	0.46	1	0.59	30	62.64	0.48*	-0.78
Gallbladder	18	0.87	2	0.52	1	0.57	0	0.00	21	27.01	0.78	-0.14
Bile ducts, other biliary	38	1.20	11	1.62	6	1.76	1	0.73	56	43.12	1.30	0.31
Pancreas	126	0.74*	30	0.91	9	0.58	5	0.85	170	225.73	0.75*	-1.33
<b>Respiratory system</b>	1,121	1.07*	219	1.13	72	0.83	27	0.86	1,439	1,361.78	1.06*	1.84
Nose, nasal cavity, ear	10	1.11	4	2.42	1	1.31	0	0.00	15	11.73	1.28	0.08
Larynx	75	1.11	7	0.66	3	0.69	1	0.70	86	83.89	1.03	0.05
Lung, bronchus	1,033	1.06	208	1.15*	67	0.82	26	0.88	1,334	1,262.74	1.06*	1.70
<b>Female breast</b>	586	1.03	114	1.00	38	0.71*	15	0.75	753	755.75	1.00	-0.14
<b>Female genital system</b>	249	0.98	44	0.94	21	0.96	6	0.76	320	331.18	0.97	-0.58
Cervix uteri	27	1.02	2	0.50	0	0.00	1	1.77	30	32.71	0.92	-0.14
Corpus uteri	135	1.04	25	1.08	13	1.22	4	1.04	177	167.10	1.06	0.51
Ovary	59	0.79	12	0.82	4	0.58	1	0.40	76	99.13	0.77*	-1.19
Vagina	14	3.23*	2	2.37	1	2.49	0	0.00	17	5.72	2.97*	0.58
Vulva	8	0.60	1	0.34	3	2.02	0	0.00	12	18.35	0.65	-0.33
<b>Male genital system</b>	1,069	0.83*	228	0.88	88	0.76*	41	1.10	1,426	1,692.72	0.84*	-11.81
Prostate	1,055	0.83*	226	0.88	85	0.74*	41	1.11	1,407	1,677.97	0.84*	-12.00
Testis	2	0.60	0	0.00	0	0.00	0	0.00	2	3.88	0.52	-0.08
<b>Urinary system</b>	603	1.19*	92	0.93	49	1.08	17	0.98	761	668.09	1.14*	2.21
Urinary bladder	398	1.11*	69	0.98	36	1.10	12	0.96	515	473.61	1.09	0.99
Kidney parenchyma	167	1.44*	15	0.68	11	1.08	4	1.07	197	152.02	1.30*	1.07
Renal pelvis, other urinary	38	1.17	8	1.32	2	0.72	1	0.95	49	42.46	1.15	0.16
Ureter	13	1.18	3	1.48	0	0.00	1	2.98	17	14.27	1.19	0.07
<b>Bone, joints</b>	3	0.60	3	3.53	1	2.55	0	0.00	7	6.37	1.10	0.01
<b>Soft tissue including heart</b>	20	0.86	6	1.31	1	0.46	0	0.00	27	30.92	0.87	-0.09
<b>Kaposi sarcoma</b>	9	1.44	0	0.00	0	0.00	0	0.00	9	7.87	1.14	0.03
<b>Melanoma of skin</b>	132	1.07	29	1.14	9	0.73	7	1.43	177	166.17	1.07	0.26
<b>Eye, orbit</b>	6	0.70	3	1.95	0	0.00	0	0.00	9	11.12	0.81	-0.05
<b>Brain, central nervous system</b>	47	0.80	12	1.14	5	1.07	0	0.00	64	75.34	0.85	-0.27
<b>Thyroid</b>	28	1.00	6	1.27	3	1.43	1	1.33	38	35.45	1.07	0.06
<b>Lymphatic, hematopoietic</b>	432	0.93	69	0.75*	39	0.90	14	0.84	554	617.43	0.90*	-1.51
Hodgkin lymphoma	12	0.91	1	0.47	1	1.10	0	0.00	14	16.50	0.85	-0.06
Non-Hodgkin lymphoma	207	1.01	35	0.83	19	0.94	11	1.40	272	274.33	0.99	-0.06
Myeloma	70	0.88	16	1.02	9	1.23	2	0.73	97	105.66	0.92	-0.21
Leukemia	143	0.85	17	0.52*	10	0.66	1	0.17*	171	220.95	0.77*	-1.19
Acute lymphocytic	2	0.46	1	1.22	0	0.00	0	0.00	3	5.66	0.53	-0.06
Chronic lymphocytic	44	0.66*	8	0.62	2	0.34	0	0.00	54	88.02	0.61*	-0.81
Acute non-lymphocytic	63	1.12	4	0.36*	4	0.76	1	0.49	72	74.81	0.96	-0.07
Chronic myeloid	16	0.71	2	0.45	4	1.91	0	0.00	22	29.91	0.74	-0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 194,197 PYR and for male cancers on 225,744 PYR.

**Table 5.2.4:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	355	1.08	1,086	1.05	845	1.13*	739	1.03	3,025	2,833.07	1.07*	9.88
All excluding same site	256	0.94	818	0.95	683	1.10*	582	0.98	2,339	2,344.68	1.00	-0.29
<b>Buccal cavity, pharynx</b>	2	0.34	14	0.76	7	0.54	9	0.76	32	49.03	0.65*	-0.88
Lip	1	2.35	1	0.74	0	0.00	2	1.95	4	3.81	1.05	0.01
Tongue	0	0.00	3	0.75	2	0.70	1	0.38	6	10.75	0.56	-0.24
Salivary gland	0	0.00	3	1.48	2	1.39	0	0.00	5	5.52	0.91	-0.03
Mouth	1	0.48	2	0.31	1	0.22	5	1.17	9	17.43	0.52*	-0.43
Nasopharynx	0	0.00	1	1.37	1	2.05	0	0.00	2	1.89	1.06	0.01
Tonsil	0	0.00	2	1.32	0	0.00	1	1.29	3	3.77	0.79	-0.04
Oropharynx	0	0.00	1	2.23	0	0.00	0	0.00	1	1.15	0.87	-0.01
Hypopharynx	0	0.00	1	0.83	1	1.25	0	0.00	2	3.03	0.66	-0.05
<b>Digestive system</b>	123	1.46*	339	1.28*	217	1.13	238	1.27*	917	728.56	1.26*	9.70
Esophagus	2	0.92	6	0.88	2	0.40	7	1.44	17	18.82	0.90	-0.09
Stomach	5	0.71	14	0.65	16	1.05	17	1.18	52	58.28	0.89	-0.32
Small intestine	2	1.93	14	4.18*	5	1.98	9	3.41*	30	9.54	3.14*	1.05
Colon	79	1.86*	203	1.51*	136	1.39*	144	1.49*	562	370.97	1.51*	9.84
Rectum, rectosigmoid junction	20	1.52	57	1.39*	23	0.81	11	0.42*	111	108.76	1.02	0.12
Rectum	17	1.97*	49	1.83*	19	1.01	9	0.51*	94	71.59	1.31*	1.15
Anus, anal canal	0	0.00	8	2.53*	3	1.31	2	0.91	13	8.65	1.50	0.22
Liver	0	0.00	0	0.00*	3	0.74	4	0.95	7	15.42	0.45*	-0.43
Gallbladder	2	0.97	5	0.80	6	1.38	2	0.51	15	16.62	0.90	-0.08
Bile ducts, other biliary	2	1.11	6	1.04	5	1.13	9	1.89	22	16.75	1.31	0.27
Pancreas	11	1.02	23	0.67	18	0.71	30	1.19	82	95.77	0.86	-0.71
<b>Respiratory system</b>	34	0.86	152	1.17	138	1.41*	112	1.14	436	365.68	1.19*	3.62
Nose, nasal cavity, ear	0	0.00	1	0.69	2	1.91	3	2.92	6	3.97	1.51	0.10
Larynx	1	0.78	4	0.99	3	1.08	1	0.42	9	10.47	0.86	-0.08
Lung, bronchus	32	0.85	147	1.18	132	1.41*	108	1.14	419	350.29	1.20*	3.54
<b>Female breast</b>	104	1.18	281	1.00	201	1.01	167	0.89	753	755.75	1.00	-0.14
<b>Female genital system</b>	25	0.60*	110	0.86	114	1.33*	71	0.93	320	331.18	0.97	-0.58
Cervix uteri	6	1.27	11	0.81	10	1.22	3	0.48	30	32.71	0.92	-0.14
Corpus uteri	11	0.52*	55	0.85	69	1.59*	42	1.11	177	167.10	1.06	0.51
Ovary	5	0.42*	32	0.86	22	0.84	17	0.71	76	99.13	0.77*	-1.19
Vagina	2	2.89	4	1.87	8	5.36*	3	2.15	17	5.72	2.97*	0.58
Vulva	0	0.00	5	0.77	3	0.62	4	0.80	12	18.35	0.65	-0.33
<b>Urinary system</b>	24	1.48	74	1.43*	37	0.97	35	0.92	170	143.90	1.18*	1.34
Urinary bladder	9	0.91	47	1.49*	26	1.12	21	0.90	103	87.76	1.17	0.78
Kidney parenchyma	13	2.68*	20	1.28	9	0.77	11	0.95	53	43.78	1.21	0.47
Renal pelvis, other urinary	2	1.40	7	1.55	2	0.61	3	0.95	14	12.35	1.13	0.08
Ureter	0	0.00	1	0.70	0	0.00	0	0.00	1	3.90	0.26	-0.15
<b>Bone, joints</b>	0	0.00	0	0.00	2	3.16	1	1.71	3	2.45	1.23	0.03
<b>Soft tissue including heart</b>	0	0.00	2	0.49	2	0.68	2	0.68	6	11.18	0.54	-0.27
<b>Kaposi sarcoma</b>	0	0.00	2	4.17	1	2.68	0	0.00	3	1.38	2.17	0.08
<b>Melanoma of skin</b>	8	1.44	11	0.61	17	1.30	14	1.07	50	49.70	1.01	0.02
<b>Eye, orbit</b>	2	4.05	1	0.66	1	0.97	1	1.05	5	4.00	1.25	0.05
<b>Brain, central nervous system</b>	4	1.25	9	0.88	10	1.38	9	1.35	32	27.29	1.17	0.24
<b>Thyroid</b>	1	0.39	8	1.02	5	0.97	6	1.34	20	20.00	1.00	0.00
<b>Lymphatic, hematopoietic</b>	26	1.01	69	0.84	71	1.17	56	0.92	222	230.06	0.96	-0.42
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	5.87	0.00*	-0.30
Non-Hodgkin lymphoma	13	1.09	40	1.04	39	1.34	31	1.04	123	109.15	1.13	0.71
Myeloma	5	1.09	9	0.62	13	1.23	13	1.26	40	39.93	1.00	0.00
Leukemia	8	0.93	20	0.74	19	0.96	12	0.61	59	75.10	0.79	-0.83
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	2.02	0.00	-0.10
Chronic lymphocytic	2	0.59	4	0.38*	7	0.90	4	0.53	17	29.31	0.58*	-0.63
Acute non-lymphocytic	4	1.35	11	1.17	6	0.87	5	0.72	26	26.18	0.99	-0.01
Chronic myeloid	1	0.85	2	0.54	4	1.48	3	1.12	10	10.26	0.98	-0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Rectum  
Males**

**Table 5.2.5:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	43,403		35,191		15,977		7,849		43,403			
<b>Person-years in interval</b>	32,210		94,292		56,746		42,496		225,744			
<b>All subsequent cancers</b>	687	1.08	1,933	0.95*	1,349	0.95	1,123	0.92*	5,092	5,300.57	0.96*	-9.24
All excluding same site	559	1.02	1,537	0.88*	1,151	0.94*	945	0.89*	4,192	4,578.53	0.92*	-17.12
<b>Buccal cavity, pharynx</b>	21	1.06	61	1.03	32	0.86	22	0.78	136	144.71	0.94	-0.39
Lip	3	0.77	12	1.04	4	0.55	6	1.08	25	28.29	0.88	-0.15
Tongue	4	1.09	7	0.63	4	0.58	4	0.76	19	26.87	0.71	-0.35
Salivary gland	0	0.00	6	1.25	2	0.59	3	0.95	11	12.87	0.85	-0.08
Mouth	5	1.06	15	1.07	10	1.17	7	1.11	37	33.51	1.10	0.15
Nasopharynx	2	2.46	3	1.26	2	1.43	0	0.00	7	5.60	1.25	0.06
Tonsil	2	1.12	6	1.13	3	0.95	1	0.45	12	12.48	0.96	-0.02
Oropharynx	1	1.80	1	0.60	0	0.00	0	0.00	2	4.00	0.50	-0.09
Hypopharynx	1	0.45	8	1.20	6	1.48	1	0.34	16	15.87	1.01	0.01
<b>Digestive system</b>	185	1.29*	544	1.21*	302	0.98	260	0.99	1,291	1,163.38	1.11*	5.65
Esophagus	10	1.18	23	0.88	18	1.02	5	0.33*	56	67.53	0.83	-0.51
Stomach	22	1.26	45	0.84	33	0.93	39	1.31	139	135.92	1.02	0.14
Small intestine	6	3.33*	15	2.61*	4	0.99	7	1.93	32	15.22	2.10*	0.74
Colon	98	1.60*	324	1.67*	161	1.18*	157	1.33*	740	508.89	1.45*	10.24
Rectum, rectosigmoid junction	24	0.90	65	0.79	34	0.63*	21	0.48*	144	206.08	0.70*	-2.75
Anus, anal canal	6	6.72*	7	2.52*	3	1.61	0	0.00	16	7.07	2.26*	0.40
Liver	3	0.53	9	0.50*	8	0.64	3	0.27*	23	47.22	0.49*	-1.07
Gallbladder	2	1.54	1	0.25	2	0.73	1	0.43	6	10.39	0.58	-0.19
Bile ducts, other biliary	1	0.34	13	1.36	11	1.57	9	1.32	34	26.37	1.29	0.34
Pancreas	10	0.61	38	0.75	26	0.76	14	0.48*	88	129.96	0.68*	-1.86
<b>Respiratory system</b>	101	0.80*	382	0.97	314	1.20*	206	0.97	1,003	996.09	1.01	0.31
Nose, nasal cavity, ear	0	0.00	2	0.65	5	2.47	2	1.19	9	7.77	1.16	0.05
Larynx	10	0.99	34	1.12	23	1.21	10	0.71	77	73.42	1.05	0.16
Lung, bronchus	91	0.79*	346	0.96	285	1.18*	193	0.98	915	912.45	1.00	0.11
<b>Male breast</b>	2	1.68	1	0.27	6	2.33	4	1.77	13	9.74	1.34	0.14
<b>Male genital system</b>	217	1.14	472	0.75*	380	0.82*	357	0.87*	1,426	1,692.72	0.84*	-11.81
Prostate	214	1.13	465	0.75*	376	0.82*	352	0.86*	1,407	1,677.97	0.84*	-12.00
Testis	0	0.00	1	0.56	1	1.11	0	0.00	2	3.88	0.52	-0.08
<b>Urinary system</b>	98	1.57*	226	1.14	144	1.03	123	1.00	591	524.19	1.13*	2.96
Urinary bladder	56	1.23	161	1.11	99	0.96	96	1.04	412	385.84	1.07	1.16
Kidney parenchyma	36	2.73*	54	1.29	35	1.22	19	0.78	144	108.24	1.33*	1.58
Renal pelvis, other urinary	6	1.60	11	0.94	10	1.26	8	1.19	35	30.11	1.16	0.22
Ureter	2	1.55	4	0.99	6	2.18	4	1.76	16	10.36	1.54	0.25
<b>Bone, joints</b>	1	1.91	0	0.00	0	0.00	3	3.74	4	3.92	1.02	0.00
<b>Soft tissue including heart</b>	4	1.67	6	0.80	6	1.16	5	1.06	21	19.74	1.06	0.06
<b>Kaposi sarcoma</b>	2	2.18	2	0.74	2	1.23	0	0.00	6	6.49	0.93	-0.02
<b>Melanoma of skin</b>	14	1.07	54	1.26	28	0.90	31	1.05	127	116.47	1.09	0.47
<b>Eye, orbit</b>	0	0.00	1	0.36	1	0.53	2	1.30	4	7.12	0.56	-0.14
<b>Brain, central nervous system</b>	2	0.32	14	0.73	8	0.64	8	0.78	32	48.05	0.67*	-0.71
<b>Thyroid</b>	4	1.92	7	1.11	3	0.76	4	1.29	18	15.45	1.16	0.11
<b>Lymphatic, hematopoietic</b>	29	0.63*	138	0.94	99	0.96	66	0.72*	332	387.37	0.86*	-2.45
Hodgkin lymphoma	1	0.65	6	1.35	5	1.88	2	1.00	14	10.62	1.32	0.15
Non-Hodgkin lymphoma	13	0.68	54	0.88	48	1.09	34	0.84	149	165.18	0.90	-0.72
Myeloma	6	0.76	27	1.08	10	0.57	14	0.90	57	65.72	0.87	-0.39
Leukemia	9	0.51*	51	0.92	36	0.93	16	0.47*	112	145.84	0.77*	-1.50
Acute lymphocytic	0	0.00	2	1.39	0	0.00	1	1.30	3	3.64	0.82	-0.03
Chronic lymphocytic	2	0.28	12	0.53*	17	1.09	6	0.45*	37	58.71	0.63*	-0.96
Acute non-lymphocytic	4	0.69	23	1.25	15	1.16	4	0.35*	46	48.63	0.95	-0.12
Chronic myeloid	1	0.42	6	0.81	2	0.39	3	0.64	12	19.65	0.61	-0.34

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 5.2.6:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	32	2.43*	101	1.98*	76	1.44*	148	1.24*	357	236.36	1.51*	28.40
All excluding same site	24	1.99*	72	1.55*	64	1.34*	111	1.04	271	212.54	1.28*	13.76
<b>Buccal cavity, pharynx</b>	2	3.78	0	0.00	1	0.50	1	0.29	4	8.02	0.50	-0.95
Lip	1	19.30	0	0.00	0	0.00	0	0.00	1	0.72	1.38	0.07
Tongue	0	0.00	0	0.00	1	2.21	0	0.00	1	1.79	0.56	-0.19
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.15
Mouth	1	7.86	0	0.00	0	0.00	0	0.00	1	2.01	0.50	-0.24
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.14
Tonsil	0	0.00	0	0.00	0	0.00	1	2.49	1	1.04	0.96	-0.01
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.18
<b>Digestive system</b>	8	4.28*	39	5.03*	18	2.06*	52	2.46*	117	39.54	2.96*	18.23
Esophagus	0	0.00	2	3.99	0	0.00	0	0.00	2	2.55	0.78	-0.13
Stomach	0	0.00	0	0.00	2	2.32	4	2.07	6	3.84	1.56	0.51
Small intestine	0	0.00	5	25.82*	2	10.00*	1	2.45	8	0.85	9.39*	1.68
Colon	7	10.53*	16	5.68*	9	2.73*	37	4.31*	69	15.35	4.50*	12.63
Rectum, rectosigmoid junction	1	2.68	10	6.34*	3	1.67	0	0.00*	14	7.78	1.80	1.46
Anus, anal canal	0	0.00	3	17.48*	0	0.00	0	0.00	3	0.68	4.40	0.55
Liver	0	0.00	0	0.00	0	0.00	2	1.84	2	2.14	0.94	-0.03
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.10
Bile ducts, other biliary	0	0.00	0	0.00	1	5.96	3	6.61*	4	0.80	4.98*	0.75
Pancreas	0	0.00	3	3.43	0	0.00	5	1.98	8	4.61	1.74	0.80
<b>Respiratory system</b>	6	3.72*	14	1.99*	13	1.55	19	0.91	52	37.91	1.37*	3.32
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.10
Larynx	1	6.04	0	0.00	1	1.28	0	0.00	2	3.18	0.63	-0.28
Lung, bronchus	5	3.55*	14	2.26*	12	1.60	19	0.99	50	34.19	1.46*	3.72
<b>Female breast</b>	4	1.28	16	1.39	3	0.28*	13	0.74	36	42.93	0.84	-3.46
<b>Female genital system</b>	1	0.81	7	1.52	8	1.88	9	1.26	25	17.24	1.45	3.88
Cervix uteri	0	0.00	0	0.00	1	1.24	1	1.17	2	3.20	0.62	-0.60
Corpus uteri	1	2.40	3	1.67	7	3.65*	6	1.61	17	7.84	2.17*	4.57
Ovary	0	0.00	4	2.86	0	0.00	0	0.00	4	5.20	0.77	-0.60
Vagina	0	0.00	0	0.00	0	0.00	1	12.38	1	0.17	5.75	0.41
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.25
<b>Male genital system</b>	0	0.00	5	1.64	7	1.39	20	0.90	32	30.81	1.04	0.53
Prostate	0	0.00	4	1.62	5	1.06	19	0.87	28	29.44	0.95	-0.64
Testis	0	0.00	0	0.00	1	4.05	0	0.00	1	1.10	0.91	-0.05
<b>Urinary system</b>	6	8.08*	8	2.60*	8	2.33*	8	0.95	30	15.65	1.92*	3.38
Urinary bladder	1	2.62	2	1.23	5	2.62	7	1.36	15	9.04	1.66	1.40
Kidney parenchyma	5	15.16*	4	3.02	3	2.17	1	0.35	13	5.88	2.21*	1.68
Renal pelvis, other urinary	0	0.00	2	15.52*	0	0.00	0	0.00	2	0.72	2.79	0.30
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.05
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	8.31	1	0.34	2.95	0.16
<b>Soft tissue including heart</b>	0	0.00	1	2.65	1	3.23	3	6.01*	5	1.30	3.86*	0.87
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	3.04	0	0.00	1	1.40	0.71	-0.09
<b>Melanoma of skin</b>	2	2.39	6	2.08	1	0.42	9	2.41*	18	9.84	1.83*	1.92
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.10
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	1.15	1	0.71	2	3.57	0.56	-0.37
<b>Thyroid</b>	0	0.00	0	0.00	3	3.22	2	1.79	5	3.72	1.34	0.30
<b>Lymphatic, hematopoietic</b>	3	2.49	5	1.13	6	1.46	9	1.09	23	18.00	1.28	1.18
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-0.28
Non-Hodgkin lymphoma	1	1.57	3	1.29	5	2.34	3	0.71	12	9.30	1.29	0.64
Myeloma	2	18.11*	1	2.10	0	0.00	5	3.79*	8	2.46	3.26*	1.30
Leukemia	0	0.00	1	0.85	1	0.88	1	0.41	3	5.06	0.59	-0.48
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	1	2.53	0	0.00	1	1.75	0.57	-0.18
Acute non-lymphocytic	0	0.00	1	2.38	0	0.00	0	0.00	1	1.75	0.57	-0.18
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	2.94	1	0.80	1.24	0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 20,021 PYR and for male cancers on 22,464 PYR.

# Rectum

## Both Sexes, 50-69 Years of Age

**Table 5.2.7:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	36,497		31,013		16,247		9,429		36,497			
<b>Person-years in interval</b>	27,882		88,631		62,341		58,379		237,233			
<b>All subsequent cancers</b>	437	1.24*	1,358	1.03	1,229	1.02	1,338	0.95	4,362	4,280.51	1.02	3.44
All excluding same site	343	1.12*	1,086	0.94*	1,057	1.01	1,110	0.92*	3,596	3,712.21	0.97	-4.90
<b>Buccal cavity, pharynx</b>	11	0.90	39	0.95	26	0.85	20	0.69	96	113.13	0.85	-0.72
Lip	0	0.00	5	0.90	3	0.68	3	0.65	11	16.15	0.68	-0.22
Tongue	3	1.21	7	0.84	3	0.48	3	0.52	16	22.90	0.70	-0.29
Salivary gland	0	0.00	5	1.77	1	0.41	3	0.98	9	9.10	0.99	0.00
Mouth	3	0.93	9	0.84	8	1.01	9	1.19	29	29.46	0.98	-0.02
Nasopharynx	1	1.70	1	0.54	3	2.38	0	0.00	5	4.75	1.05	0.01
Tonsil	1	0.76	5	1.18	2	0.70	1	0.44	9	10.69	0.84	-0.07
Oropharynx	1	2.57	2	1.56	0	0.00	0	0.00	3	3.39	0.89	-0.02
Hypopharynx	0	0.00	4	0.83	6	1.74	1	0.36	11	12.46	0.88	-0.06
<b>Digestive system</b>	134	1.85*	360	1.33*	261	1.05	345	1.11	1,100	902.38	1.22*	8.33
Esophagus	5	1.09	15	0.92	11	0.81	8	0.54	39	49.16	0.79	-0.43
Stomach	14	1.85*	19	0.69	27	1.10	42	1.40*	102	90.02	1.13	0.51
Small intestine	5	4.75*	14	3.53*	4	1.10	10	2.23*	33	13.13	2.51*	0.84
Colon	70	2.36*	218	1.91*	138	1.26*	205	1.41*	631	398.89	1.58*	9.78
Rectum, rectosigmoid junction	21	1.46	47	0.90	31	0.69*	22	0.44*	121	160.98	0.75*	-1.69
Anus, anal canal	3	3.96	7	2.55*	3	1.29	1	0.39	14	8.43	1.66	0.23
Liver	2	0.69	6	0.56	9	0.94	5	0.44	22	34.41	0.64*	-0.52
Gallbladder	2	2.43	0	0.00	1	0.32	3	0.73	6	11.20	0.54	-0.22
Bile ducts, other biliary	2	1.49	9	1.73	10	1.95	10	1.30	31	19.38	1.60*	0.49
Pancreas	8	0.92	24	0.74	26	0.88	32	0.85	90	108.40	0.83	-0.78
<b>Respiratory system</b>	74	1.04	293	1.12	298	1.33*	252	1.05	917	794.55	1.15*	5.16
Nose, nasal cavity, ear	0	0.00	0	0.00	5	3.04	5	2.62	10	6.14	1.63	0.16
Larynx	7	1.17	22	1.09	16	1.07	11	0.86	56	53.88	1.04	0.09
Lung, bronchus	67	1.04	271	1.14*	277	1.34*	235	1.05	850	732.68	1.16*	4.95
<b>Female breast</b>	40	1.16	126	1.02	111	1.02	117	0.90	394	397.35	0.99	-0.33
<b>Female genital system</b>	9	0.50*	53	0.87	80	1.62*	49	0.92	191	181.25	1.05	0.96
Cervix uteri	3	1.43	3	0.46	7	1.56	1	0.25	14	17.17	0.82	-0.31
Corpus uteri	3	0.30*	30	0.89	46	1.71*	29	1.05	108	98.22	1.10	0.96
Ovary	3	0.63	17	1.01	17	1.18	12	0.73	49	52.51	0.93	-0.34
Vagina	0	0.00	2	2.75	7	10.48*	2	2.23	11	2.50	4.41*	0.84
Vulva	0	0.00	1	0.55	2	1.07	4	1.32	7	7.20	0.97	-0.02
<b>Male genital system</b>	76	1.18	189	0.70*	217	0.79*	259	0.82*	741	926.61	0.80*	-13.70
Prostate	73	1.14	187	0.70*	216	0.79*	256	0.81*	732	919.15	0.80*	-13.82
Testis	0	0.00	1	1.12	0	0.00	0	0.00	1	2.03	0.49	-0.08
<b>Urinary system</b>	47	1.71*	142	1.37*	88	0.92	115	0.99	392	343.85	1.14*	2.03
Urinary bladder	22	1.21	90	1.29*	58	0.88	85	1.03	255	236.00	1.08	0.80
Kidney parenchyma	24	3.10*	46	1.64*	23	0.95	20	0.75	113	86.79	1.30*	1.10
Renal pelvis, other urinary	1	0.60	6	0.94	7	1.19	10	1.41	24	21.05	1.14	0.12
Ureter	0	0.00	2	0.94	4	2.00	4	1.68	10	7.07	1.41	0.12
<b>Bone, joints</b>	0	0.00	0	0.00	2	2.10	3	3.08	5	3.45	1.45	0.07
<b>Soft tissue including heart</b>	2	1.50	2	0.42	2	0.48	4	0.76	10	15.51	0.64	-0.23
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	1.37	0	0.00	1	2.94	0.34	-0.08
<b>Melanoma of skin</b>	7	0.85	26	0.88	24	0.95	29	0.96	86	93.21	0.92	-0.30
<b>Eye, orbit</b>	2	3.47	0	0.00	1	0.60	3	1.67	6	6.08	0.99	0.00
<b>Brain, central nervous system</b>	3	0.69	14	0.93	8	0.66	13	1.02	38	44.25	0.86	-0.26
<b>Thyroid</b>	3	1.33	10	1.34	4	0.72	4	0.76	21	20.49	1.02	0.02
<b>Lymphatic, hematopoietic</b>	23	0.95	83	0.92	80	0.95	87	0.81*	273	306.34	0.89	-1.41
Hodgkin lymphoma	1	1.02	3	0.93	3	1.25	2	0.84	9	8.98	1.00	0.00
Non-Hodgkin lymphoma	12	1.09	40	0.96	34	0.88	49	0.98	135	141.54	0.95	-0.28
Myeloma	5	1.20	14	0.89	15	1.03	14	0.76	48	52.90	0.91	-0.21
Leukemia	5	0.63	26	0.86	28	0.99	22	0.61*	81	102.93	0.79*	-0.92
Acute lymphocytic	0	0.00	1	1.15	0	0.00	1	1.18	2	2.72	0.74	-0.03
Chronic lymphocytic	1	0.30	6	0.47	15	1.28	7	0.49	29	42.10	0.69*	-0.55
Acute non-lymphocytic	3	1.17	12	1.20	8	0.83	7	0.54	30	35.10	0.85	-0.22
Chronic myeloid	0	0.00	5	1.28	4	1.10	5	1.01	14	13.57	1.03	0.02

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 101,793 PYR and for male cancers on 135,440 PYR.

**Table 5.2.8:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	573	0.95	1,560	0.92*	889	0.98	376	0.90*	3,398	3,616.77	0.94*	-15.60
All excluding same site	448	0.89*	1,197	0.85*	713	0.95	306	0.90	2,664	2,998.46	0.89*	-23.85
<b>Buccal cavity, pharynx</b>	10	0.77	36	1.04	12	0.69	10	1.31	68	72.59	0.94	-0.33
Lip	3	1.13	8	1.11	1	0.27	5	3.02	17	15.24	1.12	0.13
Tongue	1	0.43	3	0.48	2	0.65	2	1.54	8	12.94	0.62	-0.35
Salivary gland	0	0.00	4	1.04	3	1.33	0	0.00	7	8.65	0.81	-0.12
Mouth	2	0.59	8	0.87	3	0.64	3	1.40	16	19.47	0.82	-0.25
Nasopharynx	1	2.43	3	2.83	0	0.00	0	0.00	4	2.15	1.86	0.13
Tonsil	1	1.11	3	1.31	1	1.00	0	0.00	5	4.53	1.10	0.03
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.54	0.00	-0.11
Hypopharynx	1	0.88	5	1.72	1	0.82	0	0.00	7	5.69	1.23	0.09
<b>Digestive system</b>	166	1.08	484	1.11*	240	0.99	101	0.85	991	950.01	1.04	2.92
Esophagus	7	1.18	12	0.74	9	1.05	4	1.03	32	34.64	0.92	-0.19
Stomach	13	0.78	40	0.86	20	0.79	10	0.82	83	100.34	0.83	-1.24
Small intestine	3	1.73	10	2.03	3	1.09	5	3.67*	21	10.78	1.95*	0.73
Colon	100	1.36*	293	1.39*	150	1.24*	59	0.98	602	465.63	1.29*	9.73
Rectum, rectosigmoid junction	22	0.88	65	0.94	23	0.64*	10	0.62	120	146.07	0.82*	-1.86
Anus, anal canal	3	2.78	5	1.65	3	1.80	1	1.19	12	6.61	1.81	0.38
Liver	1	0.23	3	0.24*	2	0.31	0	0.00	6	26.10	0.23*	-1.43
Gallbladder	2	0.79	6	0.85	7	1.79	0	0.00	15	15.38	0.98	-0.03
Bile ducts, other biliary	1	0.29	10	1.00	5	0.81	5	1.48	21	22.94	0.92	-0.14
Pancreas	13	0.71	34	0.66*	18	0.63*	7	0.49	72	112.72	0.64*	-2.90
<b>Respiratory system</b>	55	0.59*	227	0.89	141	1.10	47	0.91	470	529.32	0.89*	-4.23
Nose, nasal cavity, ear	0	0.00	3	1.26	2	1.51	0	0.00	5	5.18	0.97	-0.01
Larynx	3	0.58	16	1.18	9	1.49	0	0.00	28	26.83	1.04	0.08
Lung, bronchus	51	0.58*	208	0.87*	128	1.06	47	0.97	434	495.87	0.88*	-4.41
<b>Female breast</b>	60	1.18	139	0.96	87	1.09	37	0.92	323	315.47	1.02	1.04
<b>Female genital system</b>	15	0.67	50	0.81	26	0.80	13	0.81	104	132.69	0.78*	-3.96
Cervix uteri	3	1.33	8	1.37	2	0.70	1	0.74	14	12.34	1.13	0.23
Corpus uteri	7	0.65	22	0.75	16	1.10	7	1.08	52	61.03	0.85	-1.25
Ovary	2	0.30	11	0.58	5	0.48	5	0.94	23	41.42	0.56*	-2.54
Vagina	2	4.17	2	1.45	1	1.28	0	0.00	5	3.05	1.64	0.27
Vulva	0	0.00	4	0.88	1	0.35	0	0.00	5	10.66	0.47	-0.78
<b>Male genital system</b>	141	1.12	278	0.78*	156	0.86	78	1.08	653	735.29	0.89*	-12.13
Prostate	141	1.13	274	0.78*	155	0.86	77	1.08	647	729.38	0.89*	-12.14
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.11
<b>Urinary system</b>	69	1.37*	150	1.05	85	1.08	35	0.96	339	308.60	1.10	2.17
Urinary bladder	42	1.14	116	1.10	62	1.06	25	0.90	245	228.56	1.07	1.17
Kidney parenchyma	20	2.00*	24	0.86	18	1.22	9	1.38	71	59.35	1.20	0.83
Renal pelvis, other urinary	7	2.01	10	1.03	5	0.97	1	0.42	23	20.69	1.11	0.16
Ureter	2	1.69	3	0.91	2	1.15	0	0.00	7	6.99	1.00	0.00
<b>Bone, joints</b>	1	2.21	0	0.00	0	0.00	0	0.00	1	2.59	0.39	-0.11
<b>Soft tissue including heart</b>	2	0.90	5	0.79	5	1.37	0	0.00	12	14.11	0.85	-0.15
<b>Kaposi sarcoma</b>	2	3.89	4	2.63	1	1.06	0	0.00	7	3.52	1.99	0.25
<b>Melanoma of skin</b>	13	1.35	33	1.17	20	1.21	7	0.81	73	63.12	1.16	0.70
<b>Eye, orbit</b>	0	0.00	2	0.92	1	0.88	0	0.00	3	4.62	0.65	-0.12
<b>Brain, central nervous system</b>	3	0.63	9	0.68	9	1.34	3	1.06	24	27.52	0.87	-0.25
<b>Thyroid</b>	2	1.01	5	0.93	1	0.37	4	3.40	12	11.24	1.07	0.05
<b>Lymphatic, hematopoietic</b>	29	0.62*	119	0.89	84	1.11	26	0.70	258	293.09	0.88*	-2.50
Hodgkin lymphoma	0	0.00	3	0.98	2	1.33	0	0.00	5	6.33	0.79	-0.10
Non-Hodgkin lymphoma	13	0.67	51	0.91	48	1.49*	13	0.83	125	123.50	1.01	0.11
Myeloma	4	0.49	21	0.90	8	0.62	8	1.33	41	50.30	0.82	-0.66
Leukemia	12	0.67	44	0.86	26	0.90	5	0.34*	87	112.96	0.77*	-1.85
Acute lymphocytic	0	0.00	1	0.82	0	0.00	0	0.00	1	2.67	0.37	-0.12
Chronic lymphocytic	3	0.42	10	0.50*	8	0.71	3	0.53	24	44.18	0.54*	-1.44
Acute non-lymphocytic	5	0.82	21	1.21	13	1.33	2	0.42	41	37.96	1.08	0.22
Chronic myeloid	2	0.83	3	0.43	2	0.49	0	0.00	7	15.53	0.45*	-0.61

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 72,383 PYR and for male cancers on 67,840 PYR.



## Rectum Both Sexes, Radiotherapy

**Table 5.2.9:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	21,900	16,267										
	17,470	42,329			6,403	21,167	2,650	11,782	21,900	91,545		
<b>All subsequent cancers</b>	268	1.05	658	0.91*	471	1.14*	283	1.11	1,680	1,644.35	1.02	3.89
All excluding same site	214	0.97	522	0.84*	412	1.16*	233	1.06	1,381	1,420.85	0.97	-4.35
<b>Buccal cavity, pharynx</b>	9	1.30	25	1.35	8	0.83	6	1.10	48	40.56	1.18	0.81
Lip	1	0.95	6	2.17	1	0.69	3	3.61	11	6.09	1.81	0.54
Tongue	2	1.44	4	1.07	3	1.54	0	0.00	9	8.20	1.10	0.09
Salivary gland	0	0.00	4	2.50	1	1.08	0	0.00	5	3.68	1.36	0.14
Mouth	2	1.12	4	0.85	1	0.41	2	1.44	9	10.36	0.87	-0.15
Nasopharynx	0	0.00	1	1.27	1	2.58	0	0.00	2	1.69	1.18	0.03
Tonsil	1	1.51	1	0.57	0	0.00	1	2.18	3	3.73	0.80	-0.08
Oropharynx	1	5.01	0	0.00	0	0.00	0	0.00	1	1.16	0.87	-0.02
Hypopharynx	0	0.00	4	2.05	1	1.02	0	0.00	5	4.19	1.19	0.09
<b>Digestive system</b>	84	1.50*	179	1.16	100	1.13	70	1.26	433	354.50	1.22*	8.57
Esophagus	3	1.02	7	0.86	5	1.09	2	0.72	17	18.49	0.92	-0.16
Stomach	8	1.37	14	0.89	14	1.60	11	2.02*	47	35.80	1.31	1.22
Small intestine	7	8.98*	7	3.14*	1	0.77	0	0.00	15	5.14	2.92*	1.08
Colon	44	1.76*	115	1.66*	53	1.32	47	1.84*	259	159.88	1.62*	10.83
Rectum, rectosigmoid junction	7	0.70	15	0.56*	5	0.34*	2	0.23*	29	60.47	0.48*	-3.44
Anus, anal canal	3	5.96*	6	4.32*	1	1.28	1	2.07	11	3.16	3.48*	0.86
Liver	1	0.49	0	0.00*	3	0.88	1	0.46	5	13.50	0.37*	-0.93
Gallbladder	1	1.38	0	0.00	2	1.84	0	0.00	3	4.43	0.68	-0.16
Bile ducts, other biliary	0	0.00	5	1.48	4	1.93	2	1.39	11	8.08	1.36	0.32
Pancreas	9	1.35	10	0.55	10	0.95	4	0.60	33	42.18	0.78	-1.00
<b>Respiratory system</b>	34	0.74	163	1.28*	110	1.55*	63	1.47*	370	287.75	1.29*	8.98
Nose, nasal cavity, ear	0	0.00	2	1.93	1	1.74	1	2.82	4	2.35	1.71	0.18
Larynx	1	0.31	12	1.39	9	2.04	2	0.83	24	18.66	1.29	0.58
Lung, bronchus	33	0.78	149	1.26*	100	1.52*	60	1.49*	342	266.08	1.29*	8.29
<b>Female breast</b>	17	0.77	50	0.82	38	1.09	15	0.67	120	140.12	0.86	-5.43
<b>Female genital system</b>	3	0.30*	18	0.68	38	2.62*	21	2.34*	80	59.68	1.34*	5.48
Cervix uteri	1	0.90	1	0.37	1	0.75	0	0.00	3	5.89	0.51	-0.78
Corpus uteri	1	0.20	13	0.96	27	3.63*	13	2.85*	54	30.64	1.76*	6.31
Ovary	0	0.00	1	0.13*	7	1.57	4	1.43	12	17.99	0.67	-1.62
Vagina	1	6.67	2	5.02	1	4.40	2	13.68*	6	0.92	6.51*	1.37
Vulva	0	0.00	0	0.00	2	2.73	1	1.95	3	2.89	1.04	0.03
<b>Male genital system</b>	47	0.84	60	0.36*	62	0.63*	39	0.65*	208	378.08	0.55*	-31.21
Prostate	45	0.81	57	0.35*	61	0.63*	37	0.63*	200	374.76	0.53*	-32.07
Testis	0	0.00	1	1.81	1	4.57	0	0.00	2	1.09	1.83	0.17
<b>Urinary system</b>	44	2.10*	82	1.39*	50	1.46*	36	1.67*	212	135.87	1.56*	8.32
Urinary bladder	21	1.45	59	1.44*	38	1.58*	32	2.10*	150	94.69	1.58*	6.04
Kidney parenchyma	21	4.07*	20	1.37	9	1.09	0	0.00*	50	33.11	1.51*	1.85
Renal pelvis, other urinary	2	1.56	3	0.85	3	1.49	4	3.19	12	8.07	1.49	0.43
Ureter	1	2.34	2	1.69	2	2.98	0	0.00	5	2.69	1.86	0.25
<b>Bone, joints</b>	0	0.00	0	0.00	1	3.18	0	0.00	1	1.31	0.76	-0.03
<b>Soft tissue including heart</b>	1	1.02	2	0.74	3	1.92	3	3.00	9	6.26	1.44	0.30
<b>Kaposi sarcoma</b>	0	0.00	2	2.31	1	2.50	0	0.00	3	1.81	1.66	0.13
<b>Melanoma of skin</b>	7	1.23	15	0.91	8	0.84	5	0.82	35	37.88	0.92	-0.31
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	3.03	1	2.25	0.44	-0.14
<b>Brain, central nervous system</b>	1	0.38	2	0.28	4	1.02	2	0.86	9	16.08	0.56	-0.77
<b>Thyroid</b>	2	1.49	1	0.28	4	2.14	2	1.85	9	7.91	1.14	0.12
<b>Lymphatic, hematopoietic</b>	16	0.85	51	0.97	30	0.98	12	0.61	109	121.87	0.89	-1.41
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.44	0.00	-0.38
Non-Hodgkin lymphoma	6	0.71	26	1.08	19	1.34	5	0.54	56	56.02	1.00	0.00
Myeloma	5	1.56	11	1.22	3	0.57	4	1.21	23	20.72	1.11	0.25
Leukemia	5	0.77	14	0.77	8	0.77	3	0.45	30	41.69	0.72	-1.28
Acute lymphocytic	0	0.00	1	1.99	0	0.00	0	0.00	1	1.12	0.89	-0.01
Chronic lymphocytic	2	0.76	1	0.14*	2	0.48	2	0.78	7	16.62	0.42*	-1.05
Acute non-lymphocytic	2	0.91	9	1.47	5	1.39	1	0.43	17	14.28	1.19	0.30
Chronic myeloid	0	0.00	2	0.82	1	0.71	0	0.00	3	5.64	0.53	-0.29

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 37,049 PYR and for male cancers on 54,496 PYR.

**Table 5.2.10:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	774	1.09*	2,361	1.01	1,723	0.98	1,579	0.94*	6,437	6,489.29	0.99	-1.59
All excluding same site	601	1.00	1,833	0.92*	1,422	0.96	1,294	0.90*	5,150	5,502.37	0.94*	-10.73
<b>Buccal cavity, pharynx</b>	14	0.75	50	0.84	31	0.77	25	0.72	120	153.18	0.78*	-1.01
Lip	3	0.92	7	0.69	3	0.44	5	0.87	18	26.02	0.69	-0.24
Tongue	2	0.56	6	0.53	3	0.38	5	0.74	16	29.43	0.54*	-0.41
Salivary gland	0	0.00	5	0.96	3	0.76	3	0.76	11	14.71	0.75	-0.11
Mouth	4	0.80	13	0.82	10	0.94	10	1.09	37	40.59	0.91	-0.11
Nasopharynx	2	2.67	3	1.29	2	1.33	0	0.00	7	5.80	1.21	0.04
Tonsil	1	0.62	7	1.38	3	0.91	1	0.39	12	12.53	0.96	-0.02
Oropharynx	0	0.00	2	1.27	0	0.00	0	0.00	2	4.00	0.50	-0.06
Hypopharynx	1	0.53	5	0.84	6	1.54	1	0.33	13	14.72	0.88	-0.05
<b>Digestive system</b>	224	1.30*	704	1.26*	419	1.02	428	1.09	1,775	1,537.43	1.15*	7.23
Esophagus	9	1.17	22	0.88	15	0.83	10	0.58	56	67.86	0.83	-0.36
Stomach	19	1.02	45	0.76	35	0.84	45	1.16	144	158.39	0.91	-0.44
Small intestine	1	0.49	22	3.20*	8	1.52	16	2.95*	47	19.62	2.40*	0.83
Colon	133	1.69*	412	1.59*	244	1.26*	254	1.35*	1,043	719.98	1.45*	9.84
Rectum, rectosigmoid junction	37	1.24	107	1.12	52	0.77	30	0.49*	226	254.38	0.89	-0.86
Anus, anal canal	3	2.17	9	1.98	5	1.48	1	0.31	18	12.56	1.43	0.17
Liver	2	0.37	9	0.51*	8	0.61	6	0.46*	25	49.15	0.51*	-0.74
Gallbladder	3	1.14	6	0.72	6	1.00	3	0.54	18	22.58	0.80	-0.14
Bile ducts, other biliary	3	0.84	14	1.17	12	1.28	16	1.58	45	35.04	1.28	0.30
Pancreas	12	0.59	51	0.77	34	0.69*	40	0.84	137	183.55	0.75*	-1.42
<b>Respiratory system</b>	101	0.84	371	0.94	342	1.18*	255	0.95	1,069	1,074.03	1.00	-0.15
Nose, nasal cavity, ear	0	0.00	1	0.29	6	2.40	4	1.70	11	9.39	1.17	0.05
Larynx	10	1.23	26	1.01	17	0.98	9	0.64	62	65.23	0.95	-0.10
Lung, bronchus	90	0.81*	344	0.94	317	1.18*	241	0.96	992	996.66	1.00	-0.14
<b>Female breast</b>	87	1.31*	231	1.06	163	0.99	152	0.92	633	615.63	1.03	1.11
<b>Female genital system</b>	22	0.70	92	0.91	76	1.06	50	0.74*	240	271.50	0.88	-2.00
Cervix uteri	5	1.38	10	0.92	9	1.32	3	0.54	27	26.82	1.01	0.01
Corpus uteri	10	0.62	42	0.82	42	1.17	29	0.87	123	136.46	0.90	-0.86
Ovary	5	0.56	31	1.06	15	0.69	13	0.61	64	81.14	0.79	-1.09
Vagina	1	1.84	2	1.15	7	5.53*	1	0.80	11	4.80	2.29*	0.39
Vulva	0	0.00	5	0.94	1	0.24	3	0.67	9	15.46	0.58	-0.41
<b>Male genital system</b>	170	1.26*	412	0.89*	318	0.87*	318	0.91	1,218	1,314.64	0.93*	-5.64
Prostate	169	1.26*	408	0.89*	315	0.87*	315	0.90	1,207	1,303.22	0.93*	-5.62
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.78	0.00	-0.16
<b>Urinary system</b>	78	1.35*	218	1.14	131	0.91	122	0.87	549	532.22	1.03	0.51
Urinary bladder	44	1.08	149	1.10	87	0.85	85	0.85	365	378.92	0.96	-0.42
Kidney parenchyma	28	2.17*	54	1.26	35	1.09	30	0.97	147	118.92	1.24*	0.86
Renal pelvis, other urinary	6	1.54	15	1.18	9	0.98	7	0.81	37	34.39	1.08	0.08
Ureter	1	0.76	3	0.70	4	1.28	4	1.40	12	11.57	1.04	0.01
<b>Bone, joints</b>	1	1.65	0	0.00	1	0.75	4	3.34	6	5.06	1.19	0.03
<b>Soft tissue including heart</b>	3	1.11	6	0.68	5	0.76	4	0.60	18	24.66	0.73	-0.20
<b>Kaposi sarcoma</b>	2	2.77	2	0.87	2	1.25	0	0.00	6	6.05	0.99	0.00
<b>Melanoma of skin</b>	15	1.16	50	1.13	37	1.07	40	1.10	142	128.29	1.11	0.42
<b>Eye, orbit</b>	2	1.93	2	0.60	2	0.85	2	0.93	8	8.87	0.90	-0.03
<b>Brain, central nervous system</b>	5	0.74	21	0.95	14	0.88	15	1.03	55	59.25	0.93	-0.13
<b>Thyroid</b>	3	0.91	14	1.33	4	0.55	8	1.23	29	27.55	1.05	0.04
<b>Lymphatic, hematopoietic</b>	39	0.73	156	0.89	140	1.05	110	0.83*	445	495.57	0.90*	-1.54
Hodgkin lymphoma	1	0.60	6	1.17	5	1.48	2	0.70	14	13.06	1.07	0.03
Non-Hodgkin lymphoma	20	0.89	68	0.90	68	1.15	60	0.99	216	218.31	0.99	-0.07
Myeloma	6	0.65	25	0.82	20	0.88	23	1.02	74	84.94	0.87	-0.33
Leukemia	12	0.61	57	0.88	47	0.98	25	0.53*	141	179.25	0.79*	-1.16
Acute lymphocytic	0	0.00	1	0.60	0	0.00	1	0.89	2	4.54	0.44	-0.08
Chronic lymphocytic	2	0.25*	15	0.58*	22	1.14	8	0.44*	47	71.40	0.66*	-0.74
Acute non-lymphocytic	6	0.91	25	1.16	16	0.99	8	0.50*	55	60.52	0.91	-0.17
Chronic myeloid	2	0.75	6	0.69	5	0.77	6	0.93	19	24.26	0.78	-0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 157,148 PYR and for male cancers on 171,248 PYR.

# Rectum

## Both Sexes, Long-term Follow-up, Radiotherapy

**Table 5.2.11:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	21,900		2,650		950		239		21,900			
<b>Person-years in interval</b>	79,763		8,511		2,697		573		91,545			
<b>All subsequent cancers</b>	1,397	1.01	207	1.15	57	0.93	19	1.41	1,680	1,644.35	1.02	3.89
All excluding same site	1,148	0.96	172	1.10	47	0.89	14	1.21	1,381	1,420.85	0.97	-4.35
<b>Buccal cavity, pharynx</b>	42	1.20	5	1.28	0	0.00	1	3.65	48	40.56	1.18	0.81
Lip	8	1.52	2	3.39	0	0.00	1	23.24	11	6.09	1.81	0.54
Tongue	9	1.27	0	0.00	0	0.00	0	0.00	9	8.20	1.10	0.09
Salivary gland	5	1.62	0	0.00	0	0.00	0	0.00	5	3.68	1.36	0.14
Mouth	7	0.78	2	2.00	0	0.00	0	0.00	9	10.36	0.87	-0.15
Nasopharynx	2	1.36	0	0.00	0	0.00	0	0.00	2	1.69	1.18	0.03
Tonsil	2	0.61	1	2.99	0	0.00	0	0.00	3	3.73	0.80	-0.08
Oropharynx	1	0.99	0	0.00	0	0.00	0	0.00	1	1.16	0.87	-0.02
Hypopharynx	5	1.36	0	0.00	0	0.00	0	0.00	5	4.19	1.19	0.09
<b>Digestive system</b>	363	1.21*	48	1.23	15	1.12	7	2.30	433	354.50	1.22*	8.57
Esophagus	15	0.96	0	0.00	2	2.98	0	0.00	17	18.49	0.92	-0.16
Stomach	36	1.19	6	1.56	3	2.29	2	6.61	47	35.80	1.31	1.22
Small intestine	15	3.48*	0	0.00	0	0.00	0	0.00	15	5.14	2.92*	1.08
Colon	212	1.58*	32	1.78*	10	1.61	5	3.55*	259	159.88	1.62*	10.83
Rectum, rectosigmoid junction	27	0.52*	2	0.32	0	0.00	0	0.00	29	60.47	0.48*	-3.44
Anus, anal canal	10	3.74*	1	2.91	0	0.00	0	0.00	11	3.16	3.48*	0.86
Liver	4	0.35*	1	0.65	0	0.00	0	0.00	5	13.50	0.37*	-0.93
Gallbladder	3	0.80	0	0.00	0	0.00	0	0.00	3	4.43	0.68	-0.16
Bile ducts, other biliary	9	1.35	2	2.03	0	0.00	0	0.00	11	8.08	1.36	0.32
Pancreas	29	0.82	4	0.85	0	0.00	0	0.00	33	42.18	0.78	-1.00
<b>Respiratory system</b>	307	1.25*	50	1.64*	10	0.98	3	1.33	370	287.75	1.29*	8.98
Nose, nasal cavity, ear	3	1.51	1	4.01	0	0.00	0	0.00	4	2.35	1.71	0.18
Larynx	22	1.35	2	1.15	0	0.00	0	0.00	24	18.66	1.29	0.58
Lung, bronchus	282	1.25*	47	1.65*	10	1.05	3	1.41	342	266.08	1.29*	8.29
<b>Female breast</b>	105	0.89	14	0.88	1	0.19	0	0.00	120	140.12	0.86	-5.43
<b>Female genital system</b>	59	1.16	15	2.32*	4	1.94	2	4.39	80	59.68	1.34*	5.48
Cervix uteri	3	0.58	0	0.00	0	0.00	0	0.00	3	5.89	0.51	-0.78
Corpus uteri	41	1.57*	9	2.74*	2	1.92	2	8.65	54	30.64	1.76*	6.31
Ovary	8	0.53	4	1.99	0	0.00	0	0.00	12	17.99	0.67	-1.62
Vagina	4	5.16*	1	9.58	1	29.45	0	0.00	6	0.92	6.51*	1.37
Vulva	2	0.84	0	0.00	1	7.99	0	0.00	3	2.89	1.04	0.03
<b>Male genital system</b>	169	0.53*	29	0.68*	7	0.49	3	1.02	208	378.08	0.55*	-31.21
Prostate	163	0.52*	28	0.67*	6	0.42*	3	1.03	200	374.76	0.53*	-32.07
Testis	2	1.99	0	0.00	0	0.00	0	0.00	2	1.09	1.83	0.17
<b>Urinary system</b>	176	1.54*	24	1.60*	10	1.89	2	1.65	212	135.87	1.56*	8.32
Urinary bladder	118	1.49*	20	1.89*	10	2.65*	2	2.29	150	94.69	1.58*	6.04
Kidney parenchyma	50	1.78*	0	0.00	0	0.00	0	0.00	50	33.11	1.51*	1.85
Renal pelvis, other urinary	8	1.17	4	4.57*	0	0.00	0	0.00	12	8.07	1.49	0.43
Ureter	5	2.19	0	0.00	0	0.00	0	0.00	5	2.69	1.86	0.25
<b>Bone, joints</b>	1	0.89	0	0.00	0	0.00	0	0.00	1	1.31	0.76	-0.03
<b>Soft tissue including heart</b>	6	1.14	2	2.87	1	4.07	0	0.00	9	6.26	1.44	0.30
<b>Kaposi sarcoma</b>	3	1.87	0	0.00	0	0.00	0	0.00	3	1.81	1.66	0.13
<b>Melanoma of skin</b>	30	0.94	5	1.18	0	0.00	0	0.00	35	37.88	0.92	-0.31
<b>Eye, orbit</b>	0	0.00	1	4.30	0	0.00	0	0.00	1	2.25	0.44	-0.14
<b>Brain, central nervous system</b>	7	0.51	2	1.21	0	0.00	0	0.00	9	16.08	0.56	-0.77
<b>Thyroid</b>	7	1.03	1	1.28	1	4.00	0	0.00	9	7.91	1.14	0.12
<b>Lymphatic, hematopoietic</b>	97	0.95	7	0.51	4	0.84	1	0.92	109	121.87	0.89	-1.41
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.44	0.00	-0.38
Non-Hodgkin lymphoma	51	1.09	3	0.47	1	0.44	1	1.92	56	56.02	1.00	0.00
Myeloma	19	1.09	3	1.29	1	1.26	0	0.00	23	20.72	1.11	0.25
Leukemia	27	0.77	1	0.22	2	1.24	0	0.00	30	41.69	0.72	-1.28
Acute lymphocytic	1	1.04	0	0.00	0	0.00	0	0.00	1	1.12	0.89	-0.01
Chronic lymphocytic	5	0.36*	1	0.55	1	1.62	0	0.00	7	16.62	0.42*	-1.05
Acute non-lymphocytic	16	1.34	0	0.00	1	1.72	0	0.00	17	14.28	1.19	0.30
Chronic myeloid	3	0.63	0	0.00	0	0.00	0	0.00	3	5.64	0.53	-0.29

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 37,049 PYR and for male cancers on 54,496 PYR.

**Table 5.2.12:** Risk of subsequent primary cancers after cancer of the rectum or rectosigmoid junction, both sexes, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4,858	1.01	972	0.96	423	0.87*	184	0.99	6,437	6,489.29	0.99	-1.59
All excluding same site	3,856	0.95*	810	0.94	346	0.84*	138	0.88	5,150	5,502.37	0.94*	-10.73
<b>Buccal cavity, pharynx</b>	95	0.80*	19	0.89	5	0.52	1	0.28	120	153.18	0.78*	-1.01
Lip	13	0.64	5	1.40	0	0.00	0	0.00	18	26.02	0.69	-0.24
Tongue	11	0.49*	2	0.48	3	1.60	0	0.00	16	29.43	0.54*	-0.41
Salivary gland	8	0.74	3	1.29	0	0.00	0	0.00	11	14.71	0.75	-0.11
Mouth	27	0.86	7	1.24	2	0.78	1	1.04	37	40.59	0.91	-0.11
Nasopharynx	7	1.53	0	0.00	0	0.00	0	0.00	7	5.80	1.21	0.04
Tonsil	11	1.10	1	0.61	0	0.00	0	0.00	12	12.53	0.96	-0.02
Oropharynx	2	0.64	0	0.00	0	0.00	0	0.00	2	4.00	0.50	-0.06
Hypopharynx	12	1.03	1	0.51	0	0.00	0	0.00	13	14.72	0.88	-0.05
<b>Digestive system</b>	1,347	1.18*	248	1.05	119	1.05	61	1.36*	1,775	1,537.43	1.15*	7.23
Esophagus	46	0.91	6	0.58	3	0.61	1	0.52	56	67.86	0.83	-0.36
Stomach	99	0.83	25	1.07	15	1.36	5	1.15	144	158.39	0.91	-0.44
Small intestine	31	2.18*	11	3.44*	4	2.51	1	1.55	47	19.62	2.40*	0.83
Colon	789	1.48*	140	1.24*	69	1.27	45	2.09*	1,043	719.98	1.45*	9.84
Rectum, rectosigmoid junction	196	1.01	22	0.59*	7	0.41*	1	0.15*	226	254.38	0.89	-0.86
Anus, anal canal	17	1.83*	0	0.00	1	1.05	0	0.00	18	12.56	1.43	0.17
Liver	19	0.53*	3	0.39	2	0.52	1	0.63	25	49.15	0.51*	-0.74
Gallbladder	15	0.88	2	0.60	1	0.63	0	0.00	18	22.58	0.80	-0.14
Bile ducts, other biliary	29	1.16	9	1.55	6	1.97	1	0.78	45	35.04	1.28	0.30
Pancreas	97	0.71*	26	0.92	9	0.65	5	0.91	137	183.55	0.75*	-1.42
<b>Respiratory system</b>	814	1.01	169	1.04	62	0.81	24	0.82	1,069	1,074.03	1.00	-0.15
Nose, nasal cavity, ear	7	1.00	3	2.14	1	1.48	0	0.00	11	9.39	1.17	0.05
Larynx	53	1.03	5	0.56	3	0.80	1	0.76	62	65.23	0.95	-0.10
Lung, bronchus	751	1.01	161	1.06	57	0.79	23	0.83	992	996.66	1.00	-0.14
<b>Female breast</b>	481	1.07	100	1.02	37	0.76	15	0.80	633	615.63	1.03	1.11
<b>Female genital system</b>	190	0.93	29	0.72	17	0.86	4	0.54	240	271.50	0.88	-2.00
Cervix uteri	24	1.13	2	0.58	0	0.00	1	1.88	27	26.82	1.01	0.01
Corpus uteri	94	0.91	16	0.80	11	1.14	2	0.55	123	136.46	0.90	-0.86
Ovary	51	0.85	8	0.64	4	0.64	1	0.42	64	81.14	0.79	-1.09
Vagina	10	2.81*	1	1.35	0	0.00	0	0.00	11	4.80	2.29*	0.39
Vulva	6	0.55	1	0.39	2	1.47	0	0.00	9	15.46	0.58	-0.41
<b>Male genital system</b>	900	0.93*	199	0.92	81	0.80*	38	1.11	1,218	1,314.64	0.93*	-5.64
Prostate	892	0.93*	198	0.93	79	0.79*	38	1.12	1,207	1,303.22	0.93*	-5.62
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.78	0.00	-0.16
<b>Urinary system</b>	427	1.09	68	0.81	39	0.97	15	0.93	549	532.22	1.03	0.51
Urinary bladder	280	1.00	49	0.82	26	0.90	10	0.86	365	378.92	0.96	-0.42
Kidney parenchyma	117	1.33*	15	0.81	11	1.23	4	1.15	147	118.92	1.24*	0.86
Renal pelvis, other urinary	30	1.16	4	0.77	2	0.81	1	1.01	37	34.39	1.08	0.08
Ureter	8	0.92	3	1.73	0	0.00	1	3.19	12	11.57	1.04	0.01
<b>Bone, joints</b>	2	0.52	3	4.18	1	2.88	0	0.00	6	5.06	1.19	0.03
<b>Soft tissue including heart</b>	14	0.78	4	1.03	0	0.00	0	0.00	18	24.66	0.73	-0.20
<b>Kaposi sarcoma</b>	6	1.30	0	0.00	0	0.00	0	0.00	6	6.05	0.99	0.00
<b>Melanoma of skin</b>	102	1.11	24	1.13	9	0.84	7	1.54	142	128.29	1.11	0.42
<b>Eye, orbit</b>	6	0.89	2	1.53	0	0.00	0	0.00	8	8.87	0.90	-0.03
<b>Brain, central nervous system</b>	40	0.90	10	1.13	5	1.21	0	0.00	55	59.25	0.93	-0.13
<b>Thyroid</b>	21	1.00	5	1.27	2	1.08	1	1.43	29	27.55	1.05	0.04
<b>Lymphatic, hematopoietic</b>	335	0.92	62	0.79	35	0.90	13	0.84	445	495.57	0.90*	-1.54
Hodgkin lymphoma	12	1.18	1	0.56	1	1.24	0	0.00	14	13.06	1.07	0.03
Non-Hodgkin lymphoma	156	0.99	32	0.90	18	1.01	10	1.36	216	218.31	0.99	-0.07
Myeloma	51	0.82	13	0.97	8	1.22	2	0.78	74	84.94	0.87	-0.33
Leukemia	116	0.88	16	0.57*	8	0.59	1	0.19	141	179.25	0.79*	-1.16
Acute lymphocytic	1	0.29	1	1.43	0	0.00	0	0.00	2	4.54	0.44	-0.08
Chronic lymphocytic	39	0.73	7	0.63	1	0.19	0	0.00	47	71.40	0.66*	-0.74
Acute non-lymphocytic	47	1.06	4	0.42	3	0.64	1	0.52	55	60.52	0.91	-0.17
Chronic myeloid	13	0.73	2	0.52	4	2.14	0	0.00	19	24.26	0.78	-0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 157,148 PYR and for male cancers on 171,248 PYR.

## Anus Both Sexes

**Table 5.3.1:** Characteristics of patients with an initial cancer of the anus or anal canal, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	1,948	100.0	2,957	100.0	4,905	100.0
<b>Initial treatment</b>						
Any radiation	1,191	61.1	1,921	65.0	3,112	63.4
With surgery	609	31.3	924	31.2	1,533	31.3
Without surgery	582	29.9	997	33.7	1,579	32.2
No radiation	757	38.9	1,036	35.0	1,793	36.6
With surgery	652	33.5	892	30.2	1,544	31.5
Without surgery	105	5.4	144	4.9	249	5.1
<b>Race</b>						
White	1,635	83.9	2,587	87.5	4,222	86.1
Black	231	11.9	269	9.1	500	10.2
Other	71	3.6	96	3.2	167	3.4
Unknown	11	0.6	5	0.2	16	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	23	1.2	11	0.4	34	0.7
30–49	484	24.8	444	15.0	928	18.9
50–69	950	48.8	1,307	44.2	2,257	46.0
70–79	341	17.5	722	24.4	1,063	21.7
≥ 80	150	7.7	473	16.0	623	12.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	1,741	89.4	2,696	91.2	4,437	90.5
1st and 2nd cancers	190	9.8	239	8.1	429	8.7
1st, 2nd, and 3rd cancers	15	0.8	22	0.7	37	0.8
1st, 2nd, 3rd, and additional cancers	2	0.1	0	0.0	2	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	60.3	—	66.7	—	64.0	—
Median year of 1st cancer diagnosis	1990.5	—	1989.4	—	1989.9	—
Median person-years at risk	2.9	—	3.6	—	3.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.2	—	95.0	—	94.7
1st, 2nd, and additional cancers	—	91.8	—	94.6	—	93.4
1st cancer only	—	5.8	—	5.0	—	5.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 5.3.2:** Risk of subsequent primary cancers after cancer of the anus or anal canal, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	61	1.26	172	1.12	159	1.46*	117	1.16	509	411.75	1.24*	35.96
All excluding same site	60	1.24	171	1.12	157	1.44*	115	1.15	503	410.75	1.22*	34.11
<b>Buccal cavity, pharynx</b>	3	2.50	14	3.80*	3	1.22	4	1.95	24	9.40	2.55*	5.40
Lip	0	0.00	1	2.12	0	0.00	0	0.00	1	1.21	0.83	-0.08
Tongue	0	0.00	7	9.19*	1	1.96	1	2.33	9	1.95	4.62*	2.61
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.33
Mouth	1	2.93	2	1.90	0	0.00	2	3.39	5	2.69	1.86	0.85
Nasopharynx	0	0.00	1	7.25	0	0.00	0	0.00	1	0.34	2.94	0.24
Tonsil	2	17.22*	2	5.68	2	8.86	1	5.78	7	0.87	8.08*	2.27
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.10
Hypopharynx	0	0.00	1	2.89	0	0.00	0	0.00	1	0.86	1.16	0.05
<b>Digestive system</b>	13	1.17	30	0.86	37	1.50*	25	1.09	105	93.55	1.12	4.23
Esophagus	0	0.00	2	1.33	5	4.80*	1	1.05	8	3.98	2.01	1.49
Stomach	1	0.94	4	1.23	6	2.70	0	0.00	11	8.53	1.29	0.91
Small intestine	0	0.00	1	2.05	0	0.00	2	5.82	3	1.34	2.24	0.61
Colon	7	1.35	13	0.79	18	1.53	11	1.00	49	44.37	1.10	1.71
Rectum, rectosigmoid junction	3	1.60	6	1.03	1	0.25	3	0.85	13	15.24	0.85	-0.83
Anus, anal canal	1	8.26	1	2.65	2	7.57	2	8.31	6	1.00	5.98*	1.85
Liver	0	0.00	0	0.00	0	0.00	2	2.92	2	2.74	0.73	-0.27
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.53	0.00	-0.57
Bile ducts, other biliary	1	4.28	2	2.67	2	3.64	0	0.00	5	2.09	2.39	1.08
Pancreas	0	0.00	1	0.23	3	0.97	4	1.37	8	11.72	0.68	-1.37
<b>Respiratory system</b>	14	1.81	51	2.07*	42	2.39*	32	1.99*	139	66.05	2.10*	26.98
Nose, nasal cavity, ear	0	0.00	0	0.00	1	6.48	0	0.00	1	0.59	1.70	0.15
Larynx	0	0.00	2	1.37	4	4.11*	2	2.55	8	3.69	2.17	1.59
Lung, bronchus	14	1.95*	49	2.14*	37	2.25*	30	1.99*	130	61.61	2.11*	25.29
<b>Female breast</b>	8	1.06	13	0.53*	20	1.16	14	0.89	55	64.92	0.85	-5.75
<b>Female genital system</b>	3	0.87	8	0.73	14	1.88*	12	1.86	37	28.29	1.31	5.05
Cervix uteri	0	0.00	2	1.66	0	0.00	0	0.00	2	2.88	0.69	-0.51
Corpus uteri	1	0.57	1	0.18*	8	2.10	4	1.23	14	14.43	0.97	-0.25
Ovary	1	1.00	1	0.31	1	0.45	5	2.50	8	8.45	0.95	-0.26
Vagina	0	0.00	0	0.00	1	8.26	2	18.14*	3	0.46	6.55*	1.47
Vulva	1	6.26	4	7.78*	3	8.01*	1	2.68	9	1.42	6.33*	4.39
<b>Male genital system</b>	7	1.08	11	0.54*	12	0.80	10	0.69	40	56.40	0.71*	-16.75
Prostate	7	1.10	10	0.49*	12	0.81	10	0.70	39	55.78	0.70*	-17.13
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.28
<b>Urinary system</b>	3	0.89	12	1.12	12	1.57	4	0.56	31	28.88	1.07	0.78
Urinary bladder	3	1.33	9	1.26	8	1.57	2	0.41	22	19.31	1.14	0.99
Kidney parenchyma	0	0.00	2	0.70	4	1.97	1	0.53	7	7.66	0.91	-0.24
Renal pelvis, other urinary	0	0.00	1	1.39	0	0.00	1	2.17	2	1.91	1.05	0.03
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.23
<b>Bone, joints</b>	0	0.00	0	0.00	1	10.96	0	0.00	1	0.35	2.83	0.24
<b>Soft tissue including heart</b>	0	0.00	1	1.66	0	0.00	1	2.55	2	1.61	1.24	0.14
<b>Kaposi sarcoma</b>	2	25.53*	3	14.24*	0	0.00	0	0.00	5	0.50	10.07*	1.67
<b>Melanoma of skin</b>	1	0.96	6	1.80	4	1.72	3	1.36	14	8.90	1.57	1.89
<b>Eye, orbit</b>	0	0.00	0	0.00	1	6.59	0	0.00	1	0.58	1.71	0.15
<b>Brain, central nervous system</b>	1	1.99	0	0.00	2	1.83	1	1.05	4	4.14	0.97	-0.05
<b>Thyroid</b>	0	0.00	0	0.00	1	1.60	1	1.93	2	2.44	0.82	-0.16
<b>Lymphatic, hematopoietic</b>	5	1.36	14	1.20	6	0.72	7	0.89	32	31.56	1.01	0.16
Hodgkin lymphoma	0	0.00	1	2.66	0	0.00	0	0.00	1	0.93	1.08	0.03
Non-Hodgkin lymphoma	4	2.41	9	1.68	3	0.77	4	1.07	20	14.65	1.37	1.98
Myeloma	0	0.00	0	0.00	3	2.07	0	0.00	3	5.44	0.55	-0.90
Leukemia	1	0.80	4	1.02	0	0.00	3	1.15	8	10.54	0.76	-0.94
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
Chronic lymphocytic	0	0.00	1	0.64	0	0.00	1	0.97	2	4.20	0.48	-0.81
Acute non-lymphocytic	0	0.00	2	1.51	0	0.00	0	0.00	2	3.60	0.56	-0.59
Chronic myeloid	1	5.86	1	1.88	0	0.00	0	0.00	2	1.43	1.40	0.21

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 17,250 PYR and for male cancers on 9,792 PYR.



**Table 5.3.3:** Risk of subsequent primary cancers after cancer of the anus or anal canal, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	2,957	2,240	2,483	6,918	1,231	4,441	624	3,651	2,957	17,250		
<b>All subsequent cancers</b>	24	0.89	91	1.05	96	1.54*	72	1.24	283	234.22	1.21*	28.28
All excluding same site	24	0.90	91	1.05	95	1.53*	72	1.24	282	233.49	1.21*	28.12
<b>Buccal cavity, pharynx</b>	1	2.06	4	2.56	1	0.92	1	1.04	7	4.10	1.71	1.68
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.17
Tongue	0	0.00	3	8.70*	1	4.15	0	0.00	4	0.91	4.42*	1.79
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.26
Mouth	1	5.91	1	1.84	0	0.00	0	0.00	2	1.44	1.39	0.33
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	1	14.31	1	0.34	2.92	0.38
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.16
<b>Digestive system</b>	4	0.62	16	0.78	22	1.47	15	1.05	57	56.25	1.01	0.43
Esophagus	0	0.00	1	1.75	2	4.81	0	0.00	3	1.56	1.93	0.84
Stomach	1	1.94	2	1.24	5	4.41*	0	0.00	8	4.33	1.85	2.13
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.46
Colon	2	0.62	10	0.97	11	1.46	9	1.24	32	28.40	1.13	2.09
Rectum, rectosigmoid junction	1	0.99	1	0.31	0	0.00	2	0.98	4	8.52	0.47	-2.62
Rectum	1	1.52	0	0.00	0	0.00	2	1.47	3	5.60	0.54	-1.51
Anus, anal canal	0	0.00	0	0.00	1	5.15	0	0.00	1	0.73	1.37	0.16
Liver	0	0.00	0	0.00	0	0.00	1	3.07	1	1.21	0.83	-0.12
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.71
Bile ducts, other biliary	0	0.00	1	2.23	1	2.96	0	0.00	2	1.28	1.57	0.42
Pancreas	0	0.00	1	0.37	2	1.00	3	1.54	6	7.48	0.80	-0.86
<b>Respiratory system</b>	6	1.76	28	2.44*	23	2.66*	18	2.15*	75	31.87	2.35*	25.00
Nose, nasal cavity, ear	0	0.00	0	0.00	1	11.67	0	0.00	1	0.32	3.10	0.39
Larynx	0	0.00	1	2.72	1	3.85	1	4.57	3	0.96	3.13	1.18
Lung, bronchus	6	1.84	27	2.47*	21	2.54*	17	2.12*	71	30.51	2.33*	23.47
<b>Female breast</b>	8	1.06	13	0.53*	20	1.16	14	0.89	55	64.92	0.85	-5.75
<b>Female genital system</b>	3	0.87	8	0.73	14	1.88*	12	1.86	37	28.29	1.31	5.05
Cervix uteri	0	0.00	2	1.66	0	0.00	0	0.00	2	2.88	0.69	-0.51
Corpus uteri	1	0.57	1	0.18*	8	2.10	4	1.23	14	14.43	0.97	-0.25
Ovary	1	1.00	1	0.31	1	0.45	5	2.50	8	8.45	0.95	-0.26
Vagina	0	0.00	0	0.00	1	8.26	2	18.14*	3	0.46	6.55*	1.47
Vulva	1	6.26	4	7.78*	3	8.01*	1	2.68	9	1.42	6.33*	4.39
<b>Urinary system</b>	1	0.78	8	1.90	2	0.65	3	1.00	14	11.60	1.21	1.39
Urinary bladder	1	1.30	7	2.80*	1	0.54	2	1.11	11	6.91	1.59	2.37
Kidney parenchyma	0	0.00	0	0.00	1	1.00	1	1.03	2	3.73	0.54	-1.00
Renal pelvis, other urinary	0	0.00	1	2.83	0	0.00	0	0.00	1	0.96	1.04	0.02
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.17
<b>Bone, joints</b>	0	0.00	0	0.00	1	18.63	0	0.00	1	0.21	4.87	0.46
<b>Soft tissue including heart</b>	0	0.00	1	2.94	0	0.00	0	0.00	1	0.92	1.08	0.04
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.06
<b>Melanoma of skin</b>	0	0.00	2	1.21	4	3.45	3	2.74	9	4.41	2.04	2.66
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.19
<b>Brain, central nervous system</b>	1	3.67	0	0.00	1	1.60	0	0.00	2	2.35	0.85	-0.20
<b>Thyroid</b>	0	0.00	0	0.00	1	2.14	0	0.00	1	1.82	0.55	-0.48
<b>Lymphatic, hematopoietic</b>	0	0.00	7	1.04	4	0.81	5	1.05	16	18.47	0.87	-1.43
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.29
Non-Hodgkin lymphoma	0	0.00	6	1.87	2	0.84	4	1.70	12	8.91	1.35	1.79
Myeloma	0	0.00	0	0.00	2	2.29	0	0.00	2	3.24	0.62	-0.72
Leukemia	0	0.00	1	0.47	0	0.00	1	0.67	2	5.82	0.34	-2.21
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	2.27	0.00	-1.31
Acute non-lymphocytic	0	0.00	1	1.34	0	0.00	0	0.00	1	2.05	0.49	-0.61
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.46

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 5.3.4:** Risk of subsequent primary cancers after cancer of the anus or anal canal, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	37	1.71*	81	1.21	63	1.35*	45	1.06	226	177.53	1.27*	49.51
All excluding same site	36	1.67*	80	1.20	62	1.33*	43	1.02	221	177.25	1.25*	44.68
<b>Buccal cavity, pharynx</b>	2	2.80	10	4.70*	2	1.46	3	2.77	17	5.30	3.21*	11.95
Lip	0	0.00	1	2.73	0	0.00	0	0.00	1	0.91	1.09	0.09
Tongue	0	0.00	4	9.60*	0	0.00	1	4.61	5	1.04	4.80*	4.04
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.44
Mouth	0	0.00	1	1.97	0	0.00	2	8.13	3	1.25	2.40	1.79
Nasopharynx	0	0.00	1	12.66	0	0.00	0	0.00	1	0.19	5.31	0.83
Tonsil	2	27.57*	2	9.34*	2	14.87*	0	0.00	6	0.52	11.44*	5.59
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.16
Hypopharynx	0	0.00	1	4.18	0	0.00	0	0.00	1	0.59	1.69	0.42
<b>Digestive system</b>	9	1.92	14	0.98	15	1.53	10	1.17	48	37.30	1.29	10.92
Esophagus	0	0.00	1	1.08	3	4.80	1	1.78	5	2.42	2.06	2.63
Stomach	0	0.00	2	1.22	1	0.92	0	0.00	3	4.20	0.71	-1.23
Small intestine	0	0.00	1	4.92	0	0.00	2	15.38*	3	0.54	5.57*	2.51
Colon	5	2.55	3	0.50	7	1.66	2	0.53	17	15.97	1.06	1.05
Rectum, rectosigmoid junction	2	2.32	5	1.91	1	0.57	1	0.67	9	6.73	1.34	2.32
Anus, anal canal	1	27.47	1	9.45	1	14.32	2	32.78*	5	0.27	18.31*	4.83
Liver	0	0.00	0	0.00	0	0.00	1	2.78	1	1.53	0.65	-0.54
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.31
Bile ducts, other biliary	1	10.40	1	3.34	1	4.72	0	0.00	3	0.81	3.70	2.23
Pancreas	0	0.00	0	0.00	1	0.90	1	1.03	2	4.24	0.47	-2.29
<b>Respiratory system</b>	8	1.85	23	1.74*	19	2.12*	14	1.82	64	34.17	1.87*	30.46
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.27
Larynx	0	0.00	1	0.92	3	4.21	1	1.77	5	2.73	1.83	2.32
Lung, bronchus	8	2.05	22	1.84*	16	1.96*	13	1.84	59	31.09	1.90*	28.50
<b>Male breast</b>	1	24.05	0	0.00	0	0.00	0	0.00	1	0.34	2.97	0.68
<b>Male genital system</b>	7	1.08	11	0.54*	12	0.80	10	0.69	40	56.40	0.71*	-16.75
Prostate	7	1.10	10	0.49*	12	0.81	10	0.70	39	55.78	0.70*	-17.13
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.28
<b>Urinary system</b>	2	0.96	4	0.62	10	2.20*	1	0.24	17	17.28	0.98	-0.29
Urinary bladder	2	1.35	2	0.43	7	2.14	0	0.00	11	12.41	0.89	-1.43
Kidney parenchyma	0	0.00	2	1.34	3	2.91	0	0.00	5	3.93	1.27	1.09
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	4.60	1	0.95	1.05	0.05
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.33
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	6.29	1	0.69	1.46	0.32
<b>Kaposi sarcoma</b>	2	29.58*	3	17.03*	0	0.00	0	0.00	5	0.40	12.53*	4.70
<b>Melanoma of skin</b>	1	1.88	4	2.39	0	0.00	0	0.00	5	4.48	1.11	0.53
<b>Eye, orbit</b>	0	0.00	0	0.00	1	15.33	0	0.00	1	0.25	3.97	0.76
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	2.14	1	2.57	2	1.79	1.12	0.21
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	1	7.90	1	0.62	1.62	0.39
<b>Lymphatic, hematopoietic</b>	5	3.10	7	1.41	2	0.58	2	0.64	16	13.09	1.22	2.98
Hodgkin lymphoma	0	0.00	1	5.56	0	0.00	0	0.00	1	0.43	2.33	0.58
Non-Hodgkin lymphoma	4	5.77*	3	1.39	1	0.67	0	0.00	8	5.73	1.40	2.31
Myeloma	0	0.00	0	0.00	1	1.74	0	0.00	1	2.20	0.45	-1.23
Leukemia	1	1.71	3	1.67	0	0.00	2	1.80	6	4.72	1.27	1.30
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.13
Chronic lymphocytic	0	0.00	1	1.37	0	0.00	1	2.22	2	1.93	1.04	0.07
Acute non-lymphocytic	0	0.00	1	1.72	0	0.00	0	0.00	1	1.55	0.65	-0.56
Chronic myeloid	1	12.61	1	4.16	0	0.00	0	0.00	2	0.64	3.14	1.39

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Anus

## Both Sexes, <50 Years of Age

**Table 5.3.5:** Risk of subsequent primary cancers after cancer of the anus or anal canal, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	5	2.71	22	3.19*	21	3.29*	24	1.76*	72	28.76	2.50*	78.40
All excluding same site	4	2.18	21	3.05*	20	3.15*	22	1.62*	67	28.67	2.34*	69.50
<b>Buccal cavity, pharynx</b>	0	0.00	2	8.26	1	4.26	0	0.00	3	0.92	3.26	3.77
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.13
Tongue	0	0.00	2	35.87*	1	18.41	0	0.00	3	0.21	14.16*	5.06
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.14
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.43
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.23
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.16
<b>Digestive system</b>	1	4.29	2	2.14	2	2.02	6	2.59	11	4.47	2.46*	11.83
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.56
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.73
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.19
Colon	0	0.00	0	0.00	1	2.64	3	3.12	4	1.77	2.26	4.04
Rectum, rectosigmoid junction	0	0.00	1	5.35	0	0.00	1	2.34	2	0.86	2.33	2.07
Anus, anal canal	1	128.76*	1	38.05	1	45.85	2	53.85*	5	0.09	53.77*	8.90
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.36
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.09
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.16
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.97
<b>Respiratory system</b>	0	0.00	8	9.53*	8	8.17*	5	2.09	21	4.41	4.77*	30.09
Nose, nasal cavity, ear	0	0.00	0	0.00	1	88.11*	0	0.00	1	0.05	21.32	1.73
Larynx	0	0.00	0	0.00	2	22.40*	2	11.67*	4	0.36	11.12*	6.60
Lung, bronchus	0	0.00	8	10.77*	5	5.71*	3	1.36	16	3.99	4.01*	21.78
<b>Female breast</b>	0	0.00	2	1.08	4	2.77	5	2.13	11	6.14	1.79	17.19
<b>Female genital system</b>	0	0.00	1	1.42	2	3.55	3	3.16	6	2.41	2.49	12.71
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-1.58
Corpus uteri	0	0.00	0	0.00	2	7.93	0	0.00	2	1.08	1.85	3.25
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-2.61
Vagina	0	0.00	0	0.00	0	0.00	2	193.88*	2	0.02	82.87*	6.99
Vulva	0	0.00	1	47.04	0	0.00	1	33.21	2	0.07	27.13*	6.82
<b>Male genital system</b>	0	0.00	0	0.00	1	1.97	0	0.00	1	3.18	0.31	-8.12
Prostate	0	0.00	0	0.00	1	2.15	0	0.00	1	2.99	0.33	-7.41
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.61
<b>Urinary system</b>	0	0.00	0	0.00	1	2.64	2	2.25	3	1.72	1.75	2.33
Urinary bladder	0	0.00	0	0.00	1	4.91	1	1.89	2	0.96	2.09	1.89
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-1.23
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	23.29	1	0.08	12.93	1.67
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.04
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.29
<b>Kaposi sarcoma</b>	2	47.69*	3	28.80*	0	0.00	0	0.00	5	0.23	21.68*	8.65
<b>Melanoma of skin</b>	0	0.00	1	2.48	0	0.00	2	4.66	3	1.25	2.40	3.17
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.09
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.78
<b>Thyroid</b>	0	0.00	0	0.00	1	8.67	0	0.00	1	0.48	2.06	0.93
<b>Lymphatic, hematopoietic</b>	2	11.79*	3	5.18*	1	2.02	1	1.06	7	2.19	3.20*	8.73
Hodgkin lymphoma	0	0.00	1	16.42	0	0.00	0	0.00	1	0.16	6.34	1.53
Non-Hodgkin lymphoma	2	21.74*	2	6.45	1	3.86	1	2.10	6	1.14	5.27*	8.82
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.55
Leukemia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-1.07
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.36
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.37
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.18

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,826 PYR and for male cancers on 2,689 PYR.

**Table 5.3.6:** Risk of subsequent primary cancers after cancer of the anus or anal canal, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	29	1.45	88	1.19	100	1.51*	81	1.12	298	232.04	1.28*	44.63
All excluding same site	29	1.45	88	1.20	99	1.50*	81	1.12	297	231.48	1.28*	44.34
<b>Buccal cavity, pharynx</b>	2	3.23	9	4.32*	2	1.26	4	2.81	17	5.71	2.98*	7.64
Lip	0	0.00	1	4.39	0	0.00	0	0.00	1	0.67	1.49	0.22
Tongue	0	0.00	3	6.83*	0	0.00	1	3.40	4	1.20	3.33	1.89
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.32
Mouth	0	0.00	1	1.72	0	0.00	2	4.90	3	1.61	1.87	0.94
Nasopharynx	0	0.00	1	12.32	0	0.00	0	0.00	1	0.21	4.70	0.53
Tonsil	2	28.32*	2	8.84	2	12.81*	1	8.74	7	0.57	12.34*	4.35
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.12
Hypopharynx	0	0.00	1	4.44	0	0.00	0	0.00	1	0.59	1.71	0.28
<b>Digestive system</b>	7	1.81	16	1.11	23	1.71*	15	0.93	61	47.91	1.27	8.86
Esophagus	0	0.00	2	2.50	4	6.03*	1	1.48	7	2.37	2.95*	3.13
Stomach	1	2.83	2	1.54	5	4.28*	0	0.00	8	4.21	1.90	2.57
Small intestine	0	0.00	1	4.35	0	0.00	2	8.18	3	0.75	4.03	1.53
Colon	4	2.44	6	0.95	10	1.63	6	0.77	26	21.86	1.19	2.80
Rectum, rectosigmoid junction	2	2.69	2	0.74	0	0.00	1	0.40	5	8.35	0.60	-2.27
Anus, anal canal	0	0.00	0	0.00	1	6.30	0	0.00	1	0.56	1.78	0.30
Liver	0	0.00	0	0.00	0	0.00	2	4.00	2	1.53	1.31	0.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.48
Bile ducts, other biliary	0	0.00	2	7.33	1	3.65	0	0.00	3	1.00	2.99	1.35
Pancreas	0	0.00	1	0.55	2	1.18	3	1.45	6	6.04	0.99	-0.03
<b>Respiratory system</b>	6	1.62	30	2.22*	28	2.36*	26	2.16*	90	41.06	2.19*	33.12
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.22
Larynx	0	0.00	0	0.00	1	1.42	0	0.00	1	2.48	0.40	-1.00
Lung, bronchus	6	1.77	30	2.42*	27	2.45*	26	2.29*	89	38.16	2.33*	34.40
<b>Female breast</b>	3	0.91	7	0.59	11	1.07	8	0.72	29	36.56	0.79	-8.04
<b>Female genital system</b>	3	1.84	5	0.87	6	1.29	6	1.31	20	16.57	1.21	3.65
Cervix uteri	0	0.00	1	1.63	0	0.00	0	0.00	1	1.59	0.63	-0.63
Corpus uteri	1	1.11	1	0.32	2	0.79	2	0.84	6	8.98	0.67	-3.16
Ovary	1	2.24	0	0.00	1	0.74	4	2.84	6	4.80	1.25	1.27
Vagina	0	0.00	0	0.00	1	15.94	0	0.00	1	0.23	4.42	0.82
Vulva	1	22.69	3	17.29*	1	5.79	0	0.00	5	0.64	7.86*	4.64
<b>Male genital system</b>	3	1.12	4	0.39*	9	0.89	10	0.92	26	34.07	0.76	-15.04
Prostate	3	1.13	4	0.39*	9	0.90	10	0.92	26	33.79	0.77	-14.51
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.17
<b>Urinary system</b>	2	1.49	4	0.80	7	1.53	1	0.19	14	16.12	0.87	-1.43
Urinary bladder	2	2.37	3	0.95	3	1.00	1	0.28	9	10.54	0.85	-1.04
Kidney parenchyma	0	0.00	1	0.67	4	3.10	0	0.00	5	4.55	1.10	0.30
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.69
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.22
<b>Bone, joints</b>	0	0.00	0	0.00	1	18.34	0	0.00	1	0.19	5.15	0.55
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	3.71	1	0.85	1.18	0.10
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.09
<b>Melanoma of skin</b>	0	0.00	2	1.19	3	2.14	1	0.67	6	5.06	1.19	0.64
<b>Eye, orbit</b>	0	0.00	0	0.00	1	10.53	0	0.00	1	0.34	2.95	0.45
<b>Brain, central nervous system</b>	1	4.11	0	0.00	1	1.42	1	1.46	3	2.48	1.21	0.35
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	1	2.97	1	1.37	0.73	-0.25
<b>Lymphatic, hematopoietic</b>	1	0.74	6	1.19	5	1.06	4	0.72	16	16.70	0.96	-0.47
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.34
Non-Hodgkin lymphoma	1	1.56	4	1.68	2	0.89	2	0.75	9	7.93	1.13	0.72
Myeloma	0	0.00	0	0.00	3	3.62	0	0.00	3	2.93	1.02	0.05
Leukemia	0	0.00	2	1.25	0	0.00	2	1.10	4	5.33	0.75	-0.90
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.10
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	1.39	1	2.19	0.46	-0.81
Acute non-lymphocytic	0	0.00	1	1.88	0	0.00	0	0.00	1	1.82	0.55	-0.56
Chronic myeloid	0	0.00	1	4.77	0	0.00	0	0.00	1	0.70	1.42	0.20

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 9,409 PYR and for male cancers on 5,369 PYR.

# Anus

## Both Sexes, ≥70 Years of Age

**Table 5.3.7:** Risk of subsequent primary cancers after cancer of the anus or anal canal, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	1,686	1,221	27	1.02	62	0.85	38	1.04	12	0.82	139	150.95	0.92	-17.71
All excluding same site			27	1.02	62	0.85	38	1.04	12	0.82	139	150.60	0.92	-17.19
<b>Buccal cavity, pharynx</b>			1	1.94	3	2.20	0	0.00	0	0.00	4	2.76	1.45	1.83
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.69
Tongue			0	0.00	2	7.51	0	0.00	0	0.00	2	0.54	3.73	2.17
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.49
Mouth			1	6.56	1	2.45	0	0.00	0	0.00	2	0.84	2.37	1.72
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.12
Tonsil			0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.25
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.09
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.28
<b>Digestive system</b>			5	0.71	12	0.62	12	1.17	4	0.90	33	41.17	0.80	-12.11
Esophagus			0	0.00	0	0.00	1	3.27	0	0.00	1	1.30	0.77	-0.45
Stomach			0	0.00	2	1.07	1	1.04	0	0.00	3	3.92	0.77	-1.36
Small intestine			0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.72
Colon			3	0.87	7	0.72	7	1.33	2	0.86	19	20.73	0.92	-2.57
Rectum, rectosigmoid junction			1	0.92	3	1.02	1	0.69	1	1.74	6	6.03	0.99	-0.05
Anus, anal canal			0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.51
Liver			0	0.00	0	0.00	0	0.00	0	0.00	0	1.01	0.00	-1.50
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-1.14
Bile ducts, other biliary			1	6.32	0	0.00	1	3.87	0	0.00	2	1.00	2.00	1.48
Pancreas			0	0.00	0	0.00	1	0.78	1	1.77	2	5.14	0.39	-4.65
<b>Respiratory system</b>			8	2.09	13	1.26	6	1.25	1	0.61	28	20.59	1.36	10.99
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.32
Larynx			0	0.00	2	4.51	1	5.57	0	0.00	3	0.85	3.52	3.18
Lung, bronchus			8	2.22	11	1.13	5	1.10	1	0.64	25	19.46	1.28	8.20
<b>Female breast</b>			5	1.33	4	0.38*	5	0.91	1	0.43	15	22.21	0.68	-14.38
<b>Female genital system</b>			0	0.00	2	0.44	6	2.68	3	3.27	11	9.32	1.18	3.35
Cervix uteri			0	0.00	1	2.42	0	0.00	0	0.00	1	0.84	1.19	0.31
Corpus uteri			0	0.00	0	0.00	4	3.91*	2	5.27	6	4.37	1.37	3.25
Ovary			0	0.00	1	0.72	0	0.00	1	3.27	2	2.91	0.69	-1.81
Vagina			0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.41
Vulva			0	0.00	0	0.00	2	10.78*	0	0.00	2	0.71	2.81	2.57
<b>Male genital system</b>			4	1.08	7	0.72	2	0.46	0	0.00	13	19.14	0.68	-35.45
Prostate			4	1.09	6	0.62	2	0.46	0	0.00	12	19.00	0.63	-40.36
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.10
<b>Urinary system</b>			1	0.51	8	1.49	4	1.50	1	0.93	14	11.05	1.27	4.37
Urinary bladder			1	0.73	6	1.59	4	2.11	0	0.00	11	7.82	1.41	4.72
Kidney parenchyma			0	0.00	1	0.84	0	0.00	1	4.53	2	2.42	0.83	-0.63
Renal pelvis, other urinary			0	0.00	1	2.55	0	0.00	0	0.00	1	0.81	1.24	0.28
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.40
<b>Bone, joints</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.17
<b>Soft tissue including heart</b>			0	0.00	1	3.55	0	0.00	0	0.00	1	0.60	1.67	0.59
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.19
<b>Melanoma of skin</b>			1	2.30	3	2.42	1	1.59	0	0.00	5	2.59	1.93	3.57
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.29
<b>Brain, central nervous system</b>			0	0.00	0	0.00	1	3.50	0	0.00	1	1.22	0.82	-0.33
<b>Thyroid</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.86
<b>Lymphatic, hematopoietic</b>			2	0.93	5	0.83	0	0.00	2	1.49	9	12.67	0.71	-5.44
Hodgkin lymphoma			0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.40
Non-Hodgkin lymphoma			1	1.08	3	1.12	0	0.00	1	1.71	5	5.58	0.90	-0.85
Myeloma			0	0.00	0	0.00	0	0.00	0	0.00	0	2.21	0.00	-3.27
Leukemia			1	1.28	2	0.92	0	0.00	1	1.94	4	4.62	0.87	-0.92
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.16
Chronic lymphocytic			0	0.00	1	1.17	0	0.00	0	0.00	1	1.80	0.55	-1.19
Acute non-lymphocytic			0	0.00	1	1.34	0	0.00	0	0.00	1	1.57	0.64	-0.85
Chronic myeloid			1	9.59	0	0.00	0	0.00	0	0.00	1	0.63	1.58	0.54

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,016 PYR and for male cancers on 1,733 PYR.

# Chapter 6

## New Malignancies Following Cancer of the Respiratory Tract

Neil E. Caporaso, Kevin W. Dodd, Margaret A. Tucker

### Synopsis

The risk of subsequent primary cancer was evaluated in 286,675 persons with initial cancers of the respiratory tract diagnosed between 1973 and 2000. Overall risk of a new malignancy was significantly increased among survivors of lung cancer (O/E=1.36, O=11,700, EAR=65 per 10,000 person-years), laryngeal cancer (O/E=1.71, O=5,277, EAR=140), and nasal cavity cancer (O/E=1.44, O=405, EAR=68), but not mesothelioma (O/E=0.98, O=91). The risk of subsequent cancers following lung, laryngeal, and nasal cancers appeared strongly related to tobacco exposures, with excesses for most smoking-related sites. These risks appeared relatively constant over time. When lung cancer was treated initially with radiation, however, there was a delayed increase of esophageal cancer after 5 or more years, suggesting a radiation effect. There was an excess of acute non-lymphocytic leukemia, especially after small cell carcinoma of the lung, which has previously been linked to treatment with alkylating agent chemotherapy. Following laryngeal cancer, the risk was particularly elevated (3- to 6-fold) for subsequent cancers of the buccal cavity, pharynx, and lung. This pattern reflects a “field cancerization” phenomenon involving multiple patches of genetically transformed cells resulting from tobacco exposure (and alcohol for some sites) or the spread and implantation of single clones. Following nasal cavity cancer, excesses of buccal and respiratory tract tumors were consistent with tobacco exposure, although the numbers were small. After mesothelioma, a nearly 7-fold excess of thyroid cancer was observed, but the increase was based on only 3 cases.

### Lung and Bronchus Cancer

Primary cancers of the lung and bronchus represent 13% of all cancers occurring in the U.S. (13% in men and 12% in women), with approximately 172,570 new cases diagnosed annually (Jemal et al, 2005). Lung cancer ranks third in incidence (behind breast cancer in women and prostate cancer in men). It is the leading cause of cancer mortality in the U.S., accounting

for 29% of all cancer deaths (31% in men and 27% in women)—more than breast, colon, prostate, and pancreas cancers combined. Lung cancer incidence is greatest for black men, followed by white men, black women, and white women. The relative survival rate remains disappointingly low, with only 15.2% surviving for 5 years. The distribution of cell types in SEER includes squamous (26%), adenocarcinoma (31%, including 3% bronchioloalveolar), small cell (16%), large cell (9%), and others (18%). Among patients in SEER with non-small cell lung cancer (NSCLC) histologies in the current survey, surgery was the initial therapy in 31% of the cases; among those with small cell lung cancer (SCLC), only 5% had surgery. For those with NSCLC, radiation occasionally results in long-term survival, but it is most effective for palliation and local tumor control (Ginsberg et al, 2001). Chemotherapy and newer combined modality and molecular therapies for NSCLC have not had a marked impact on survival during the period of this SEER study (Selvaggi and Seagliotti, 2002; Jemal et al, 2005). Among those with SCLC, combination chemotherapy is the treatment of choice, with radiotherapy often incorporated. At presentation, 30-40% of SCLC patients have limited disease and 60-70% have extensive disease. Five-year relative survival rates are 10-20% in SCLC patients with limited disease and 3-5% in those with extensive disease (Hanna and Einhorn, 2002; Ries et al, 2004; Jemal et al, 2005).

Tobacco smoking is the dominant etiologic factor responsible for the vast majority of lung cancers (Ruano-Ravina et al, 2003). Other exposures also contribute to risk, including asbestos, radon, radiotherapy, polycyclic aromatic hydrocarbons, and nutritional and dietary factors, as well as environmental tobacco smoke (Blot and Fraumeni, 1996; Ruano-Ravina et al, 2003; Alberg et al, 2005). Familial susceptibility to lung cancer has been documented and traced to inherited factors (Bailey-Wilson et al, 2004). Although etiologic factors are not strongly related to lung cancer histology, the dose-response relationship with tobacco exposure is less steep for adenocarcinoma than for other histologies (Suzuki et al, 1990).

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).*

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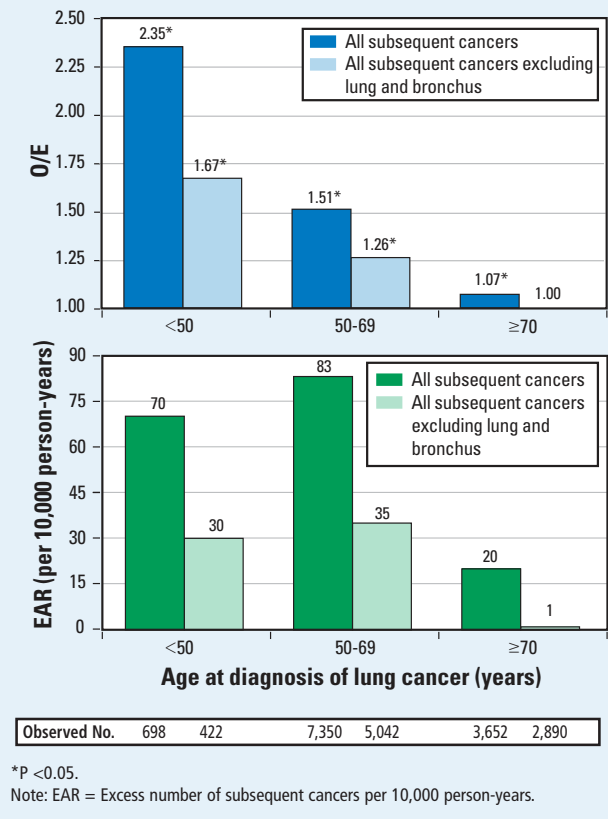


## Results and Discussion

A total of 11,700 subsequent primary cancers were observed in 255,083 patients surviving at least 2 months after an initial cancer of the lung or bronchus diagnosed between 1973 and 2000 (O/E=1.36, 95% CI=1.34-1.39, EAR=65 per 10,000 person-years). In analyses adjusting for the competing risk of death due to other causes, the cumulative incidence of developing any second cancer was 5.7% at 25 years (95% CI=5.5%-5.8%), which included an incidence of 1.7% (1.7%-1.8%) for second cancers of the lung or bronchus. Significantly increased risks were observed for subsequent cancers of the respiratory tract (with 90% of subsequent respiratory tumors occurring in the lung), buccal cavity (including tongue, tonsils, mouth, oropharynx, and hypopharynx), esophagus, stomach, small intestine, colon, rectum, pancreas, bladder, kidney, renal pelvis, and thyroid, as well as for acute non-lymphocytic leukemia (ANLL). The risk of all new malignancies combined decreased when subsequent lung cancers were excluded (O/E=1.17, 95% CI=1.15-1.20, EAR=25). The risk for all subsequent cancers remained elevated up to 20 years after diagnosis, with those surviving 10 or more years showing a 49% increased relative risk of subsequent cancer. The risks of new primary cancers were slightly higher in blacks (O/E=1.47, EAR=88) than in whites (O/E=1.34, EAR=61). Although the relative risk of developing a subsequent neoplasm was higher in women (O/E=1.50, EAR=65) than in men (O/E=1.31, EAR=65), the excess absolute risks were nearly identical. The higher relative risks of new malignancies among women, many of which are smoking-related, were likely due to the fact that a greater proportion of men than women are smokers in the general population (MMWR, 2004) from whom the expected values are derived. The virtually identical absolute risks suggest cautious interpretation of gender effects in the development of subsequent cancers. Relative risks for all subsequent cancers were higher in those diagnosed with lung cancer before age 50 years (O/E=2.35, EAR=70), compared with those between 50 and 69 years of age (O/E=1.51, EAR=83) or older ( $\geq 70$  years, O/E=1.07, EAR=20) (Figure 6.1). This is similar to the pattern observed in data from Finland (Salminen et al, 1995) and Switzerland (Levi et al, 1999). However, in our survey the excess absolute risks were similar among lung cancer survivors diagnosed at ages younger than 70 years (Figure 6.1). In contrast, observed numbers of subsequent cancers were significantly below those expected for cancers of the female genital system (notably uterine corpus and vulva), brain, prostate, and testis, as well as melanoma and chronic lymphocytic leukemia. The lower rates for new cancers of the uterine corpus may reflect decreased estrogen levels associated with tobacco smoking (Michnovicz et al, 1986).

Tobacco smoking is the dominant risk factor underlying the pattern of new malignancies associated with lung cancer. Subsequent lung cancers constituted 29%

**Figure 6.1:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after cancer of the lung or bronchus, both sexes, SEER 1973-2000.



of all new primary cancers, with increases in risk being highest (greater than 3-fold) in those surviving 5 or more years after initial diagnosis. A similar pattern of smoking-related subsequent cancers has been observed in previous studies of lung cancer (Boice and Fraumeni, 1985; Richardson et al, 1993; Salminen et al, 1995; Tucker et al, 1997), with sustained risk increases beyond 5 years for cancers of the larynx, esophagus, and bladder. The risks of subsequent cancers of the lung and buccal cavity are especially high among lung cancer survivors who continue to smoke cigarettes (Tucker et al, 1997; Johnson, 1998), mandating a high priority for smoking cessation efforts in this group. Some data indicate that smoking cessation following lung cancer lowers the risk of new smoking-related malignancies (Richardson et al, 1993; Ebbert et al, 2003).

Overall, subsequent cancer risks were higher among patients diagnosed with NSCLC (O/E=1.38, EAR=69) than SCLC (O/E=1.13, EAR=21). This pattern has been observed previously, although the number of long-term SCLC survivors was small (Levi et al, 1999). Among 5-or-more-year survivors in our survey, new primary cancer risks were higher among those initially diagnosed with SCLC (O/E=1.87) than with NSCLC (O/E=1.52). The pattern of subsequent cancers after NSCLC and SCLC involved mainly smoking-related cancers, but the risk of ANLL after SCLC (O/E=6.57) was much higher than after NSCLC (O/E=1.47), most

likely due to treatment with alkylating agents, as previously reported (Pedersen-Bjergaard et al, 1985; Sagman et al, 1992; Tucker et al, 1997; Johnson, 1998). In our series, 36 out of 38 patients with subsequent primary ANLL had received chemotherapy as their initial therapy following SCLC. After both NSCLC and SCLC, there was an elevated risk of thyroid cancer within the first year, which probably reflects increased medical surveillance and incidental findings at autopsy, since 34 of the 84 (40%) thyroid cancers were diagnosed at autopsy.

The temporal pattern of increased risks for several cancer sites near the field of radiation appeared consistent with radiation-related effects. After radiation for NSCLC, the relative risk of cancer of the esophagus increased to 6-fold for the 5-9 year follow-up period, and to 11-fold among patients who survived 10 or more years. Similar radiation-related risks were seen for esophageal cancer following SCLC, based on smaller numbers. For laryngeal cancer following NSCLC, an excess of radiation-related tumors was suggested only in the period 5-9 years after initial treatment. For subsequent cancers of the lung following radiation, substantial excesses were limited to the follow-up periods of 5-10 years and greater than 10 years for both SCLC and NSCLC. In previously reported studies, continued tobacco use appeared to interact with radiotherapy (and possibly chemotherapy as well) to augment the risk of second tumors (Tucker et al, 1997).

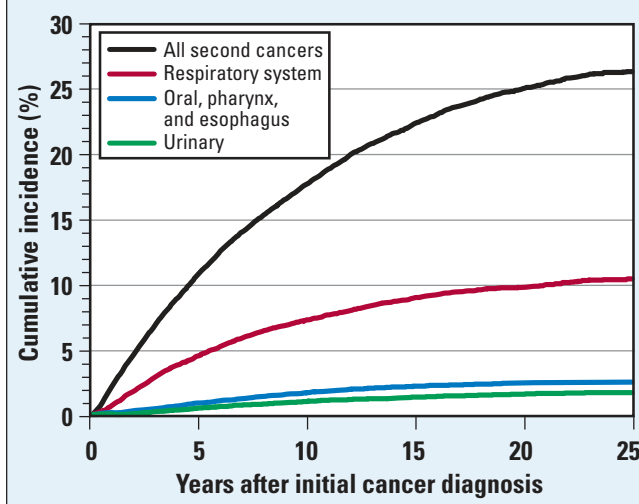
Although the contribution of genetic susceptibility to multiple primary cancers cannot be directly addressed in our study, there was a higher risk of subsequent cancers among lung cancer patients diagnosed at younger ages. The recent finding of a genetic locus that may account for familial lung cancer (Bailey-Wilson et al, 2004) provides an opportunity for further studies of susceptibility factors that contribute to subsequent tumors associated with lung cancer.

## Laryngeal Cancer

The larynx accounts for approximately 0.7% of all incident cancers (about 9,880 per year) in the U.S. and 0.7% of all cancer deaths (about 3,770 per year) (Jemal et al, 2005). Laryngeal cancer is 4 times more common in men than women and occurs more frequently in blacks than whites. The overall relative 5-year survival rate for larynx cancer is 65.0%, although patients diagnosed with localized disease have an 83.7% survival rate. The vast majority of cancers of the larynx are squamous cell carcinomas. Treatment may include surgery, radiation, and occasionally chemotherapy or combined modalities.

The major risk factors for laryngeal cancer are tobacco smoking and alcohol consumption. Dietary factors (low consumption of fruits and vegetables, high consumption of processed meats) and certain occupational exposures may contribute as well (Dietz et al, 2004; Levi et al, 2004).

**Figure 6.2:** Cumulative incidence of developing a second cancer among patients with cancer of the larynx, both sexes, SEER 1973-2000.



## Results and Discussion

A total of 5,277 subsequent primary cancers developed among 23,943 patients surviving at least 2 months after an initial cancer of the larynx. The risk of developing any new malignancy was significantly increased by 71% (O/E=1.71, 95% CI=1.66-1.76, EAR=140). The cumulative incidence of developing a second cancer was 26.7% at 25 years (95% CI=25.9%-27.4%) (Figure 6.2). Both the relative and absolute risks of a new neoplasm were greater among women (O/E=2.41, EAR=177) than men (O/E=1.62, EAR=132), and among blacks (O/E=1.98, EAR=203) than whites (O/E=1.68, EAR=135). Although the relative risk for any subsequent tumor was higher in those diagnosed with laryngeal cancer before the age of 50 years (O/E=2.36, EAR=91) compared with older patients (age 50-69, O/E=1.78, EAR=154; age  $\geq$ 70, O/E=1.42, EAR=131), the absolute risk was lower in the younger group. Risk of all subsequent cancers decreased over time following diagnosis of the initial cancer, from a 94% excess in the 1- to 4-year interval to a 16% excess at 20 or more years after diagnosis. The risk of developing a subsequent cancer was increased for a variety of sites, including cancers of the buccal cavity and pharynx, esophagus, colon, liver, nasal cavity, lung, larynx, urinary bladder, kidney, and thyroid. Risks were significantly below that expected for prostate cancer, chronic lymphocytic leukemia, and melanoma.

The pattern of tumors associated with laryngeal cancer, with pronounced excesses of tumors in the upper aerodigestive tract (oral cavity, pharynx, esophagus), resembles that in previous surveys (McDonald et al, 1989; Fujita et al, 1998; Gao et al, 2003; Do et al, 2003; Dikshit et al, 2005) implicating "field cancerization" due to tobacco and alcohol exposure, or the spread and implantation of single clones of mutant cells. Tobacco smoking is also likely to have contributed to excess tumors of the lung, bladder, and kidney, while alcohol

is likely to have contributed to an elevated risk of liver cancer (O/E=1.92). The increase in thyroid cancer was limited to the first year following diagnosis, suggesting an effect of increased medical surveillance.

Most (74%) of the patients with cancer of the larynx received radiation as part of the initial treatment. There was some suggestion of a modest increase in risk of subsequent cancer over time in some adjacent irradiated sites, especially the pharynx (O/E=5.88), with most cases occurring 5-9 years (O/E=8.86, O=27) or 10 or more years (O/E=8.19, O=18) after laryngeal cancer diagnosis. These results are consistent with a radiation effect and with the findings of others (Holland et al, 2002; Gao et al, 2003).

## Nose, Nasal Cavity, and Middle Ear Cancers

Cancers of the nose, nasal cavity, and middle ear account for only 0.2% of all cancers in the SEER Program. Tobacco use and exposures in wood-dust and metal-related occupations are documented risk factors (Dong and Hemminki, 2001). Additional workplace exposures include nickel, chromates, textiles, radium, leather dust, and petroleum (Blot et al, 1997; Caplan et al, 2000). The 5-year relative survival rate is 52.4%, with substantially lower survival among blacks (32.4%) compared with whites (56.0%). The majority of patients are treated with radiation (65.1%) and/or surgery (69.5%).

### Results and Discussion

Among 3,543 2-month survivors with cancers of the nose, nasal cavity, and middle ear, 405 subsequent primary cancers were observed, reflecting a significantly increased risk of new malignancies (O/E=1.44, 95% CI=1.31-1.59, EAR=68). The cumulative incidence of developing a second cancer was 14.4% at 20 years (95% CI=12.9%-16.0%). The overall risk of new malignancies decreased slightly over time. Although the relative risk was slightly higher for women (O/E=1.60) than for men (O/E=1.37), the excess absolute risks were identical (EAR=68). The relative risks were similar for blacks and whites but did not reach statistical significance for blacks. The excess risk of developing subsequent cancers of the buccal cavity, pharynx, larynx, and lung is consistent with the effects of prior tobacco smoking. Based on a small number of cases, there was an increased risk of soft tissue cancers (O/E=5.49, O=6), as well as extranodal non-Hodgkin lymphoma (NHL) (O/E=2.57, O=7), although the risk for NHL overall was not significantly elevated. An increase in NHL has been observed by others (Boice and Fraumeni, 1985; Dong and Hemminki, 2001).

## Mesothelioma

Mesothelioma is a rare malignancy that arises from the mesothelial lining of the lung (pleura) or the abdomen

(peritoneum), primarily due to asbestos exposure in the workplace with no effect from smoking (Blot and Fraumeni, 1996). The annual number of mesothelioma cases increased from the 1970s through the mid-1990s but then leveled off in the U.S. (Price and Ware, 2004) and Europe. However, age-adjusted rates for females have been low and constant over the last century. There is no standard curative approach (Khalil et al, 2003), although surgery (van Ruth et al, 2003), chemotherapy (Janne, 2003), and radiotherapy (Senan, 2003) have limited roles. Prognosis is poor following a diagnosis of mesothelioma, with a 5-year relative survival rate of 8.4%.

### Results and Discussion

Among 4,106 2-month survivors of mesothelioma, 91 subsequent primary cancers were observed, reflecting no overall increase in subsequent cancer risk (O/E=0.98, 95% CI=0.79-1.20). The cumulative incidence of developing a second cancer among patients with mesothelioma was 2.0% at 10 years (95% CI=1.6%-2.5%).

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## Lung and Bronchus Both Sexes

**Table 6.1.1:** Characteristics of patients with an initial cancer of the lung or bronchus, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	161,672	100.0	93,411	100.0	255,083	100.0
<b>Initial treatment</b>						
Any radiation	90,753	56.1	47,327	50.7	138,080	54.1
With surgery	13,219	8.2	6,961	7.5	20,180	7.9
Without surgery	77,534	48.0	40,366	43.2	117,900	46.2
No radiation	70,919	43.9	46,084	49.3	117,003	45.9
With surgery	29,033	18.0	18,931	20.3	47,964	18.8
Without surgery	41,886	25.9	27,153	29.1	69,039	27.1
<b>Race</b>						
White	135,151	83.6	80,844	86.5	215,995	84.7
Black	18,120	11.2	8,245	8.8	26,365	10.3
Other	8,244	5.1	4,210	4.5	12,454	4.9
Unknown	157	0.1	112	0.1	269	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	201	0.1	249	0.3	450	0.2
30–49	11,863	7.3	8,248	8.8	20,111	7.9
50–69	90,809	56.2	49,759	53.3	140,568	55.1
70–79	45,278	28.0	25,789	27.6	71,067	27.9
≥ 80	13,521	8.4	9,366	10.0	22,887	9.0
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	154,642	95.7	89,849	96.2	244,491	95.8
1st and 2nd cancers	6,350	3.9	3,244	3.5	9,594	3.8
1st, 2nd, and 3rd cancers	611	0.4	289	0.3	900	0.4
1st, 2nd, 3rd, and additional cancers	69	0.0	29	0.0	98	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	66.3	—	66.5	—	66.4	—
Median year of 1st cancer diagnosis	1987.5	—	1990.3	—	1988.5	—
Median person-years at risk	0.6	—	0.8	—	0.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	93.5	—	94.1	—	93.7
1st, 2nd, and additional cancers	—	93.1	—	93.8	—	93.3
1st cancer only	—	4.4	—	3.7	—	4.2

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 6.1.2:** Risk of subsequent primary cancers after cancer of the lung or bronchus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,460	1.09*	4,760	1.40*	2,690	1.57*	1,790	1.49*	11,700	8,580.71	1.36*	64.64
All excluding same site	2,046	1.10*	3,456	1.22*	1,695	1.19*	1,157	1.14*	8,354	7,134.70	1.17*	25.27
<b>Buccal cavity, pharynx</b>	169	2.66*	223	2.43*	104	2.46*	40	1.51*	536	224.15	2.39*	6.46
Lip	13	1.32	19	1.38	7	1.10	4	1.01	43	33.89	1.27	0.19
Tongue	42	3.38*	47	2.59*	15	1.78	11	2.05*	115	44.38	2.59*	1.46
Salivary gland	12	2.44*	6	0.81	6	1.62	1	0.37	25	18.66	1.34	0.13
Mouth	46	2.77*	67	2.79*	35	3.19*	9	1.32	157	58.39	2.69*	2.04
Nasopharynx	2	0.80	9	2.53*	1	0.63	1	1.03	13	8.62	1.51	0.09
Tonsil	24	3.93*	26	2.99*	11	2.84*	6	2.61	67	20.96	3.20*	0.95
Oropharynx	3	1.61	6	2.23	4	3.24	2	2.64	15	6.55	2.29*	0.18
Hypopharynx	16	2.28*	34	3.39*	17	3.77*	6	2.26	73	24.22	3.01*	1.01
<b>Digestive system</b>	590	1.19*	990	1.33*	479	1.30*	342	1.32*	2,401	1,867.36	1.29*	11.06
Esophagus	54	1.95*	96	2.37*	70	3.60*	48	3.61*	268	100.93	2.66*	3.46
Stomach	82	1.53*	118	1.52*	42	1.13	26	1.02	268	193.91	1.38*	1.54
Small intestine	21	3.06*	22	2.10*	6	1.12	0	0.00*	49	26.60	1.84*	0.46
Colon	220	1.01	404	1.22*	199	1.19*	171	1.43*	994	836.00	1.19*	3.27
Rectum, rectosigmoid junction	95	1.08	161	1.24*	73	1.16	35	0.84	364	321.70	1.13*	0.88
Anus, anal canal	3	0.70	4	0.61	2	0.61	5	2.20	14	16.46	0.85	-0.05
Liver	11	0.62	15	0.57*	14	1.07	11	1.15	51	66.58	0.77	-0.32
Gallbladder	5	0.81	5	0.54	4	0.86	1	0.31	15	23.32	0.64	-0.17
Bile ducts, other biliary	11	1.09	18	1.17	4	0.50	12	1.92	45	39.83	1.13	0.11
Pancreas	86	1.44*	141	1.58*	62	1.40*	29	0.93	318	224.60	1.42*	1.94
<b>Respiratory system</b>	496	1.17*	1,457	2.31*	1,073	3.50*	673	3.26*	3,699	1,568.35	2.36*	44.15
Nose, nasal cavity, ear	6	1.78	11	2.21*	5	2.08	2	1.22	24	12.39	1.94*	0.24
Larynx	76	2.49*	130	2.98*	69	3.46*	38	3.13*	313	106.16	2.95*	4.29
Lung, bronchus	414	1.06	1,304	2.25*	995	3.51*	633	3.29*	3,346	1,446.02	2.31*	39.37
<b>Female breast</b>	143	0.78*	319	1.06	160	1.05	131	1.22*	753	746.86	1.01	0.31
<b>Female genital system</b>	41	0.49*	112	0.83*	57	0.87	35	0.79	245	328.81	0.75*	-4.18
Cervix uteri	5	0.54	16	1.14	6	0.95	3	0.79	30	33.36	0.90	-0.17
Corpus uteri	16	0.36*	50	0.71*	26	0.76	14	0.62	106	171.83	0.62*	-3.29
Ovary	16	0.66	42	1.06	21	1.06	14	1.03	93	97.15	0.96	-0.21
Vagina	2	1.65	1	0.51	2	2.01	1	1.40	6	4.88	1.23	0.06
Vulva	1	0.29	2	0.35	1	0.33	3	1.28	7	14.51	0.48*	-0.37
<b>Male genital system</b>	470	0.96	729	0.99	364	0.95	234	0.83*	1,797	1,890.32	0.95*	-3.31
Prostate	469	0.97	717	0.98	362	0.96	233	0.83*	1,781	1,873.36	0.95*	-3.27
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	5.12	0.00*	-0.18
<b>Urinary system</b>	293	1.60*	455	1.66*	209	1.51*	143	1.45*	1,100	695.03	1.58*	8.39
Urinary bladder	169	1.33*	318	1.67*	159	1.65*	113	1.63*	759	482.66	1.57*	5.73
Kidney parenchyma	103	2.30*	113	1.68*	41	1.22	21	0.89	278	169.45	1.64*	2.25
Renal pelvis, other urinary	21	1.82*	24	1.40	9	1.07	9	1.55	63	42.93	1.47*	0.42
Ureter	6	1.57	5	0.88	2	0.71	3	1.57	16	14.23	1.12	0.04
<b>Bone, joints</b>	1	0.53	5	1.78	1	0.75	1	1.14	8	6.90	1.16	0.02
<b>Soft tissue including heart</b>	11	1.31	14	1.11	8	1.28	2	0.44	35	31.82	1.10	0.07
<b>Kaposi sarcoma</b>	2	0.84	3	0.90	0	0.00	1	0.95	6	8.40	0.71	-0.05
<b>Melanoma of skin</b>	33	0.73	45	0.64*	36	1.00	33	1.23	147	178.41	0.82*	-0.65
<b>Eye, orbit</b>	2	0.63	3	0.63	0	0.00	1	0.65	6	11.75	0.51	-0.12
<b>Brain, central nervous system</b>	12	0.53*	32	0.94	6	0.36*	11	1.00	61	84.06	0.73*	-0.48
<b>Thyroid</b>	45	4.17*	23	1.40	9	1.16	7	1.37	84	40.00	2.10*	0.91
<b>Lymphatic, hematopoietic</b>	119	0.73*	282	1.15*	130	1.04	94	1.04	625	623.10	1.00	0.04
Hodgkin lymphoma	5	0.94	4	0.53	2	0.58	2	0.92	13	18.55	0.70	-0.11
Non-Hodgkin lymphoma	51	0.72*	111	1.02	64	1.14	51	1.23	277	277.94	1.00	-0.02
Myeloma	24	0.83	41	0.94	17	0.77	9	0.57	91	110.56	0.82	-0.41
Leukemia	39	0.68*	126	1.47*	47	1.10	32	1.05	244	216.06	1.13	0.58
Acute lymphocytic	2	1.31	4	1.76	2	1.75	0	0.00	8	5.71	1.40	0.05
Chronic lymphocytic	9	0.39*	23	0.66*	12	0.69	12	0.99	56	87.34	0.64*	-0.65
Acute non-lymphocytic	19	1.00	81	2.81*	23	1.58	14	1.32	137	73.05	1.88*	1.33
Chronic myeloid	4	0.52	12	1.05	7	1.22	5	1.20	28	29.03	0.96	-0.02

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 200,312 PYR and for male cancers on 282,226 PYR.



## Lung and Bronchus Both Sexes, Long-term Follow-up

**Table 6.1.3:** Risk of subsequent primary cancers after cancer of the lung or bronchus, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	9,910	1.34*	1,230	1.57*	447	1.39*	113	1.12	11,700	8,580.71	1.36*	64.64
All excluding same site	7,197	1.18*	792	1.21*	292	1.08	73	0.86	8,354	7,134.70	1.17*	25.27
<b>Buccal cavity, pharynx</b>	496	2.51*	33	1.86*	6	0.89	1	0.49	536	224.15	2.39*	6.46
Lip	39	1.30	3	1.13	1	0.99	0	0.00	43	33.89	1.27	0.19
Tongue	104	2.67*	8	2.24	3	2.18	0	0.00	115	44.38	2.59*	1.46
Salivary gland	24	1.50	1	0.58	0	0.00	0	0.00	25	18.66	1.34	0.13
Mouth	148	2.87*	9	1.97	0	0.00	0	0.00	157	58.39	2.69*	2.04
Nasopharynx	12	1.57	1	1.53	0	0.00	0	0.00	13	8.62	1.51	0.09
Tonsil	61	3.27*	4	2.56	1	1.74	1	5.99	67	20.96	3.20*	0.95
Oropharynx	13	2.24*	2	3.92	0	0.00	0	0.00	15	6.55	2.29*	0.18
Hypopharynx	67	3.11*	5	2.74	1	1.53	0	0.00	73	24.22	3.01*	1.01
<b>Digestive system</b>	2,059	1.28*	239	1.42*	79	1.15	24	1.07	2,401	1,867.36	1.29*	11.06
Esophagus	220	2.51*	37	4.27*	9	2.57*	2	1.80	268	100.93	2.66*	3.46
Stomach	242	1.44*	20	1.20	4	0.60	2	0.92	268	193.91	1.38*	1.54
Small intestine	49	2.16*	0	0.00	0	0.00	0	0.00	49	26.60	1.84*	0.46
Colon	823	1.15*	115	1.49*	40	1.26	16	1.53	994	836.00	1.19*	3.27
Rectum, rectosigmoid junction	329	1.18*	25	0.91	8	0.74	2	0.59	364	321.70	1.13*	0.88
Anus, anal canal	9	0.63	2	1.36	2	3.30	1	5.02	14	16.46	0.85	-0.05
Liver	40	0.70*	8	1.31	3	1.17	0	0.00	51	66.58	0.77	-0.32
Gallbladder	14	0.70	0	0.00	1	1.15	0	0.00	15	23.32	0.64	-0.17
Bile ducts, other biliary	33	0.98	8	2.04	4	2.31	0	0.00	45	39.83	1.13	0.11
Pancreas	289	1.50*	21	1.04	7	0.84	1	0.36	318	224.60	1.42*	1.94
<b>Respiratory system</b>	3,026	2.22*	467	3.44*	165	3.05*	41	2.43*	3,699	1,568.35	2.36*	44.15
Nose, nasal cavity, ear	22	2.05*	2	1.88	0	0.00	0	0.00	24	12.39	1.94*	0.24
Larynx	275	2.93*	27	3.27*	10	3.30*	1	1.15	313	106.16	2.95*	4.29
Lung, bronchus	2,713	2.16*	438	3.47*	155	3.07*	40	2.53*	3,346	1,446.02	2.31*	39.37
<b>Female breast</b>	622	0.97	87	1.25*	31	1.08	13	1.39	753	746.86	1.01	0.31
<b>Female genital system</b>	210	0.74*	23	0.80	8	0.69	4	1.08	245	328.81	0.75*	-4.18
Cervix uteri	27	0.91	3	1.17	0	0.00	0	0.00	30	33.36	0.90	-0.17
Corpus uteri	92	0.62*	8	0.54	4	0.68	2	1.07	106	171.83	0.62*	-3.29
Ovary	79	0.95	9	1.02	3	0.83	2	1.71	93	97.15	0.96	-0.21
Vagina	5	1.20	1	2.18	0	0.00	0	0.00	6	4.88	1.23	0.06
Vulva	4	0.33*	2	1.37	1	1.52	0	0.00	7	14.51	0.48*	-0.37
<b>Male genital system</b>	1,563	0.97	163	0.89	60	0.79	11	0.50*	1,797	1,890.32	0.95*	-3.31
Prostate	1,548	0.97	162	0.89	60	0.79	11	0.51*	1,781	1,873.36	0.95*	-3.27
Testis	0	0.00*	0	0.00	0	0.00	0	0.00	0	5.12	0.00*	-0.18
<b>Urinary system</b>	957	1.60*	102	1.60*	38	1.44*	3	0.35	1,100	695.03	1.58*	8.39
Urinary bladder	646	1.56*	79	1.77*	32	1.73*	2	0.33	759	482.66	1.57*	5.73
Kidney parenchyma	257	1.76*	16	1.04	4	0.64	1	0.50	278	169.45	1.64*	2.25
Renal pelvis, other urinary	54	1.45*	7	1.86	2	1.30	0	0.00	63	42.93	1.47*	0.42
Ureter	13	1.05	3	2.41	0	0.00	0	0.00	16	14.23	1.12	0.04
<b>Bone, joints</b>	7	1.16	1	1.75	0	0.00	0	0.00	8	6.90	1.16	0.02
<b>Soft tissue including heart</b>	33	1.21	2	0.69	0	0.00	0	0.00	35	31.82	1.10	0.07
<b>Kaposi sarcoma</b>	5	0.68	1	1.41	0	0.00	0	0.00	6	8.40	0.71	-0.05
<b>Melanoma of skin</b>	114	0.75*	17	1.00	12	1.64	4	1.58	147	178.41	0.82*	-0.65
<b>Eye, orbit</b>	5	0.49	0	0.00	1	2.47	0	0.00	6	11.75	0.51	-0.12
<b>Brain, central nervous system</b>	50	0.68*	8	1.11	3	1.05	0	0.00	61	84.06	0.73*	-0.48
<b>Thyroid</b>	77	2.21*	5	1.49	2	1.52	0	0.00	84	40.00	2.10*	0.91
<b>Lymphatic, hematopoietic</b>	531	1.00	55	0.95	30	1.24	9	1.12	625	623.10	1.00	0.04
Hodgkin lymphoma	11	0.67	2	1.38	0	0.00	0	0.00	13	18.55	0.70	-0.11
Non-Hodgkin lymphoma	226	0.96	26	0.98	19	1.68*	6	1.58	277	277.94	1.00	-0.02
Myeloma	82	0.87	7	0.69	1	0.24	1	0.73	91	110.56	0.82	-0.41
Leukemia	212	1.14	20	1.01	10	1.23	2	0.75	244	216.06	1.13	0.58
Acute lymphocytic	8	1.62	0	0.00	0	0.00	0	0.00	8	5.71	1.40	0.05
Chronic lymphocytic	44	0.58*	9	1.14	3	0.94	0	0.00	56	87.34	0.64*	-0.65
Acute non-lymphocytic	123	1.97*	7	1.03	5	1.74	2	2.07	137	73.05	1.88*	1.33
Chronic myeloid	23	0.93	3	1.12	2	1.79	0	0.00	28	29.03	0.96	-0.02

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 200,312 PYR and for male cancers on 282,226 PYR.

**Table 6.1.4:** Risk of subsequent primary cancers after cancer of the lung or bronchus, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	721	1.13*	1,561	1.49*	951	1.77*	681	1.75*	3,914	2,615.88	1.50*	64.80
All excluding same site	556	1.01	1,093	1.21*	561	1.21*	409	1.23*	2,619	2,253.77	1.16*	18.23
<b>Buccal cavity, pharynx</b>	44	3.74*	54	2.83*	24	2.52*	10	1.53	132	46.90	2.81*	4.25
Lip	0	0.00	6	5.08*	0	0.00	0	0.00	6	3.00	2.00	0.15
Tongue	12	4.63*	15	3.55*	3	1.42	3	2.08	33	10.38	3.18*	1.13
Salivary gland	1	0.82	2	1.00	2	1.97	1	1.35	6	4.97	1.21	0.05
Mouth	14	3.48*	15	2.29*	8	2.44*	3	1.32	40	16.13	2.48*	1.19
Nasopharynx	1	2.07	2	2.60	0	0.00	0	0.00	3	1.87	1.60	0.06
Tonsil	8	7.21*	5	2.84	4	4.82*	0	0.00	17	4.20	4.04*	0.64
Oropharynx	0	0.00	3	5.93*	2	8.01	1	6.39	6	1.22	4.91*	0.24
Hypopharynx	3	3.47	2	1.43	3	4.43	2	4.72	10	3.37	2.97*	0.33
<b>Digestive system</b>	161	1.14	330	1.42*	161	1.33*	132	1.45*	784	586.84	1.34*	9.84
Esophagus	13	3.09*	23	3.34*	16	4.53*	12	4.66*	64	17.19	3.72*	2.34
Stomach	11	1.01	21	1.20	10	1.11	6	0.88	48	44.09	1.09	0.20
Small intestine	6	2.85*	6	1.70	3	1.62	0	0.00	15	8.90	1.69	0.30
Colon	68	0.98	150	1.30*	75	1.24	73	1.59*	366	291.40	1.26*	3.72
Rectum, rectosigmoid junction	26	1.15	51	1.38*	24	1.28	10	0.75	111	91.57	1.21	0.97
Rectum	15	1.02	31	1.29	19	1.55	7	0.79	72	59.92	1.20	0.60
Anus, anal canal	1	0.51	1	0.31	1	0.60	4	3.33	7	8.11	0.86	-0.06
Liver	3	0.94	5	0.95	8	2.88*	5	2.27	21	13.44	1.56	0.38
Gallbladder	2	0.64	4	0.79	1	0.38	1	0.53	8	12.70	0.63	-0.23
Bile ducts, other biliary	5	1.65	5	0.99	1	0.37	6	2.69	17	13.05	1.30	0.20
Pancreas	26	1.39	60	1.94*	21	1.29	13	1.05	120	78.40	1.53*	2.08
<b>Respiratory system</b>	176	1.95*	500	3.30*	407	5.16*	278	4.79*	1,361	378.40	3.60*	49.05
Nose, nasal cavity, ear	1	1.16	2	1.41	2	2.74	0	0.00	5	3.55	1.41	0.07
Larynx	10	3.33*	28	5.75*	15	6.28*	6	3.86*	59	11.82	4.99*	2.36
Lung, bronchus	165	1.92*	468	3.23*	390	5.16*	272	4.87*	1,295	362.12	3.58*	46.57
<b>Female breast</b>	143	0.78*	319	1.06	160	1.05	131	1.22*	753	746.86	1.01	0.31
<b>Female genital system</b>	41	0.49*	112	0.83*	57	0.87	35	0.79	245	328.81	0.75*	-4.18
Cervix uteri	5	0.54	16	1.14	6	0.95	3	0.79	30	33.36	0.90	-0.17
Corpus uteri	16	0.36*	50	0.71*	26	0.76	14	0.62	106	171.83	0.62*	-3.29
Ovary	16	0.66	42	1.06	21	1.06	14	1.03	93	97.15	0.96	-0.21
Vagina	2	1.65	1	0.51	2	2.01	1	1.40	6	4.88	1.23	0.06
Vulva	1	0.29	2	0.35	1	0.33	3	1.28	7	14.51	0.48*	-0.37
<b>Urinary system</b>	69	2.29*	80	1.60*	54	2.05*	33	1.67*	236	126.33	1.87*	5.47
Urinary bladder	31	1.78*	46	1.58*	38	2.49*	25	2.15*	140	73.37	1.91*	3.33
Kidney parenchyma	33	3.23*	27	1.59*	15	1.69	5	0.76	80	42.68	1.87*	1.86
Renal pelvis, other urinary	5	2.02	7	1.71	1	0.47	3	1.89	16	10.28	1.56	0.29
Ureter	1	1.33	0	0.00	0	0.00	1	2.06	2	3.13	0.64	-0.06
<b>Bone, joints</b>	1	1.76	1	1.08	1	2.16	1	3.07	4	2.29	1.75	0.09
<b>Soft tissue including heart</b>	5	2.03	8	1.98	3	1.45	0	0.00	16	10.10	1.58	0.29
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.04
<b>Melanoma of skin</b>	9	0.74	15	0.75	11	1.07	7	0.93	42	50.04	0.84	-0.40
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	1.92	1	3.73	0.27	-0.14
<b>Brain, central nervous system</b>	3	0.45	13	1.17	4	0.71	2	0.52	22	27.25	0.81	-0.26
<b>Thyroid</b>	20	3.60*	9	1.01	5	1.17	3	1.05	37	21.58	1.71*	0.77
<b>Lymphatic, hematopoietic</b>	42	0.88	98	1.24*	42	1.01	32	1.02	214	199.21	1.07	0.74
Hodgkin lymphoma	3	2.09	1	0.43	1	0.88	1	1.30	6	5.65	1.06	0.02
Non-Hodgkin lymphoma	19	0.82	39	1.00	20	0.97	20	1.28	98	98.10	1.00	0.00
Myeloma	10	1.18	10	0.71	3	0.41	3	0.55	26	35.18	0.74	-0.46
Leukemia	10	0.69	48	2.01*	18	1.44	8	0.84	84	60.29	1.39*	1.18
Acute lymphocytic	0	0.00	4	5.70*	1	2.75	0	0.00	5	1.75	2.85	0.16
Chronic lymphocytic	1	0.18*	7	0.75	2	0.41	3	0.82	13	23.57	0.55*	-0.53
Acute non-lymphocytic	7	1.36	33	3.87*	10	2.23*	5	1.45	55	21.59	2.55*	1.67
Chronic myeloid	0	0.00	3	0.93	3	1.77	0	0.00	6	8.18	0.73	-0.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Lung and Bronchus Males

**Table 6.1.5:** Risk of subsequent primary cancers after cancer of the lung or bronchus, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	161,672	83,787	68,051	115,876	15,664	51,293	6,400	31,270	161,672	83,787	282,226	
All excluding same site	1,739	1.07*	3,199	1.35*	1,739	1.49*	1,109	1.36*	7,786	5,964.83	1.31*	64.53
<b>Buccal cavity, pharynx</b>	125	2.41*	169	2.33*	80	2.44*	30	1.50*	404	177.25	2.28*	8.03
Lip	13	1.43	13	1.03	7	1.23	4	1.15	37	30.88	1.20	0.22
Tongue	30	3.05*	32	2.30*	12	1.90	8	2.04	82	34.00	2.41*	1.70
Salivary gland	11	2.98*	4	0.75	4	1.49	0	0.00	19	13.69	1.39	0.19
Mouth	32	2.55*	52	2.98*	27	3.50*	6	1.32	117	42.26	2.77*	2.65
Nasopharynx	1	0.49	7	2.51*	1	0.83	1	1.39	10	6.75	1.48	0.12
Tonsil	16	3.21*	21	3.03*	7	2.31	6	3.34*	50	16.76	2.98*	1.18
Oropharynx	3	1.93	3	1.37	2	2.03	1	1.66	9	5.33	1.69	0.13
Hypopharynx	13	2.11*	32	3.71*	14	3.65*	4	1.79	63	20.85	3.02*	1.49
<b>Digestive system</b>	429	1.21*	660	1.29*	318	1.28*	210	1.25*	1,617	1,280.52	1.26*	11.92
Esophagus	41	1.74*	73	2.17*	54	3.39*	36	3.36*	204	83.74	2.44*	4.26
Stomach	71	1.66*	97	1.62*	32	1.13	20	1.07	220	149.82	1.47*	2.49
Small intestine	15	3.16*	16	2.30*	3	0.86	0	0.00	34	17.70	1.92*	0.58
Colon	152	1.02	254	1.18*	124	1.16	98	1.33*	628	544.60	1.15*	2.96
Rectum, rectosigmoid junction	69	1.06	110	1.19	49	1.11	25	0.88	253	230.13	1.10	0.81
Anus, anal canal	2	0.86	3	0.90	1	0.62	1	0.93	7	8.35	0.84	-0.05
Liver	8	0.55	10	0.47*	6	0.58	6	0.82	30	53.14	0.56*	-0.82
Gallbladder	3	1.00	1	0.24	3	1.48	0	0.00	7	10.62	0.66	-0.13
Bile ducts, other biliary	6	0.85	13	1.25	3	0.57	6	1.49	28	26.78	1.05	0.04
Pancreas	60	1.46*	81	1.39*	41	1.47*	16	0.85	198	146.19	1.35*	1.84
<b>Respiratory system</b>	320	0.96	957	2.00*	666	2.92*	395	2.66*	2,338	1,189.95	1.96*	40.68
Nose, nasal cavity, ear	5	1.99	9	2.54*	3	1.79	2	1.81	19	8.84	2.15*	0.36
Larynx	66	2.40*	102	2.63*	54	3.08*	32	3.02*	254	94.34	2.69*	5.66
Lung, bronchus	249	0.82*	836	1.92*	605	2.91*	361	2.64*	2,051	1,083.90	1.89*	34.27
<b>Male breast</b>	2	0.66	3	0.68	3	1.39	3	1.97	11	11.12	0.99	0.00
<b>Male genital system</b>	470	0.96	729	0.99	364	0.95	234	0.83*	1,797	1,890.32	0.95*	-3.31
Prostate	469	0.97	717	0.98	362	0.96	233	0.83*	1,781	1,873.36	0.95*	-3.27
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	5.12	0.00*	-0.18
<b>Urinary system</b>	224	1.46*	375	1.67*	155	1.38*	110	1.39*	864	568.70	1.52*	10.46
Urinary bladder	138	1.26*	272	1.69*	121	1.50*	88	1.53*	619	409.29	1.51*	7.43
Kidney parenchyma	70	2.03*	86	1.71*	26	1.05	16	0.94	198	126.76	1.56*	2.52
Renal pelvis, other urinary	16	1.76*	17	1.30	8	1.27	6	1.42	47	32.65	1.44*	0.51
Ureter	5	1.63	5	1.13	2	0.93	2	1.41	14	11.09	1.26	0.10
<b>Bone, joints</b>	0	0.00	4	2.13	0	0.00	0	0.00	4	4.61	0.87	-0.02
<b>Soft tissue including heart</b>	6	1.01	6	0.70	5	1.20	2	0.67	19	21.71	0.88	-0.10
<b>Kaposi sarcoma</b>	2	0.91	3	0.99	0	0.00	1	1.11	6	7.57	0.79	-0.06
<b>Melanoma of skin</b>	24	0.72	30	0.60*	25	0.97	26	1.34	105	128.37	0.82*	-0.83
<b>Eye, orbit</b>	2	0.89	3	0.93	0	0.00	0	0.00	5	8.02	0.62	-0.11
<b>Brain, central nervous system</b>	9	0.56	19	0.83	2	0.18*	9	1.27	39	56.81	0.69*	-0.63
<b>Thyroid</b>	25	4.77*	14	1.87*	4	1.16	4	1.79	47	18.42	2.55*	1.01
<b>Lymphatic, hematopoietic</b>	77	0.67*	184	1.10	88	1.06	62	1.05	411	423.89	0.97	-0.46
Hodgkin lymphoma	2	0.52	3	0.57	1	0.43	1	0.71	7	12.90	0.54	-0.21
Non-Hodgkin lymphoma	32	0.67*	72	1.02	44	1.23	31	1.19	179	179.84	1.00	-0.03
Myeloma	14	0.68	31	1.04	14	0.95	6	0.58	65	75.38	0.86	-0.37
Leukemia	29	0.68*	78	1.27*	29	0.95	24	1.14	160	155.77	1.03	0.15
Acute lymphocytic	2	1.82	0	0.00	1	1.28	0	0.00	3	3.96	0.76	-0.03
Chronic lymphocytic	8	0.46*	16	0.63	10	0.80	9	1.06	43	63.77	0.67*	-0.74
Acute non-lymphocytic	12	0.86	48	2.37*	13	1.29	9	1.25	82	51.46	1.59*	1.08
Chronic myeloid	4	0.70	9	1.10	4	0.99	5	1.73	22	20.84	1.06	0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 6.1.6:** Risk of subsequent primary cancers after cancer of the lung or bronchus, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	95	2.88*	185	2.71*	160	2.47*	258	1.97*	698	297.31	2.35*	70.25
All excluding same site	77	2.67*	111	1.88*	84	1.53*	150	1.37*	422	252.50	1.67*	29.72
<b>Buccal cavity, pharynx</b>	10	6.74*	7	2.39	11	4.16*	5	1.26	33	11.04	2.99*	3.85
Lip	0	0.00	1	3.95	0	0.00	0	0.00	1	0.97	1.03	0.01
Tongue	1	3.21	3	4.73	1	1.71	2	2.24	7	2.42	2.89*	0.80
Salivary gland	1	8.58	1	4.51	0	0.00	0	0.00	2	0.83	2.42	0.21
Mouth	4	10.15*	0	0.00	7	9.91*	1	0.98	12	2.90	4.13*	1.59
Nasopharynx	1	9.23	1	5.11	0	0.00	0	0.00	2	0.64	3.11	0.24
Tonsil	3	14.53*	0	0.00	2	5.53	1	2.05	6	1.46	4.10*	0.80
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.06
Hypopharynx	0	0.00	1	3.68	1	3.60	1	2.28	3	1.11	2.69	0.33
<b>Digestive system</b>	22	4.48*	30	2.85*	26	2.40*	56	2.45*	134	49.16	2.73*	14.87
Esophagus	5	12.87*	6	7.31*	6	7.21*	11	6.79*	28	3.66	7.65*	4.27
Stomach	6	10.29*	6	5.19*	0	0.00	6	2.87*	18	4.92	3.66*	2.29
Small intestine	2	15.39*	1	3.89	0	0.00	0	0.00	3	1.08	2.77	0.34
Colon	1	0.57	7	1.83	9	2.21*	28	3.04*	45	18.86	2.39*	4.58
Rectum, rectosigmoid junction	3	3.21	1	0.48	9	4.14*	2	0.46	15	9.53	1.57	0.96
Anus, anal canal	1	8.89	0	0.00	1	5.03	2	6.03	4	0.87	4.61*	0.55
Liver	1	3.79	0	0.00	0	0.00	0	0.00	1	2.41	0.41	-0.25
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.08
Bile ducts, other biliary	0	0.00	1	5.54	0	0.00	1	2.15	2	0.92	2.16	0.19
Pancreas	3	5.38*	8	6.53*	1	0.78	4	1.46	16	5.81	2.75*	1.79
<b>Respiratory system</b>	22	4.62*	80	7.64*	81	7.23*	114	4.84*	297	50.01	5.94*	43.30
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	5.11	1	0.53	1.88	0.08
Larynx	4	7.97*	6	5.63*	5	4.65*	5	2.68	20	4.51	4.44*	2.72
Lung, bronchus	18	4.33*	74	8.03*	76	7.62*	108	5.03*	276	44.82	6.16*	40.53
<b>Female breast</b>	8	1.06	12	0.78	9	0.73	20	1.14	49	52.96	0.93	-1.51
<b>Female genital system</b>	3	1.03	8	1.32	8	1.61	8	1.12	27	21.05	1.28	2.26
Cervix uteri	0	0.00	4	2.63	3	3.19	1	1.12	8	4.22	1.90	1.44
Corpus uteri	0	0.00	1	0.42	3	1.35	3	0.82	7	9.23	0.76	-0.85
Ovary	3	3.41	3	1.62	2	1.32	4	1.87	12	6.38	1.88	2.13
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.23
<b>Male genital system</b>	5	3.68*	8	2.19	4	0.67	21	0.80	38	37.24	1.02	0.25
Prostate	5	5.42*	8	2.66*	4	0.71	21	0.81	38	35.43	1.07	0.84
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.46	0.00	-0.47
<b>Urinary system</b>	12	6.25*	10	2.46*	11	2.60*	9	0.97	42	19.52	2.15*	3.94
Urinary bladder	2	2.02	4	1.86	7	2.97*	8	1.40	21	11.19	1.88*	1.72
Kidney parenchyma	10	11.84*	6	3.45*	4	2.37	1	0.32	21	7.44	2.82*	2.38
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.90	0.00	-0.16
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.04
<b>Bone, joints</b>	0	0.00	1	7.38	0	0.00	0	0.00	1	0.44	2.26	0.10
<b>Soft tissue including heart</b>	0	0.00	1	2.06	1	2.67	1	1.82	3	1.68	1.79	0.23
<b>Kaposi sarcoma</b>	1	1.97	2	2.75	0	0.00	1	3.25	4	1.95	2.05	0.36
<b>Melanoma of skin</b>	0	0.00	5	1.41	0	0.00	6	1.44	11	12.37	0.89	-0.24
<b>Eye, orbit</b>	0	0.00	1	6.93	0	0.00	0	0.00	1	0.54	1.86	0.08
<b>Brain, central nervous system</b>	3	4.31	2	1.53	0	0.00	2	1.28	7	4.62	1.51	0.42
<b>Thyroid</b>	2	2.36	1	0.65	1	0.95	1	0.83	5	4.66	1.07	0.06
<b>Lymphatic, hematopoietic</b>	4	1.37	12	2.11*	5	1.00	6	0.66	27	22.72	1.19	0.75
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.65	0.00	-0.29
Non-Hodgkin lymphoma	3	1.99	2	0.68	1	0.39	5	1.10	11	11.52	0.95	-0.09
Myeloma	0	0.00	1	1.49	2	2.84	1	0.68	4	3.17	1.26	0.15
Leukemia	1	1.29	9	5.85*	2	1.43	0	0.00	12	6.38	1.88	0.99
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	1	2.00	0	0.00	1	2.20	0.45	-0.21
Acute non-lymphocytic	1	3.49	7	12.90*	1	2.19	0	0.00	9	2.17	4.14*	1.20
Chronic myeloid	0	0.00	1	3.50	0	0.00	0	0.00	1	1.04	0.96	-0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 26,322 PYR and for male cancers on 30,716 PYR.

## Lung and Bronchus Both Sexes, 50-69 Years of Age

**Table 6.1.7:** Risk of subsequent primary cancers after cancer of the lung or bronchus, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,313	1.30*	2,777	1.54*	1,932	1.70*	1,328	1.43*	7,350	4,882.82	1.51*	82.84
All excluding same site	1,056	1.29*	1,939	1.32*	1,193	1.27*	854	1.10*	5,042	4,005.81	1.26*	34.79
<b>Buccal cavity, pharynx</b>	110	3.09*	157	2.77*	71	2.37*	29	1.46	367	142.02	2.58*	7.55
Lip	9	2.05	10	1.39	5	1.22	3	1.00	27	18.65	1.45	0.28
Tongue	28	3.87*	30	2.60*	13	2.12*	7	1.74	78	28.93	2.70*	1.65
Salivary gland	8	3.65*	3	0.79	2	0.86	1	0.51	14	10.25	1.37	0.13
Mouth	30	3.18*	53	3.55*	20	2.58*	8	1.58	111	37.19	2.98*	2.48
Nasopharynx	1	0.65	7	2.96*	1	0.87	0	0.00	9	5.77	1.56	0.11
Tonsil	14	3.57*	19	3.17*	8	2.75*	3	1.79	44	14.51	3.03*	0.99
Oropharynx	1	0.85	4	2.18	3	3.18	2	3.47	10	4.53	2.21*	0.18
Hypopharynx	11	2.56*	23	3.39*	13	3.75*	5	2.43	52	16.61	3.13*	1.19
<b>Digestive system</b>	283	1.38*	526	1.45*	338	1.46*	231	1.18*	1,378	995.94	1.38*	12.83
Esophagus	30	2.08*	64	2.69*	55	4.03*	35	3.42*	184	62.08	2.96*	4.09
Stomach	43	2.00*	54	1.46*	29	1.26	15	0.79	141	100.57	1.40*	1.36
Small intestine	12	3.86*	13	2.33*	6	1.70	0	0.00	31	15.19	2.04*	0.53
Colon	90	1.08	196	1.29*	139	1.37*	106	1.18	531	426.87	1.24*	3.50
Rectum, rectosigmoid junction	51	1.29	92	1.34*	48	1.16	28	0.88	219	181.52	1.21*	1.26
Anus, anal canal	1	0.46	2	0.53	1	0.45	3	1.79	7	9.90	0.71	-0.10
Liver	3	0.37	8	0.57	12	1.36	9	1.22	32	38.44	0.83	-0.22
Gallbladder	2	0.93	2	0.49	1	0.37	1	0.41	6	11.34	0.53	-0.18
Bile ducts, other biliary	2	0.54	11	1.61	2	0.43	10	2.16*	25	19.79	1.26	0.17
Pancreas	49	1.96*	79	1.79*	43	1.54*	23	0.97	194	120.93	1.60*	2.45
<b>Respiratory system</b>	316	1.49*	938	2.57*	801	3.67*	507	3.11*	2,562	957.37	2.68*	53.88
Nose, nasal cavity, ear	4	2.43	7	2.59*	4	2.58	1	0.82	16	7.13	2.25*	0.30
Larynx	55	3.06*	82	2.87*	55	3.65*	32	3.40*	224	71.00	3.16*	5.14
Lung, bronchus	257	1.34*	838	2.52*	739	3.68*	474	3.11*	2,308	877.00	2.63*	48.05
<b>Female breast</b>	79	0.83	186	1.07	114	1.10	98	1.25*	477	451.48	1.06	2.12
<b>Female genital system</b>	25	0.54*	69	0.85	39	0.85	24	0.74	157	205.97	0.76*	-4.07
Cervix uteri	3	0.57	9	1.06	3	0.73	2	0.79	17	20.47	0.83	-0.29
Corpus uteri	12	0.47*	32	0.71	18	0.72	11	0.64	73	112.45	0.65*	-3.28
Ovary	8	0.62	25	1.08	16	1.19	8	0.80	57	59.27	0.96	-0.19
Vagina	0	0.00	1	1.02	0	0.00	0	0.00	1	2.65	0.38	-0.14
Vulva	1	0.79	1	0.40	1	0.59	3	1.80	6	7.14	0.84	-0.09
<b>Male genital system</b>	215	1.10	386	1.04	250	0.95	187	0.83*	1,038	1,052.05	0.99	-0.79
Prostate	214	1.11	377	1.03	250	0.96	186	0.83*	1,027	1,042.91	0.98	-0.90
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.85	0.00	-0.16
<b>Urinary system</b>	147	1.89*	256	1.85*	148	1.65*	115	1.51*	666	382.08	1.74*	9.53
Urinary bladder	77	1.51*	166	1.81*	112	1.84*	88	1.65*	443	256.64	1.73*	6.26
Kidney parenchyma	59	2.63*	75	1.94*	29	1.24	19	1.05	182	102.51	1.78*	2.67
Renal pelvis, other urinary	11	2.37*	15	1.79*	7	1.29	8	1.77	41	22.92	1.79*	0.61
Ureter	2	1.35	1	0.37	2	1.11	3	2.00	8	7.52	1.06	0.02
<b>Bone, joints</b>	0	0.00	3	1.89	1	1.11	1	1.57	5	4.08	1.23	0.03
<b>Soft tissue including heart</b>	7	1.84	5	0.77	6	1.53	1	0.30	19	17.56	1.08	0.05
<b>Kaposi sarcoma</b>	1	1.06	1	0.71	0	0.00	0	0.00	2	3.62	0.55	-0.05
<b>Melanoma of skin</b>	23	1.00	24	0.60*	27	1.13	22	1.12	96	106.42	0.90	-0.35
<b>Eye, orbit</b>	0	0.00	2	0.75	0	0.00	1	0.86	3	6.96	0.43	-0.13
<b>Brain, central nervous system</b>	6	0.50	17	0.84	5	0.43	7	0.84	35	52.08	0.67*	-0.57
<b>Thyroid</b>	31	5.02*	15	1.49	7	1.33	6	1.72	59	24.99	2.36*	1.14
<b>Lymphatic, hematopoietic</b>	56	0.81	152	1.24*	90	1.14	73	1.07	371	338.51	1.10	1.09
Hodgkin lymphoma	2	0.73	4	0.92	1	0.44	2	1.27	9	10.94	0.82	-0.07
Non-Hodgkin lymphoma	22	0.71	56	1.00	42	1.16	39	1.23	159	154.56	1.03	0.15
Myeloma	15	1.21	17	0.77	10	0.71	5	0.41*	47	60.67	0.77	-0.46
Leukemia	17	0.75	75	1.85*	37	1.40	27	1.18	156	112.33	1.39*	1.47
Acute lymphocytic	1	1.48	2	1.72	2	2.82	0	0.00	5	3.10	1.61	0.06
Chronic lymphocytic	1	0.10*	14	0.82	9	0.82	8	0.88	32	46.84	0.68*	-0.50
Acute non-lymphocytic	10	1.39	49	3.70*	19	2.14*	13	1.61	91	37.41	2.43*	1.80
Chronic myeloid	2	0.65	6	1.13	5	1.47	5	1.63	18	14.85	1.21	0.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 120,427 PYR and for male cancers on 177,384 PYR.

**Table 6.1.8:** Risk of subsequent primary cancers after cancer of the lung or bronchus, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,052	0.87*	1,798	1.17*	598	1.19*	204	1.38*	3,652	3,400.58	1.07*	19.69
All excluding same site	913	0.90*	1,406	1.08*	418	0.97	153	1.18*	2,890	2,876.39	1.00	1.07
<b>Buccal cavity, pharynx</b>	49	1.84*	59	1.84*	22	2.27*	6	2.19	136	71.09	1.91*	5.08
Lip	4	0.75	8	1.26	2	0.98	1	1.67	15	14.27	1.05	0.06
Tongue	13	2.65*	14	2.36*	1	0.58	2	4.34	30	13.02	2.30*	1.33
Salivary gland	3	1.15	2	0.60	4	3.33	0	0.00	9	7.58	1.19	0.11
Mouth	12	1.78	14	1.69	8	3.16*	0	0.00	34	18.29	1.86*	1.23
Nasopharynx	0	0.00	1	0.99	0	0.00	1	13.32	2	2.21	0.91	-0.02
Tonsil	7	3.56*	7	3.06*	1	1.67	2	14.77*	17	4.99	3.41*	0.94
Oropharynx	2	3.07	2	2.59	1	4.70	0	0.00	5	1.69	2.97	0.26
Hypopharynx	5	1.94	10	3.36*	3	3.93	0	0.00	18	6.49	2.77*	0.90
<b>Digestive system</b>	285	0.99	434	1.18*	115	0.91	55	1.36*	889	822.26	1.08*	5.23
Esophagus	19	1.47	26	1.64*	9	1.81	2	1.39	56	35.19	1.59*	1.63
Stomach	33	1.05	58	1.48*	13	0.98	5	1.14	109	88.42	1.23*	1.61
Small intestine	7	1.94	8	1.72	0	0.00	0	0.00	15	10.33	1.45	0.37
Colon	129	0.97	201	1.15	51	0.82	37	1.82*	418	390.27	1.07	2.17
Rectum, rectosigmoid junction	41	0.87	68	1.15	16	0.84	5	0.90	130	130.65	1.00	-0.05
Anus, anal canal	1	0.50	2	0.78	0	0.00	0	0.00	3	5.69	0.53	-0.21
Liver	7	0.76	7	0.60	2	0.53	2	1.85	18	25.73	0.70	-0.61
Gallbladder	3	0.76	3	0.58	3	1.67	0	0.00	9	11.50	0.78	-0.20
Bile ducts, other biliary	9	1.42	6	0.71	2	0.63	1	0.86	18	19.12	0.94	-0.09
Pancreas	34	1.00	54	1.23	18	1.20	2	0.41	108	97.85	1.10	0.79
<b>Respiratory system</b>	158	0.76*	439	1.71*	191	2.47*	52	2.63*	840	560.97	1.50*	21.85
Nose, nasal cavity, ear	2	1.21	4	1.88	1	1.37	0	0.00	7	4.74	1.48	0.18
Larynx	17	1.42	42	3.00*	9	2.37*	1	1.16	69	30.66	2.25*	3.00
Lung, bronchus	139	0.72*	392	1.64*	180	2.47*	51	2.73*	762	524.20	1.45*	18.62
<b>Female breast</b>	56	0.69*	121	1.07	37	0.99	13	1.15	227	242.41	0.94	-2.88
<b>Female genital system</b>	13	0.37*	35	0.74	10	0.66	3	0.66	61	101.79	0.60*	-7.62
Cervix uteri	2	0.66	3	0.75	0	0.00	0	0.00	5	8.67	0.58	-0.68
Corpus uteri	4	0.23*	17	0.72	5	0.70	0	0.00	26	50.14	0.52*	-4.51
Ovary	5	0.47	14	0.96	3	0.62	2	1.34	24	31.50	0.76	-1.40
Vagina	2	3.08	0	0.00	2	5.99	1	8.65	5	2.03	2.47	0.55
Vulva	0	0.00	1	0.33	0	0.00	0	0.00	1	6.76	0.15*	-1.08
<b>Male genital system</b>	250	0.85*	335	0.92	110	0.97	26	0.86	721	801.02	0.90*	-10.80
Prostate	250	0.86*	332	0.92	108	0.96	26	0.87	716	795.02	0.90*	-10.66
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.81	0.00	-0.11
<b>Urinary system</b>	134	1.29*	189	1.43*	50	1.12	19	1.41	392	293.43	1.34*	7.72
Urinary bladder	90	1.19	148	1.54*	40	1.21	17	1.67	295	214.82	1.37*	6.28
Kidney parenchyma	34	1.59*	32	1.18	8	0.93	1	0.42	75	59.50	1.26	1.21
Renal pelvis, other urinary	10	1.46	9	1.05	2	0.71	1	1.18	22	19.11	1.15	0.23
Ureter	4	1.72	4	1.37	0	0.00	0	0.00	8	6.48	1.24	0.12
<b>Bone, joints</b>	1	1.16	1	0.93	0	0.00	0	0.00	2	2.37	0.84	-0.03
<b>Soft tissue including heart</b>	4	0.92	8	1.42	1	0.51	0	0.00	13	12.58	1.03	0.03
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.83	0.00	-0.22
<b>Melanoma of skin</b>	10	0.49*	16	0.60*	9	0.96	5	1.64	40	59.62	0.67*	-1.54
<b>Eye, orbit</b>	2	1.30	0	0.00	0	0.00	0	0.00	2	4.26	0.47	-0.18
<b>Brain, central nervous system</b>	3	0.30*	13	1.03	1	0.26	2	1.97	19	27.36	0.69	-0.65
<b>Thyroid</b>	12	3.19*	7	1.46	1	0.71	0	0.00	20	10.36	1.93*	0.76
<b>Lymphatic, hematopoietic</b>	59	0.65*	118	1.00	35	0.86	15	1.17	227	261.88	0.87*	-2.73
Hodgkin lymphoma	3	1.36	0	0.00	1	1.22	0	0.00	4	5.95	0.67	-0.15
Non-Hodgkin lymphoma	26	0.68*	53	1.05	21	1.20	7	1.29	107	111.86	0.96	-0.38
Myeloma	9	0.55	23	1.09	5	0.70	3	1.37	40	46.72	0.86	-0.53
Leukemia	21	0.62*	42	0.97	8	0.53	5	1.00	76	97.34	0.78*	-1.67
Acute lymphocytic	1	1.26	2	1.98	0	0.00	0	0.00	3	2.27	1.32	0.06
Chronic lymphocytic	8	0.60	9	0.53	2	0.34	4	2.08	23	38.30	0.60*	-1.20
Acute non-lymphocytic	8	0.69	25	1.67*	3	0.57	1	0.60	37	33.47	1.11	0.28
Chronic myeloid	2	0.45	5	0.86	2	0.94	0	0.00	9	13.14	0.68	-0.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 53,563 PYR and for male cancers on 74,127 PYR.



## Lung and Bronchus Small Cell Carcinoma, Both Sexes

**Table 6.1.9:** Risk of subsequent primary cancers after small cell carcinoma of the lung or bronchus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	234	0.72*	324	1.27*	166	1.88*	80	1.86*	804	709.86	1.13*	21.03
All excluding same site	201	0.75*	258	1.22*	102	1.39*	53	1.46*	614	589.67	1.04	5.44
<b>Buccal cavity, pharynx</b>	10	1.08	19	2.84*	7	3.34*	4	4.32*	40	18.95	2.11*	4.70
Lip	0	0.00	2	2.21	1	3.50	1	8.01	4	2.65	1.51	0.30
Tongue	4	2.16	3	2.20	1	2.31	1	5.19	9	3.84	2.35*	1.15
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	1.52	0.00	-0.34
Mouth	3	1.23	8	4.47*	3	5.35*	0	0.00	14	5.04	2.78*	2.00
Nasopharynx	0	0.00	1	3.76	0	0.00	0	0.00	1	0.74	1.35	0.06
Tonsil	0	0.00	1	1.52	0	0.00	1	11.98	2	1.85	1.08	0.03
Oropharynx	0	0.00	1	5.06	2	32.60*	0	0.00	3	0.56	5.36*	0.55
Hypopharynx	1	0.98	2	2.79	0	0.00	1	11.28	4	2.04	1.96	0.44
<b>Digestive system</b>	47	0.68*	68	1.29	36	1.96*	21	2.30*	172	149.12	1.15	5.11
Esophagus	6	1.57	5	1.77	6	6.45*	1	2.30	18	8.00	2.25*	2.23
Stomach	5	0.71	7	1.36	6	3.52*	1	1.23	19	14.66	1.30	0.97
Small intestine	0	0.00	2	2.52	0	0.00	0	0.00	2	2.21	0.90	-0.05
Colon	19	0.63*	24	1.02	11	1.31	12	2.81*	66	66.54	0.99	-0.12
Rectum, rectosigmoid junction	7	0.56	13	1.39	8	2.55*	3	2.03	31	26.42	1.17	1.02
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	10.71	1	1.49	0.67	-0.11
Liver	1	0.42	2	1.08	1	1.60	0	0.00	4	5.18	0.77	-0.26
Gallbladder	0	0.00	0	0.00	1	4.03	0	0.00	1	1.93	0.52	-0.21
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	3.08	0.00	-0.69
Pancreas	8	0.96	13	2.02*	3	1.33	2	1.76	26	18.14	1.43	1.76
<b>Respiratory system</b>	46	0.75	78	1.69*	72	4.61*	31	4.23*	227	130.37	1.74*	21.59
Nose, nasal cavity, ear	2	4.14	0	0.00	0	0.00	0	0.00	2	1.03	1.95	0.22
Larynx	11	2.50*	12	3.89*	8	8.44*	4	9.95*	35	8.83	3.96*	5.85
Lung, bronchus	33	0.59*	66	1.55*	64	4.41*	27	3.94*	190	120.20	1.58*	15.59
<b>Female breast</b>	9	0.28*	23	0.76	8	0.73	7	1.27	47	79.25	0.59*	-15.07
<b>Female genital system</b>	2	0.13*	7	0.52	4	0.85	4	1.76	17	35.32	0.48*	-8.56
Cervix uteri	0	0.00	3	2.22	0	0.00	1	5.39	4	3.55	1.13	0.21
Corpus uteri	0	0.00*	2	0.28	3	1.20	1	0.85	6	18.85	0.32*	-6.00
Ovary	2	0.46	2	0.51	1	0.71	0	0.00	5	10.35	0.48	-2.50
Vagina	0	0.00	0	0.00	0	0.00	1	28.59	1	0.48	2.09	0.24
Vulva	0	0.00	0	0.00	0	0.00	1	8.68	1	1.38	0.72	-0.18
<b>Male genital system</b>	52	0.81	39	0.81	10	0.60	3	0.37	104	137.38	0.76*	-14.29
Prostate	52	0.81	38	0.80	10	0.60	3	0.37	103	136.05	0.76*	-14.15
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.20
<b>Urinary system</b>	30	1.17	23	1.19	14	2.10*	5	1.53	72	54.83	1.31*	3.84
Urinary bladder	15	0.86	18	1.38	11	2.43*	5	2.26	49	37.19	1.32	2.64
Kidney parenchyma	11	1.67	4	0.79	2	1.15	0	0.00	17	14.25	1.19	0.61
Renal pelvis, other urinary	4	2.51	1	0.84	1	2.45	0	0.00	6	3.39	1.77	0.58
Ureter	1	1.90	0	0.00	1	7.47	0	0.00	2	1.12	1.79	0.20
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.13
<b>Soft tissue including heart</b>	2	1.66	2	2.12	0	0.00	0	0.00	4	2.63	1.52	0.31
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.15
<b>Melanoma of skin</b>	7	1.00	2	0.35	3	1.53	1	1.02	13	15.63	0.83	-0.59
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.23
<b>Brain, central nervous system</b>	0	0.00	4	1.50	0	0.00	0	0.00	4	7.46	0.54	-0.77
<b>Thyroid</b>	7	4.04*	3	2.11	2	4.34	0	0.00	12	3.83	3.13*	1.82
<b>Lymphatic, hematopoietic</b>	16	0.69	53	2.91*	8	1.25	3	0.93	80	51.05	1.57*	6.47
Hodgkin lymphoma	2	2.54	0	0.00	0	0.00	0	0.00	2	1.63	1.23	0.08
Non-Hodgkin lymphoma	5	0.48	16	1.90*	2	0.67	2	1.30	25	23.38	1.07	0.36
Myeloma	1	0.25	3	0.95	0	0.00	0	0.00	4	8.88	0.45	-1.09
Leukemia	8	1.01	34	5.60*	6	2.82*	1	0.94	49	17.16	2.86*	7.11
Acute lymphocytic	1	4.57	3	17.59*	1	17.02	0	0.00	5	0.48	10.49*	1.01
Chronic lymphocytic	1	0.31	0	0.00	1	1.16	0	0.00	2	7.01	0.29	-1.12
Acute non-lymphocytic	5	1.90	30	14.62*	3	4.10	0	0.00	38	5.79	6.57*	7.20
Chronic myeloid	0	0.00	1	1.23	1	3.55	1	6.99	3	2.29	1.31	0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 21,407 PYR and for male cancers on 23,362 PYR.

**Table 6.1.10:** Risk of subsequent primary cancers after non-small cell carcinoma of the lung or bronchus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,226	1.15*	4,436	1.40*	2,524	1.56*	1,710	1.47*	10,896	7,870.85	1.38*	69.10
All excluding same site	1,845	1.15*	3,198	1.22*	1,593	1.18*	1,104	1.13*	7,740	6,545.03	1.18*	27.30
<b>Buccal cavity, pharynx</b>	159	2.92*	204	2.40*	97	2.41*	36	1.41	496	205.19	2.42*	6.64
Lip	13	1.53	17	1.32	6	0.99	3	0.78	39	31.24	1.25	0.18
Tongue	38	3.59*	44	2.62*	14	1.75	10	1.93	106	40.54	2.61*	1.50
Salivary gland	12	2.85*	6	0.88	6	1.71	1	0.39	25	17.14	1.46	0.18
Mouth	43	3.04*	59	2.66*	32	3.07*	9	1.37	143	53.35	2.68*	2.05
Nasopharynx	2	0.93	8	2.43*	1	0.67	1	1.07	12	7.88	1.52	0.09
Tonsil	24	4.63*	25	3.11*	11	3.00*	5	2.25	65	19.12	3.40*	1.05
Oropharynx	3	1.88	5	2.00	2	1.70	2	2.74	12	5.99	2.00*	0.14
Hypopharynx	15	2.50*	32	3.44*	17	3.96*	5	1.94	69	22.18	3.11*	1.07
<b>Digestive system</b>	543	1.27*	922	1.34*	443	1.26*	321	1.28*	2,229	1,718.24	1.30*	11.67
Esophagus	48	2.01*	91	2.42*	64	3.46*	47	3.66*	250	92.93	2.69*	3.59
Stomach	77	1.65*	111	1.53*	36	1.01	25	1.01	249	179.25	1.39*	1.59
Small intestine	21	3.58*	20	2.06*	6	1.19	0	0.00*	47	24.38	1.93*	0.52
Colon	201	1.07	380	1.24*	188	1.18*	159	1.38*	928	769.46	1.21*	3.62
Rectum, rectosigmoid junction	88	1.17	148	1.23*	65	1.09	32	0.79	333	295.28	1.13*	0.86
Anus, anal canal	3	0.83	4	0.66	2	0.65	4	1.83	13	14.96	0.87	-0.04
Liver	10	0.66	13	0.53*	13	1.04	11	1.19	47	61.39	0.77	-0.33
Gallbladder	5	0.95	5	0.58	3	0.68	1	0.32	14	21.39	0.65	-0.17
Bile ducts, other biliary	11	1.26	18	1.25	4	0.52	12	1.99*	45	36.75	1.22	0.19
Pancreas	78	1.52*	128	1.54*	59	1.40*	27	0.89	292	206.46	1.41*	1.95
<b>Respiratory system</b>	450	1.24*	1,379	2.36*	1,001	3.44*	642	3.22*	3,472	1,437.99	2.41*	46.46
Nose, nasal cavity, ear	4	1.38	11	2.39*	5	2.19	2	1.26	22	11.37	1.94*	0.24
Larynx	65	2.49*	118	2.91*	61	3.21*	34	2.90*	278	97.33	2.86*	4.13
Lung, bronchus	381	1.14*	1,238	2.30*	931	3.46*	606	3.27*	3,156	1,325.82	2.38*	41.81
<b>Female breast</b>	134	0.88	296	1.09	152	1.07	124	1.22*	706	667.61	1.06	2.15
<b>Female genital system</b>	39	0.57*	105	0.86	53	0.87	31	0.74	228	293.48	0.78*	-3.66
Cervix uteri	5	0.66	13	1.03	6	1.02	2	0.55	26	29.81	0.87	-0.21
Corpus uteri	16	0.44*	48	0.75*	23	0.72	13	0.61	100	152.98	0.65*	-2.96
Ovary	14	0.70	40	1.12	20	1.09	14	1.08	88	86.80	1.01	0.07
Vagina	2	1.97	1	0.56	2	2.16	0	0.00	5	4.41	1.13	0.03
Vulva	1	0.35	2	0.39	1	0.35	2	0.90	6	13.12	0.46*	-0.40
<b>Male genital system</b>	418	0.98	690	1.00	354	0.97	231	0.84*	1,693	1,752.94	0.97	-2.32
Prostate	417	0.99	679	1.00	352	0.97	230	0.85*	1,678	1,737.31	0.97	-2.29
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	4.66	0.00*	-0.18
<b>Urinary system</b>	263	1.66*	432	1.69*	195	1.48*	138	1.45*	1,028	640.20	1.61*	8.86
Urinary bladder	154	1.40*	300	1.70*	148	1.62*	108	1.61*	710	445.47	1.59*	6.04
Kidney parenchyma	92	2.41*	109	1.75*	39	1.22	21	0.92	261	155.20	1.68*	2.42
Renal pelvis, other urinary	17	1.71	23	1.44	8	1.00	9	1.60	57	39.54	1.44*	0.40
Ureter	5	1.52	5	0.94	1	0.37	3	1.63	14	13.11	1.07	0.02
<b>Bone, joints</b>	1	0.62	5	1.93	1	0.80	1	1.19	8	6.30	1.27	0.04
<b>Soft tissue including heart</b>	9	1.25	12	1.03	8	1.35	2	0.46	31	29.18	1.06	0.04
<b>Kaposi sarcoma</b>	2	0.97	3	0.96	0	0.00	1	0.98	6	7.71	0.78	-0.04
<b>Melanoma of skin</b>	26	0.68*	43	0.67*	33	0.97	32	1.24	134	162.78	0.82*	-0.66
<b>Eye, orbit</b>	2	0.74	3	0.69	0	0.00	1	0.68	6	10.73	0.56	-0.11
<b>Brain, central nervous system</b>	12	0.63	28	0.89	6	0.39*	11	1.04	57	76.61	0.74*	-0.45
<b>Thyroid</b>	38	4.19*	20	1.34	7	0.96	7	1.43	72	36.17	1.99*	0.82
<b>Lymphatic, hematopoietic</b>	103	0.74*	229	1.00	122	1.03	91	1.05	545	572.06	0.95	-0.62
Hodgkin lymphoma	3	0.66	4	0.57	2	0.61	2	0.95	11	16.92	0.65	-0.14
Non-Hodgkin lymphoma	46	0.76	95	0.94	62	1.16	49	1.22	252	254.56	0.99	-0.06
Myeloma	23	0.92	38	0.94	17	0.81	9	0.59	87	101.68	0.86	-0.34
Leukemia	31	0.63*	92	1.16	41	1.01	31	1.05	195	198.90	0.98	-0.09
Acute lymphocytic	1	0.77	1	0.47	1	0.92	0	0.00	3	5.24	0.57	-0.05
Chronic lymphocytic	8	0.40*	23	0.71	11	0.67	12	1.03	54	80.33	0.67*	-0.60
Acute non-lymphocytic	14	0.85	51	1.91*	20	1.44	14	1.37	99	67.27	1.47*	0.72
Chronic myeloid	4	0.60	11	1.04	6	1.10	4	0.99	25	26.74	0.93	-0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 178,906 PYR and for male cancers on 258,864 PYR.

## Lung and Bronchus Small Cell Carcinoma, Both Sexes, Radiotherapy

**Table 6.1.11:** Risk of subsequent primary cancers after small cell carcinoma of the lung or bronchus, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	126	0.71*	213	1.41*	92	1.93*	52	2.71*	483	394.10	1.23*	33.73
All excluding same site	111	0.76*	166	1.32*	52	1.31	29	1.80*	358	326.93	1.10	11.79
<b>Buccal cavity, pharynx</b>	6	1.15	15	3.72*	6	5.22*	2	4.62	29	10.84	2.68*	6.89
Lip	0	0.00	1	1.90	1	6.61	0	0.00	2	1.47	1.36	0.20
Tongue	3	2.86	2	2.41	1	4.15	0	0.00	6	2.21	2.71	1.44
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-0.32
Mouth	1	0.72	7	6.50*	2	6.53	0	0.00	10	2.89	3.47*	2.70
Nasopharynx	0	0.00	1	6.14	0	0.00	0	0.00	1	0.43	2.32	0.22
Tonsil	0	0.00	1	2.47	0	0.00	1	24.43	2	1.08	1.84	0.35
Oropharynx	0	0.00	1	8.28	2	58.52*	0	0.00	3	0.32	9.24*	1.02
Hypopharynx	1	1.73	1	2.31	0	0.00	1	23.79	3	1.17	2.56	0.69
<b>Digestive system</b>	26	0.70	40	1.30	20	2.08*	10	2.58*	96	81.48	1.18	5.51
Esophagus	2	0.94	4	2.38	4	8.02*	1	5.15	11	4.50	2.45*	2.47
Stomach	3	0.79	5	1.68	5	5.65*	0	0.00	13	8.01	1.62	1.89
Small intestine	0	0.00	2	4.21	0	0.00	0	0.00	2	1.23	1.62	0.29
Colon	8	0.50*	12	0.88	4	0.92	7	3.92*	31	35.95	0.86	-1.88
Rectum, rectosigmoid junction	5	0.74	8	1.45	5	3.00	1	1.52	19	14.63	1.30	1.66
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-0.32
Liver	0	0.00	1	0.91	0	0.00	0	0.00	1	2.88	0.35	-0.71
Gallbladder	0	0.00	0	0.00	1	7.79	0	0.00	1	1.04	0.96	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.67	0.00	-0.63
Pancreas	7	1.55	8	2.12	1	0.85	0	0.00	16	9.93	1.61	2.30
<b>Respiratory system</b>	24	0.71	54	1.96*	43	5.07*	25	7.54*	146	72.98	2.00*	27.70
Nose, nasal cavity, ear	1	3.74	0	0.00	0	0.00	0	0.00	1	0.58	1.73	0.16
Larynx	8	3.22*	7	3.76*	3	5.76*	2	10.58*	20	5.06	3.95*	5.67
Lung, bronchus	15	0.49*	47	1.85*	40	5.08*	23	7.44*	125	67.17	1.86*	21.94
<b>Female breast</b>	7	0.38*	18	0.98	3	0.49	6	2.43	34	45.21	0.75	-8.94
<b>Female genital system</b>	2	0.24*	3	0.37	2	0.76	2	1.97	9	20.29	0.44*	-9.01
Cervix uteri	0	0.00	1	1.19	0	0.00	1	12.80	2	2.08	0.96	-0.07
Corpus uteri	0	0.00*	2	0.46	2	1.42	1	1.84	5	10.89	0.46	-4.70
Ovary	2	0.83	0	0.00	0	0.00	0	0.00	2	5.91	0.34	-3.12
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.21
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.60
<b>Male genital system</b>	28	0.82	24	0.85	3	0.33*	0	0.00*	55	74.79	0.74*	-14.32
Prostate	28	0.83	23	0.82	3	0.34*	0	0.00	54	74.02	0.73*	-14.48
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.21
<b>Urinary system</b>	16	1.16	18	1.59	8	2.23	3	2.04	45	30.22	1.49*	5.61
Urinary bladder	8	0.86	13	1.71	7	2.90*	3	3.02	31	20.34	1.52*	4.05
Kidney parenchyma	6	1.66	4	1.30	1	1.04	0	0.00	11	8.04	1.37	1.12
Renal pelvis, other urinary	2	2.32	1	1.45	0	0.00	0	0.00	3	1.85	1.62	0.44
Ureter	1	3.54	0	0.00	0	0.00	0	0.00	1	0.60	1.66	0.15
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.13
<b>Soft tissue including heart</b>	0	0.00	1	1.77	0	0.00	0	0.00	1	1.48	0.68	-0.18
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.15
<b>Melanoma of skin</b>	4	1.03	1	0.29	3	2.67	0	0.00	8	8.99	0.89	-0.38
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.22
<b>Brain, central nervous system</b>	0	0.00	4	2.48	0	0.00	0	0.00	4	4.25	0.94	-0.09
<b>Thyroid</b>	4	3.99*	2	2.24	0	0.00	0	0.00	6	2.26	2.66	1.42
<b>Lymphatic, hematopoietic</b>	6	0.48	32	2.98*	4	1.16	3	2.10	45	28.18	1.60*	6.38
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.94	0.00	-0.36
Non-Hodgkin lymphoma	2	0.35	10	2.00	1	0.61	2	2.87	15	12.98	1.16	0.77
Myeloma	1	0.46	0	0.00	0	0.00	0	0.00	1	4.87	0.21	-1.47
Leukemia	3	0.71	22	6.21*	3	2.66	1	2.16	29	9.39	3.09*	7.44
Acute lymphocytic	0	0.00	1	9.83	1	31.50	0	0.00	2	0.27	7.51	0.66
Chronic lymphocytic	1	0.57	0	0.00	0	0.00	0	0.00	1	3.84	0.26	-1.08
Acute non-lymphocytic	1	0.71	21	17.55*	2	5.17	0	0.00	24	3.16	7.60*	7.91
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	16.24	1	1.25	0.80	-0.10

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 12,540 PYR and for male cancers on 13,819 PYR.

## Lung and Bronchus Small Cell Carcinoma, Both Sexes, No Radiotherapy

**Table 6.1.12:** Risk of subsequent primary cancers after small cell carcinoma of the lung or bronchus, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	108	0.73*	111	1.07	74	1.83*	28	1.17	321	315.76	1.02	2.84
All excluding same site	90	0.73*	92	1.07	50	1.48*	24	1.19	256	262.73	0.97	-3.66
<b>Buccal cavity, pharynx</b>	4	1.00	4	1.50	1	1.06	2	4.05	11	8.12	1.36	1.57
Lip	0	0.00	1	2.63	0	0.00	1	14.80	2	1.18	1.70	0.45
Tongue	1	1.25	1	1.87	0	0.00	1	9.95	3	1.63	1.84	0.75
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.36
Mouth	2	1.89	1	1.41	1	3.93	0	0.00	4	2.16	1.85	1.00
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.17
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.41
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.13
Hypopharynx	0	0.00	1	3.53	0	0.00	0	0.00	1	0.86	1.16	0.07
<b>Digestive system</b>	21	0.66	28	1.27	16	1.83*	11	2.10*	76	67.64	1.12	4.54
Esophagus	4	2.36	1	0.88	2	4.64	0	0.00	7	3.50	2.00	1.90
Stomach	2	0.63	2	0.93	1	1.22	1	2.07	6	6.66	0.90	-0.36
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.53
Colon	11	0.78	12	1.20	7	1.73	5	2.02	35	30.59	1.14	2.40
Rectum, rectosigmoid junction	2	0.35	5	1.29	3	2.04	2	2.43	12	11.79	1.02	0.11
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	19.63	1	0.65	1.55	0.19
Liver	1	0.91	1	1.34	1	3.44	0	0.00	3	2.31	1.30	0.38
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	0.00	-0.48
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.41	0.00	-0.77
Pancreas	1	0.26	5	1.87	2	1.87	2	3.04	10	8.21	1.22	0.97
<b>Respiratory system</b>	22	0.80	24	1.28	29	4.06*	6	1.49	81	57.39	1.41*	12.82
Nose, nasal cavity, ear	1	4.64	0	0.00	0	0.00	0	0.00	1	0.45	2.22	0.30
Larynx	3	1.57	5	4.09*	5	11.71*	2	9.39*	15	3.77	3.98*	6.10
Lung, bronchus	18	0.71	19	1.10	24	3.61*	4	1.06	65	53.03	1.23	6.50
<b>Female breast</b>	2	0.14*	5	0.42*	5	1.03	1	0.33	13	34.05	0.38*	-23.73
<b>Female genital system</b>	0	0.00*	4	0.76	2	0.96	2	1.60	8	15.03	0.53	-7.93
Cervix uteri	0	0.00	2	3.88	0	0.00	0	0.00	2	1.47	1.36	0.60
Corpus uteri	0	0.00	0	0.00	1	0.92	0	0.00	1	7.96	0.13*	-7.85
Ovary	0	0.00	2	1.30	1	1.60	0	0.00	3	4.44	0.68	-1.62
Vagina	0	0.00	0	0.00	0	0.00	1	48.05	1	0.21	4.66	0.89
Vulva	0	0.00	0	0.00	0	0.00	1	14.68	1	0.64	1.57	0.41
<b>Male genital system</b>	24	0.79	15	0.76	7	0.91	3	0.67	49	62.59	0.78	-14.24
Prostate	24	0.79	15	0.76	7	0.91	3	0.68	49	62.03	0.79	-13.66
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.18
<b>Urinary system</b>	14	1.19	5	0.63	6	1.95	2	1.12	27	24.61	1.10	1.30
Urinary bladder	7	0.86	5	0.92	4	1.90	2	1.63	18	16.85	1.07	0.62
Kidney parenchyma	5	1.69	0	0.00	1	1.28	0	0.00	6	6.21	0.97	-0.12
Renal pelvis, other urinary	2	2.73	0	0.00	1	5.14	0	0.00	3	1.54	1.95	0.79
Ureter	0	0.00	0	0.00	1	15.54	0	0.00	1	0.51	1.95	0.27
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.14
<b>Soft tissue including heart</b>	2	3.70	1	2.65	0	0.00	0	0.00	3	1.15	2.60	1.00
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.16
<b>Melanoma of skin</b>	3	0.96	1	0.46	0	0.00	1	2.01	5	6.63	0.75	-0.89
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.24
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	3.21	0.00	-1.74
<b>Thyroid</b>	3	4.10	1	1.88	2	10.14*	0	0.00	6	1.57	3.81*	2.40
<b>Lymphatic, hematopoietic</b>	10	0.94	21	2.81*	4	1.34	0	0.00	35	22.87	1.53*	6.59
Hodgkin lymphoma	2	5.92	0	0.00	0	0.00	0	0.00	2	0.69	2.91	0.71
Non-Hodgkin lymphoma	3	0.63	6	1.76	1	0.73	0	0.00	10	10.40	0.96	-0.22
Myeloma	0	0.00	3	2.30	0	0.00	0	0.00	3	4.01	0.75	-0.55
Leukemia	5	1.37	12	4.74*	3	3.00	0	0.00	20	7.78	2.57*	6.64
Acute lymphocytic	1	10.10	2	29.06*	0	0.00	0	0.00	3	0.21	14.28*	1.52
Chronic lymphocytic	0	0.00	0	0.00	1	2.47	0	0.00	1	3.18	0.31	-1.18
Acute non-lymphocytic	4	3.28	9	10.52*	1	2.91	0	0.00	14	2.63	5.33*	6.18
Chronic myeloid	0	0.00	1	2.98	1	7.54	0	0.00	2	1.03	1.94	0.53

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,867 PYR and for male cancers on 9,543 PYR.

## Lung and Bronchus Non-small Cell Carcinoma, Both Sexes, Radiotherapy

**Table 6.1.13:** Risk of subsequent primary cancers after non-small cell carcinoma of the lung or bronchus, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	979	1.04	1,287	1.31*	514	1.73*	264	1.78*	3,044	2,369.95	1.28*	48.20
All excluding same site	887	1.14*	1,015	1.25*	336	1.36*	164	1.32*	2,402	1,959.92	1.23*	31.61
<b>Buccal cavity, pharynx</b>	76	2.77*	61	2.25*	23	2.98*	5	1.41	165	65.89	2.50*	7.09
Lip	3	0.71	5	1.25	0	0.00	0	0.00	8	9.79	0.82	-0.13
Tongue	19	3.54*	9	1.67	6	3.84*	0	0.00	34	13.03	2.61*	1.50
Salivary gland	7	3.42*	2	0.94	0	0.00	0	0.00	9	5.15	1.75	0.28
Mouth	14	1.97*	20	2.85*	6	3.03*	3	3.37	43	17.01	2.53*	1.86
Nasopharynx	2	1.81	4	3.67	0	0.00	0	0.00	6	2.64	2.27	0.24
Tonsil	16	5.97*	9	3.42*	4	5.35*	0	0.00	29	6.40	4.53*	1.62
Oropharynx	2	2.44	2	2.46	1	4.29	0	0.00	5	1.97	2.54	0.22
Hypopharynx	8	2.58*	9	2.96*	5	5.86*	2	5.23	24	7.37	3.25*	1.19
<b>Digestive system</b>	264	1.28*	278	1.31*	116	1.85*	51	1.68*	709	512.12	1.38*	14.08
Esophagus	23	1.90*	28	2.29*	22	6.13*	19	10.77*	92	29.70	3.10*	4.45
Stomach	41	1.80*	36	1.58*	7	1.08	5	1.66	89	55.04	1.62*	2.43
Small intestine	10	3.50*	9	2.95*	1	1.06	0	0.00	20	7.33	2.73*	0.91
Colon	93	1.04	109	1.17	58	2.09*	17	1.26	277	224.27	1.24*	3.77
Rectum, rectosigmoid junction	40	1.09	45	1.21	10	0.93	2	0.39	97	89.63	1.08	0.53
Anus, anal canal	0	0.00	0	0.00	1	1.76	0	0.00	1	4.44	0.23	-0.25
Liver	2	0.26*	5	0.63	5	2.06	1	0.81	13	19.15	0.68	-0.44
Gallbladder	2	0.83	2	0.79	1	1.37	1	2.94	6	6.01	1.00	0.00
Bile ducts, other biliary	6	1.46	5	1.14	3	2.22	0	0.00	14	10.55	1.33	0.25
Pancreas	46	1.86*	39	1.53*	7	0.93	5	1.37	97	61.38	1.58*	2.55
<b>Respiratory system</b>	124	0.69*	325	1.76*	199	3.65*	104	3.92*	752	446.72	1.68*	21.83
Nose, nasal cavity, ear	3	2.11	5	3.46*	1	2.36	0	0.00	9	3.49	2.58*	0.39
Larynx	29	2.16*	44	3.33*	18	4.82*	4	2.33	95	32.11	2.96*	4.50
Lung, bronchus	92	0.56*	272	1.60*	178	3.55*	100	4.08*	642	410.03	1.57*	16.59
<b>Female breast</b>	59	0.87	72	0.94	24	0.99	15	1.27	170	180.92	0.94	-2.15
<b>Female genital system</b>	17	0.55*	27	0.79	8	0.77	7	1.44	59	80.31	0.73*	-4.20
Cervix uteri	3	0.85	5	1.35	1	0.95	2	4.50	11	8.74	1.26	0.45
Corpus uteri	4	0.25*	9	0.51*	6	1.11	4	1.58	23	41.91	0.55*	-3.73
Ovary	8	0.89	10	1.00	0	0.00	1	0.68	19	23.52	0.81	-0.89
Vagina	1	2.25	1	2.02	1	6.59	0	0.00	3	1.16	2.58	0.36
Vulva	0	0.00	1	0.71	0	0.00	0	0.00	1	3.29	0.30	-0.45
<b>Male genital system</b>	200	0.94	219	0.97	57	0.81	32	0.85	508	545.76	0.93	-4.24
Prostate	199	0.94	216	0.97	57	0.82	32	0.86	504	540.57	0.93	-4.10
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.69	0.00	-0.19
<b>Urinary system</b>	129	1.67*	169	2.11*	43	1.79*	19	1.57	360	193.45	1.86*	11.91
Urinary bladder	73	1.36*	106	1.92*	28	1.69*	14	1.67	221	133.73	1.65*	6.24
Kidney parenchyma	47	2.49*	52	2.62*	14	2.31*	5	1.62	118	47.87	2.46*	5.02
Renal pelvis, other urinary	9	1.86	11	2.24*	1	0.70	0	0.00	21	11.85	1.77*	0.65
Ureter	4	2.50	3	1.85	1	2.13	0	0.00	8	3.92	2.04	0.29
<b>Bone, joints</b>	0	0.00	2	2.48	0	0.00	0	0.00	2	1.94	1.03	0.00
<b>Soft tissue including heart</b>	7	2.00	6	1.64	1	0.91	0	0.00	14	8.81	1.59	0.37
<b>Kaposi sarcoma</b>	2	1.86	2	1.85	0	0.00	0	0.00	4	2.60	1.54	0.10
<b>Melanoma of skin</b>	14	0.75	13	0.64	5	0.77	4	1.16	36	48.99	0.73	-0.93
<b>Eye, orbit</b>	1	0.76	1	0.75	0	0.00	0	0.00	2	3.24	0.62	-0.09
<b>Brain, central nervous system</b>	9	0.95	8	0.82	1	0.34	1	0.71	19	23.55	0.81	-0.33
<b>Thyroid</b>	21	4.72*	6	1.28	2	1.42	0	0.00	29	11.20	2.59*	1.27
<b>Lymphatic, hematopoietic</b>	44	0.66*	78	1.11	23	1.08	18	1.68	163	169.60	0.96	-0.47
Hodgkin lymphoma	1	0.44	1	0.45	0	0.00	1	3.56	3	5.37	0.56	-0.17
Non-Hodgkin lymphoma	11	0.38*	31	1.00	16	1.66	12	2.41*	70	74.78	0.94	-0.34
Myeloma	13	1.07	10	0.79	0	0.00*	3	1.59	26	30.56	0.85	-0.33
Leukemia	19	0.80	36	1.47*	7	0.96	2	0.56	64	58.90	1.09	0.36
Acute lymphocytic	1	1.57	1	1.51	0	0.00	0	0.00	2	1.59	1.26	0.03
Chronic lymphocytic	3	0.31*	5	0.50	1	0.34	0	0.00	9	23.90	0.38*	-1.07
Acute non-lymphocytic	10	1.27	26	3.17*	4	1.63	2	1.63	42	19.75	2.13*	1.59
Chronic myeloid	3	0.94	1	0.30	2	2.04	0	0.00	6	7.94	0.76	-0.14

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 50,724 PYR and for male cancers on 89,113 PYR.

## Lung and Bronchus Non-small Cell Carcinoma, Both Sexes, No Radiotherapy

**Table 6.1.14:** Risk of subsequent primary cancers after non-small cell carcinoma of the lung or bronchus, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,247	1.26*	3,149	1.45*	2,010	1.52*	1,446	1.43*	7,852	5,500.90	1.43*	78.91
All excluding same site	958	1.16*	2,183	1.21*	1,257	1.14*	940	1.10*	5,338	4,585.11	1.16*	25.27
<b>Buccal cavity, pharynx</b>	83	3.08*	143	2.47*	74	2.28*	31	1.40	331	139.31	2.38*	6.43
Lip	10	2.33*	12	1.36	6	1.21	3	0.89	31	21.44	1.45	0.32
Tongue	19	3.63*	35	3.07*	8	1.24	10	2.25*	72	27.51	2.62*	1.49
Salivary gland	5	2.31	4	0.85	6	2.09	1	0.44	16	11.99	1.33	0.13
Mouth	29	4.13*	39	2.57*	26	3.08*	6	1.05	100	36.34	2.75*	2.14
Nasopharynx	0	0.00	4	1.81	1	0.84	1	1.25	6	5.24	1.15	0.03
Tonsil	8	3.19*	16	2.96*	7	2.39	5	2.66	36	12.72	2.83*	0.78
Oropharynx	1	1.29	3	1.78	1	1.06	2	3.21	7	4.02	1.74	0.10
Hypopharynx	7	2.42	23	3.66*	12	3.49*	3	1.37	45	14.80	3.04*	1.01
<b>Digestive system</b>	279	1.26*	644	1.35*	327	1.13*	270	1.23*	1,520	1,206.12	1.26*	10.54
Esophagus	25	2.12*	63	2.48*	42	2.81*	28	2.53*	158	63.23	2.50*	3.18
Stomach	36	1.51*	75	1.51*	29	1.00	20	0.92	160	124.21	1.29*	1.20
Small intestine	11	3.66*	11	1.65	5	1.22	0	0.00	27	17.06	1.58*	0.33
Colon	108	1.09	271	1.27*	130	0.99	142	1.40*	651	545.19	1.19*	3.55
Rectum, rectosigmoid junction	48	1.25	103	1.24*	55	1.13	30	0.85	236	205.65	1.15*	1.02
Anus, anal canal	3	1.59	4	0.95	1	0.40	4	2.10	12	10.52	1.14	0.05
Liver	8	1.04	8	0.48*	8	0.80	10	1.25	34	42.25	0.80	-0.28
Gallbladder	3	1.05	3	0.49	2	0.55	0	0.00	8	15.38	0.52	-0.25
Bile ducts, other biliary	5	1.08	13	1.30	1	0.16*	12	2.25*	31	26.20	1.18	0.16
Pancreas	32	1.20	89	1.55*	52	1.51*	22	0.83	195	145.07	1.34*	1.68
<b>Respiratory system</b>	326	1.79*	1,054	2.64*	802	3.39*	538	3.11*	2,720	991.27	2.74*	58.02
Nose, nasal cavity, ear	1	0.68	6	1.90	4	2.15	2	1.45	13	7.87	1.65	0.17
Larynx	36	2.85*	74	2.71*	43	2.82*	30	2.99*	183	65.23	2.81*	3.95
Lung, bronchus	289	1.73*	966	2.62*	753	3.44*	506	3.14*	2,514	915.79	2.75*	53.64
<b>Female breast</b>	75	0.90	224	1.15*	128	1.09	109	1.21	536	486.69	1.10*	3.85
<b>Female genital system</b>	22	0.58*	78	0.89	45	0.89	24	0.65*	169	213.17	0.79*	-3.45
Cervix uteri	2	0.49	8	0.89	5	1.03	0	0.00	15	21.07	0.71	-0.47
Corpus uteri	12	0.61	39	0.85	17	0.64	9	0.48*	77	111.07	0.69*	-2.66
Ovary	6	0.55	30	1.17	20	1.31	13	1.14	69	63.28	1.09	0.46
Vagina	1	1.75	0	0.00	1	1.29	0	0.00	2	3.24	0.62	-0.10
Vulva	1	0.60	1	0.26	1	0.42	2	0.99	5	9.83	0.51	-0.38
<b>Male genital system</b>	218	1.03	471	1.02	297	1.01	199	0.84*	1,185	1,207.18	0.98	-1.31
Prostate	218	1.04	463	1.01	295	1.01	198	0.84*	1,174	1,196.74	0.98	-1.34
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.97	0.00	-0.17
<b>Urinary system</b>	134	1.66*	263	1.50*	152	1.41*	119	1.43*	668	446.76	1.50*	7.43
Urinary bladder	81	1.44*	194	1.60*	120	1.60*	94	1.60*	489	311.74	1.57*	5.95
Kidney parenchyma	45	2.34*	57	1.34*	25	0.97	16	0.81	143	107.33	1.33*	1.20
Renal pelvis, other urinary	8	1.56	12	1.09	7	1.06	9	1.83	36	27.69	1.30	0.28
Ureter	1	0.59	2	0.54	0	0.00	3	1.85	6	9.20	0.65	-0.11
<b>Bone, joints</b>	1	1.22	3	1.68	1	0.98	1	1.37	6	4.36	1.38	0.06
<b>Soft tissue including heart</b>	2	0.54	6	0.75	7	1.45	2	0.52	17	20.37	0.83	-0.11
<b>Kaposi sarcoma</b>	0	0.00	1	0.49	0	0.00	1	1.13	2	5.11	0.39	-0.10
<b>Melanoma of skin</b>	12	0.61	30	0.68*	28	1.01	28	1.25	98	113.80	0.86	-0.53
<b>Eye, orbit</b>	1	0.72	2	0.66	0	0.00	1	0.78	4	7.48	0.53	-0.12
<b>Brain, central nervous system</b>	3	0.31*	20	0.93	5	0.39*	10	1.09	38	53.06	0.72*	-0.51
<b>Thyroid</b>	17	3.69*	14	1.36	5	0.85	7	1.66	43	24.97	1.72*	0.61
<b>Lymphatic, hematopoietic</b>	59	0.82	151	0.96	99	1.02	73	0.96	382	402.46	0.95	-0.69
Hodgkin lymphoma	2	0.88	3	0.62	2	0.75	1	0.55	8	11.56	0.69	-0.12
Non-Hodgkin lymphoma	35	1.12	64	0.92	46	1.06	37	1.05	182	179.78	1.01	0.07
Myeloma	10	0.78	28	1.00	17	1.00	6	0.45*	61	71.13	0.86	-0.34
Leukemia	12	0.47*	56	1.02	34	1.01	29	1.12	131	139.99	0.94	-0.30
Acute lymphocytic	0	0.00	0	0.00	1	1.13	0	0.00	1	3.64	0.27	-0.09
Chronic lymphocytic	5	0.48	18	0.81	10	0.74	12	1.17	45	56.43	0.80	-0.38
Acute non-lymphocytic	4	0.47	25	1.35	16	1.40	12	1.33	57	47.52	1.20	0.32
Chronic myeloid	1	0.29	10	1.36	4	0.89	4	1.13	19	18.80	1.01	0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 128,182 PYR and for male cancers on 169,751 PYR.



## Larynx Both Sexes

**Table 6.2.1:** Characteristics of patients with an initial cancer of the larynx, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	19,574	100.0	4,369	100.0	23,943	100.0
<b>Initial treatment</b>						
Any radiation	14,370	73.4	3,247	74.3	17,617	73.6
With surgery	6,764	34.6	1,584	36.3	8,348	34.9
Without surgery	7,606	38.9	1,663	38.1	9,269	38.7
No radiation	5,204	26.6	1,122	25.7	6,326	26.4
With surgery	4,196	21.4	874	20.0	5,070	21.2
Without surgery	1,008	5.1	248	5.7	1,256	5.2
<b>Race</b>						
White	16,580	84.7	3,657	83.7	20,237	84.5
Black	2,347	12.0	587	13.4	2,934	12.3
Other	597	3.0	108	2.5	705	2.9
Unknown	50	0.3	17	0.4	67	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	31	0.2	32	0.7	63	0.3
30–49	1,991	10.2	556	12.7	2,547	10.6
50–69	12,216	62.4	2,681	61.4	14,897	62.2
70–79	4,209	21.5	834	19.1	5,043	21.1
≥ 80	1,127	5.8	266	6.1	1,393	5.8
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	15,688	80.1	3,615	82.7	19,303	80.6
1st and 2nd cancers	3,408	17.4	667	15.3	4,075	17.0
1st, 2nd, and 3rd cancers	426	2.2	78	1.8	504	2.1
1st, 2nd, 3rd, and additional cancers	52	0.3	9	0.2	61	0.3
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	63.7	—	62.7	—	63.5	—
Median year of 1st cancer diagnosis	1986.5	—	1988.0	—	1986.8	—
Median person-years at risk	4.5	—	4.3	—	4.5	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	94.9	—	96.6	—	95.1
1st, 2nd, and additional cancers	—	94.1	—	96.0	—	94.4
1st cancer only	—	4.8	—	3.4	—	4.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 6.2.2:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	515	1.75*	2,057	1.94*	1,477	1.68*	1,228	1.44*	5,277	3,087.41	1.71*	140.47
All excluding same site	509	1.76*	2,032	1.95*	1,461	1.68*	1,215	1.45*	5,217	3,042.66	1.71*	139.49
<b>Buccal cavity, pharynx</b>	45	4.66*	188	5.72*	143	5.87*	118	5.90*	494	86.88	5.69*	26.12
Lip	2	1.26	6	1.11	3	0.74	6	1.76	17	14.46	1.18	0.16
Tongue	20	10.73*	55	8.64*	35	7.35*	31	7.84*	141	16.95	8.32*	7.96
Salivary gland	0	0.00	3	1.25	8	4.04*	4	2.02	15	7.03	2.13*	0.51
Mouth	12	4.92*	64	7.79*	40	6.69*	23	4.86*	139	21.36	6.51*	7.55
Nasopharynx	1	2.77	3	2.52	4	4.73*	2	3.01	10	3.06	3.27*	0.45
Tonsil	3	3.10	25	7.78*	19	8.30*	19	10.76*	66	8.24	8.01*	3.71
Oropharynx	2	6.81	4	4.03*	8	10.92*	4	6.76*	18	2.61	6.90*	0.99
Hypopharynx	5	4.46*	13	3.42*	18	6.46*	20	9.34*	56	9.85	5.68*	2.96
<b>Digestive system</b>	74	1.15	336	1.46*	263	1.41*	221	1.26*	894	656.65	1.36*	15.23
Esophagus	13	3.14*	65	4.52*	50	4.41*	40	3.81*	168	40.37	4.16*	8.19
Stomach	12	1.63	26	1.01	28	1.38	17	0.92	83	71.87	1.15	0.71
Small intestine	1	1.13	4	1.26	5	1.87	5	1.89	15	9.38	1.60	0.36
Colon	27	0.99	124	1.26*	97	1.18	91	1.15	339	286.85	1.18*	3.35
Rectum, rectosigmoid junction	8	0.68	46	1.10	39	1.18	25	0.85	118	116.21	1.02	0.12
Anus, anal canal	0	0.00	2	1.13	2	1.42	3	2.35	7	4.95	1.41	0.13
Liver	3	1.25	19	2.22*	11	1.56	15	2.15*	48	24.96	1.92*	1.48
Gallbladder	0	0.00	4	1.79	5	2.78	0	0.00	9	6.33	1.42	0.17
Bile ducts, other biliary	1	0.81	7	1.54	2	0.51	5	1.20	15	13.83	1.08	0.08
Pancreas	9	1.18	38	1.41	23	1.06	18	0.88	88	76.56	1.15	0.73
<b>Respiratory system</b>	198	3.30*	887	4.18*	578	3.43*	433	2.85*	2,096	592.96	3.53*	96.42
Nose, nasal cavity, ear	2	4.31	15	9.32*	3	2.39	0	0.00	20	4.47	4.48*	1.00
Larynx	6	1.21	25	1.48	16	1.27	13	1.27	60	44.75	1.34*	0.98
Lung, bronchus	188	3.45*	841	4.36*	559	3.62*	419	2.99*	2,007	542.33	3.70*	93.96
<b>Female breast</b>	10	0.94	49	1.34	30	1.03	25	0.97	114	101.75	1.12	4.35
<b>Female genital system</b>	7	1.38	22	1.29	18	1.41	9	0.85	56	45.45	1.23	3.75
Cervix uteri	1	1.59	5	2.53	2	1.52	1	1.04	9	4.89	1.84	1.46
Corpus uteri	2	0.75	6	0.67	6	0.90	6	1.10	20	23.75	0.84	-1.33
Ovary	3	2.11	6	1.24	8	2.12	2	0.62	19	13.28	1.43	2.03
Vagina	0	0.00	2	8.33	1	5.26	0	0.00	3	0.67	4.48	0.83
Vulva	0	0.00	2	3.10	1	1.85	0	0.00	3	1.90	1.58	0.39
<b>Male genital system</b>	85	1.13	264	0.93	213	0.84*	208	0.79*	770	874.15	0.88*	-8.15
Prostate	84	1.12	262	0.94	210	0.84*	206	0.79*	762	866.46	0.88*	-8.18
Testis	0	0.00	0	0.00	0	0.00	1	2.59	1	2.31	0.43	-0.10
<b>Urinary system</b>	34	1.30	140	1.47*	108	1.36*	96	1.22	378	279.43	1.35*	6.32
Urinary bladder	19	1.03	91	1.35*	81	1.43*	72	1.27	263	198.90	1.32*	4.11
Kidney parenchyma	15	2.40*	41	1.83*	19	1.04	19	1.09	94	64.37	1.46*	1.90
Renal pelvis, other urinary	0	0.00	8	1.40	8	1.75	5	1.16	21	16.16	1.30	0.31
Ureter	0	0.00	3	1.57	4	2.58	1	0.69	8	5.42	1.48	0.17
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	3	5.18*	3	2.41	1.25	0.04
<b>Soft tissue including heart</b>	3	2.69	2	0.51	2	0.63	2	0.64	9	11.32	0.79	-0.15
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	3.60	0.00	-0.23
<b>Melanoma of skin</b>	2	0.32	14	0.62	16	0.83	12	0.60	44	67.95	0.65*	-1.54
<b>Eye, orbit</b>	0	0.00	0	0.00	3	2.53	0	0.00	3	4.22	0.71	-0.08
<b>Brain, central nervous system</b>	2	0.64	10	0.92	7	0.83	7	0.93	26	29.93	0.87	-0.25
<b>Thyroid</b>	13	10.53*	9	2.15	1	0.32	2	0.74	25	11.27	2.22*	0.88
<b>Lymphatic, hematopoietic</b>	26	1.23	89	1.17	60	0.95	50	0.81	225	221.56	1.02	0.22
Hodgkin lymphoma	1	1.29	3	1.18	4	2.20	3	2.04	11	6.61	1.66	0.28
Non-Hodgkin lymphoma	13	1.46	45	1.39*	29	1.06	26	0.94	113	96.13	1.18	1.08
Myeloma	5	1.33	15	1.11	6	0.54	5	0.46	31	39.32	0.79	-0.53
Leukemia	7	0.92	26	0.95	21	0.93	16	0.73	70	79.49	0.88	-0.61
Acute lymphocytic	0	0.00	0	0.00	0	0.00	2	3.80	2	2.05	0.98	0.00
Chronic lymphocytic	1	0.32	2	0.18*	5	0.54	3	0.34*	11	32.63	0.34*	-1.39
Acute non-lymphocytic	6	2.43	14	1.56	9	1.21	6	0.81	35	26.33	1.33	0.56
Chronic myeloid	0	0.00	5	1.37	5	1.67	3	1.01	13	10.64	1.22	0.15

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 28,157 PYR and for male cancers on 127,719 PYR.

## Larynx Both Sexes, Long-term Follow-up

**Table 6.2.3:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	23,943		6,136		2,909		1,052		23,943			
<b>Person-years in interval</b>	121,615		21,794		9,379		3,088		155,877			
<b>All subsequent cancers</b>	4,049	1.81*	795	1.53*	335	1.36*	98	1.16	5,277	3,087.41	1.71*	140.47
All excluding same site	4,002	1.82*	788	1.54*	331	1.36*	96	1.15	5,217	3,042.66	1.71*	139.49
<b>Buccal cavity, pharynx</b>	376	5.62*	76	5.97*	33	6.01*	9	4.98*	494	86.88	5.69*	26.12
Lip	11	1.00	5	2.32	1	1.07	0	0.00	17	14.46	1.18	0.16
Tongue	110	8.47*	18	7.18*	13	11.92*	0	0.00	141	16.95	8.32*	7.96
Salivary gland	11	2.18*	2	1.69	2	3.48	0	0.00	15	7.03	2.13*	0.51
Mouth	116	6.97*	18	5.95*	5	3.89*	0	0.00	139	21.36	6.51*	7.55
Nasopharynx	8	3.34*	1	2.33	0	0.00	1	17.69	10	3.06	3.27*	0.45
Tonsil	47	7.26*	14	12.28*	4	8.42*	1	6.69	66	8.24	8.01*	3.71
Oropharynx	14	6.94*	2	5.27	2	12.42*	0	0.00	18	2.61	6.90*	0.99
Hypopharynx	36	4.67*	12	8.57*	5	8.79*	3	17.36*	56	9.85	5.68*	2.96
<b>Digestive system</b>	673	1.40*	151	1.40*	57	1.14	13	0.72	894	656.65	1.36*	15.23
Esophagus	128	4.28*	26	4.03*	9	3.01*	5	4.75*	168	40.37	4.16*	8.19
Stomach	66	1.24	16	1.40	1	0.19	0	0.00	83	71.87	1.15	0.71
Small intestine	10	1.48	2	1.25	2	2.61	1	3.56	15	9.38	1.60	0.36
Colon	248	1.19*	55	1.14	31	1.38	5	0.61	339	286.85	1.18*	3.35
Rectum, rectosigmoid junction	93	1.07	17	0.92	7	0.85	1	0.35	118	116.21	1.02	0.12
Anus, anal canal	4	1.09	3	3.82	0	0.00	0	0.00	7	4.95	1.41	0.13
Liver	33	1.83*	12	2.88*	2	0.98	1	1.33	48	24.96	1.92*	1.48
Gallbladder	9	1.93	0	0.00	0	0.00	0	0.00	9	6.33	1.42	0.17
Bile ducts, other biliary	10	1.03	4	1.65	1	0.80	0	0.00	15	13.83	1.08	0.08
Pancreas	70	1.25	14	1.13	4	0.69	0	0.00	88	76.56	1.15	0.73
<b>Respiratory system</b>	1,663	3.77*	292	3.09*	102	2.38*	39	2.66*	2,096	592.96	3.53*	96.42
Nose, nasal cavity, ear	20	6.01*	0	0.00	0	0.00	0	0.00	20	4.47	4.48*	1.00
Larynx	47	1.36*	7	1.06	4	1.44	2	2.31	60	44.75	1.34*	0.98
Lung, bronchus	1,588	3.95*	285	3.28*	97	2.44*	37	2.71*	2,007	542.33	3.70*	93.96
<b>Female breast</b>	89	1.17	19	1.21	6	0.80	0	0.00	114	101.75	1.12	4.35
<b>Female genital system</b>	47	1.35	8	1.21	1	0.33	0	0.00	56	45.45	1.23	3.75
Cervix uteri	8	2.04	1	1.60	0	0.00	0	0.00	9	4.89	1.84	1.46
Corpus uteri	14	0.77	6	1.77	0	0.00	0	0.00	20	23.75	0.84	-1.33
Ovary	17	1.69	1	0.50	1	1.07	0	0.00	19	13.28	1.43	2.03
Vagina	3	6.01*	0	0.00	0	0.00	0	0.00	3	0.67	4.48	0.83
Vulva	3	2.19	0	0.00	0	0.00	0	0.00	3	1.90	1.58	0.39
<b>Male genital system</b>	562	0.92*	124	0.77*	66	0.85	18	0.72	770	874.15	0.88*	-8.15
Prostate	556	0.92*	124	0.78*	64	0.83	18	0.73	762	866.46	0.88*	-8.18
Testis	0	0.00	0	0.00	1	10.32	0	0.00	1	2.31	0.43	-0.10
<b>Urinary system</b>	282	1.40*	60	1.27	27	1.19	9	1.07	378	279.43	1.35*	6.32
Urinary bladder	191	1.34*	45	1.32	21	1.27	6	0.97	263	198.90	1.32*	4.11
Kidney parenchyma	75	1.60*	11	1.03	5	1.00	3	1.70	94	64.37	1.46*	1.90
Renal pelvis, other urinary	16	1.35	4	1.52	1	0.82	0	0.00	21	16.16	1.30	0.31
Ureter	7	1.76	1	1.13	0	0.00	0	0.00	8	5.42	1.48	0.17
<b>Bone, joints</b>	0	0.00	2	5.56	1	6.12	0	0.00	3	2.41	1.25	0.04
<b>Soft tissue including heart</b>	7	0.85	2	1.07	0	0.00	0	0.00	9	11.32	0.79	-0.15
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	3.60	0.00	-0.23
<b>Melanoma of skin</b>	32	0.67*	8	0.68	3	0.51	1	0.43	44	67.95	0.65*	-1.54
<b>Eye, orbit</b>	3	0.96	0	0.00	0	0.00	0	0.00	3	4.22	0.71	-0.08
<b>Brain, central nervous system</b>	19	0.85	5	1.07	1	0.47	1	1.36	26	29.93	0.87	-0.25
<b>Thyroid</b>	23	2.69*	0	0.00	2	2.64	0	0.00	25	11.27	2.22*	0.88
<b>Lymphatic, hematopoietic</b>	175	1.10	25	0.67*	23	1.28	2	0.30	225	221.56	1.02	0.22
Hodgkin lymphoma	8	1.56	1	1.07	1	2.47	1	7.51	11	6.61	1.66	0.28
Non-Hodgkin lymphoma	87	1.27*	13	0.79	13	1.60	0	0.00	113	96.13	1.18	1.08
Myeloma	26	0.91	4	0.60	1	0.32	0	0.00	31	39.32	0.79	-0.53
Leukemia	54	0.94	7	0.53	8	1.27	1	0.43	70	79.49	0.88	-0.61
Acute lymphocytic	0	0.00	1	2.98	1	6.82	0	0.00	2	2.05	0.98	0.00
Chronic lymphocytic	8	0.34*	2	0.37	1	0.40	0	0.00	11	32.63	0.34*	-1.39
Acute non-lymphocytic	29	1.54*	3	0.67	2	0.92	1	1.22	35	26.33	1.33	0.56
Chronic myeloid	10	1.31	1	0.56	2	2.31	0	0.00	13	10.64	1.22	0.15

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 28,157 PYR and for male cancers on 127,719 PYR.

**Table 6.2.4:** Risk of subsequent primary cancers after cancer of the larynx, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	94	2.62*	338	2.71*	238	2.36*	180	1.97*	850	352.54	2.41*	176.67
All excluding same site	93	2.61*	333	2.69*	236	2.36*	178	1.96*	840	350.82	2.39*	173.73
<b>Buccal cavity, pharynx</b>	11	15.74*	32	13.40*	24	13.04*	21	13.61*	88	6.47	13.60*	28.96
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.14
Tongue	7	45.51*	9	17.11*	8	19.67*	4	11.77*	28	1.43	19.63*	9.44
Salivary gland	0	0.00	0	0.00	2	10.57*	1	5.79	3	0.67	4.47	0.83
Mouth	4	16.88*	11	13.55*	3	4.76	6	11.23*	24	2.21	10.84*	7.74
Nasopharynx	0	0.00	1	10.89	1	14.41	0	0.00	2	0.25	8.15	0.62
Tonsil	0	0.00	5	20.72*	4	23.27*	3	23.54*	12	0.61	19.57*	4.04
Oropharynx	0	0.00	1	15.20	2	40.42*	2	51.88*	5	0.17	28.92*	1.71
Hypopharynx	0	0.00	3	16.16*	1	7.26	4	37.44*	8	0.48	16.50*	2.67
<b>Digestive system</b>	13	1.71	59	2.20*	33	1.48*	26	1.25	131	77.46	1.69*	19.01
Esophagus	3	12.14*	17	19.81*	7	10.15*	5	8.04*	32	2.42	13.24*	10.51
Stomach	1	1.75	3	1.51	2	1.24	3	2.02	9	5.67	1.59	1.18
Small intestine	0	0.00	1	2.46	1	2.92	0	0.00	2	1.20	1.67	0.28
Colon	5	1.34	18	1.36	10	0.90	9	0.86	42	38.43	1.09	1.27
Rectum, rectosigmoid junction	1	0.79	11	2.51*	4	1.14	2	0.65	18	12.24	1.47	2.05
Rectum	1	1.22	8	2.82*	3	1.32	1	0.49	13	7.96	1.63	1.79
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.10	0.00	-0.39
Liver	0	0.00	0	0.00	2	4.14	0	0.00	2	1.70	1.18	0.11
Gallbladder	0	0.00	1	1.71	0	0.00	0	0.00	1	1.65	0.61	-0.23
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	2.07	1	1.64	0.61	-0.23
Pancreas	3	2.99	8	2.25	7	2.34	6	2.10	24	10.39	2.31*	4.83
<b>Respiratory system</b>	31	6.26*	143	8.12*	107	7.26*	80	5.76*	361	51.18	7.05*	110.03
Nose, nasal cavity, ear	0	0.00	1	6.01	0	0.00	0	0.00	1	0.47	2.12	0.19
Larynx	1	5.22	5	7.78*	2	4.09	2	5.09	10	1.72	5.83*	2.94
Lung, bronchus	30	6.38*	137	8.18*	105	7.45*	78	5.85*	350	48.87	7.16*	106.94
<b>Female breast</b>	10	0.94	49	1.34	30	1.03	25	0.97	114	101.75	1.12	4.35
<b>Female genital system</b>	7	1.38	22	1.29	18	1.41	9	0.85	56	45.45	1.23	3.75
Cervix uteri	1	1.59	5	2.53	2	1.52	1	1.04	9	4.89	1.84	1.46
Corpus uteri	2	0.75	6	0.67	6	0.90	6	1.10	20	23.75	0.84	-1.33
Ovary	3	2.11	6	1.24	8	2.12	2	0.62	19	13.28	1.43	2.03
Vagina	0	0.00	2	8.33	1	5.26	0	0.00	3	0.67	4.48	0.83
Vulva	0	0.00	2	3.10	1	1.85	0	0.00	3	1.90	1.58	0.39
<b>Urinary system</b>	5	3.08	12	2.09*	6	1.25	2	0.44	25	16.77	1.49	2.92
Urinary bladder	1	1.08	7	2.12	2	0.72	1	0.38	11	9.66	1.14	0.48
Kidney parenchyma	4	7.09*	4	2.01	3	1.82	1	0.64	12	5.76	2.08*	2.22
Renal pelvis, other urinary	0	0.00	1	2.15	1	2.58	0	0.00	2	1.35	1.49	0.23
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.14
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	13.13	1	0.31	3.25	0.25
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.36	0.00	-0.48
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.04
<b>Melanoma of skin</b>	0	0.00	0	0.00	2	1.06	2	1.14	4	6.69	0.60	-0.96
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.18
<b>Brain, central nervous system</b>	0	0.00	0	0.00	2	1.89	1	1.09	3	3.70	0.81	-0.25
<b>Thyroid</b>	5	14.75*	1	0.90	0	0.00	0	0.00	6	2.95	2.03	1.08
<b>Lymphatic, hematopoietic</b>	3	1.17	11	1.22	12	1.58	7	0.97	33	26.36	1.25	2.36
Hodgkin lymphoma	0	0.00	0	0.00	1	4.57	1	5.52	2	0.78	2.58	0.43
Non-Hodgkin lymphoma	0	0.00	4	0.92	8	2.17	4	1.12	16	12.83	1.25	1.13
Myeloma	2	4.23	5	3.00	2	1.45	1	0.78	10	4.81	2.08	1.84
Leukemia	1	1.29	2	0.73	1	0.44	1	0.46	5	7.96	0.63	-1.05
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.08
Chronic lymphocytic	1	3.29	0	0.00	0	0.00	0	0.00	1	3.13	0.32	-0.76
Acute non-lymphocytic	0	0.00	2	2.07	1	1.24	1	1.29	4	2.82	1.42	0.42
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.09	0.00	-0.39

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 6.2.5:** Risk of subsequent primary cancers after cancer of the larynx, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	19,574	15,032	16,739	49,537	9,442	35,087	5,034	28,062	19,574	127,719		
<b>All subsequent cancers</b>	421	1.63*	1,719	1.83*	1,239	1.59*	1,048	1.38*	4,427	2,734.88	1.62*	132.49
All excluding same site	416	1.64*	1,699	1.85*	1,225	1.60*	1,037	1.38*	4,377	2,691.84	1.63*	131.94
<b>Buccal cavity, pharynx</b>	34	3.79*	156	5.12*	119	5.29*	97	5.25*	406	80.41	5.05*	25.49
Lip	2	1.29	6	1.13	3	0.76	6	1.82	17	14.07	1.21	0.23
Tongue	13	7.60*	46	7.88*	27	6.20*	27	7.47*	113	15.52	7.28*	7.63
Salivary gland	0	0.00	3	1.39	6	3.35*	3	1.66	12	6.36	1.89	0.44
Mouth	8	3.64*	53	7.15*	37	6.92*	17	4.05*	115	19.15	6.01*	7.50
Nasopharynx	1	3.00	2	1.82	3	3.86	2	3.29	8	2.81	2.84*	0.41
Tonsil	3	3.35	20	6.73*	15	7.09*	16	9.77*	54	7.62	7.08*	3.63
Oropharynx	2	7.29	3	3.24	6	8.79*	2	3.62	13	2.44	5.34*	0.83
Hypopharynx	5	4.69*	10	2.77*	17	6.41*	16	7.86*	48	9.37	5.12*	3.02
<b>Digestive system</b>	61	1.07	277	1.37*	230	1.40*	195	1.26*	763	579.19	1.32*	14.39
Esophagus	10	2.57*	48	3.55*	43	4.03*	35	3.55*	136	37.96	3.58*	7.68
Stomach	11	1.62	23	0.97	26	1.39	14	0.83	74	66.21	1.12	0.61
Small intestine	1	1.30	3	1.08	4	1.72	5	2.17	13	8.18	1.59	0.38
Colon	22	0.93	106	1.24*	87	1.23	82	1.20	297	248.42	1.20*	3.80
Rectum, rectosigmoid junction	7	0.66	35	0.94	35	1.18	23	0.87	100	103.97	0.96	-0.31
Anus, anal canal	0	0.00	2	1.45	2	1.84	3	3.02	7	3.85	1.82	0.25
Liver	3	1.34	19	2.38*	9	1.37	15	2.31*	46	23.26	1.98*	1.78
Gallbladder	0	0.00	3	1.82	5	3.78*	0	0.00	8	4.69	1.71	0.26
Bile ducts, other biliary	1	0.92	7	1.75	2	0.58	4	1.09	14	12.19	1.15	0.14
Pancreas	6	0.91	30	1.28	16	0.86	12	0.69	64	66.17	0.97	-0.17
<b>Respiratory system</b>	167	3.03*	744	3.83*	471	3.06*	353	2.55*	1,735	541.78	3.20*	93.43
Nose, nasal cavity, ear	2	4.81	14	9.70*	3	2.68	0	0.00	19	3.99	4.76*	1.17
Larynx	5	1.05	20	1.23	14	1.15	11	1.12	50	43.04	1.16	0.55
Lung, bronchus	158	3.17*	704	3.99*	454	3.23*	341	2.68*	1,657	493.46	3.36*	91.10
<b>Male breast</b>	0	0.00	2	1.14	2	1.39	1	0.70	5	5.12	0.98	-0.01
<b>Male genital system</b>	85	1.13	264	0.93	213	0.84*	208	0.79*	770	874.15	0.88*	-8.15
Prostate	84	1.12	262	0.94	210	0.84*	206	0.79*	762	866.46	0.88*	-8.18
Testis	0	0.00	0	0.00	0	0.00	1	2.59	1	2.31	0.43	-0.10
<b>Urinary system</b>	29	1.18	128	1.43*	102	1.37*	94	1.27*	353	262.66	1.34*	7.07
Urinary bladder	18	1.03	84	1.31*	79	1.47*	71	1.31*	252	189.24	1.33*	4.91
Kidney parenchyma	11	1.93	37	1.82*	16	0.96	18	1.13	82	58.60	1.40*	1.83
Renal pelvis, other urinary	0	0.00	7	1.34	7	1.67	5	1.27	19	14.81	1.28	0.33
Ureter	0	0.00	3	1.70	4	2.79	1	0.75	8	5.02	1.59	0.23
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	2	3.97	2	2.10	0.95	-0.01
<b>Soft tissue including heart</b>	3	3.07	2	0.58	2	0.72	2	0.72	9	9.96	0.90	-0.08
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	3.49	0.00	-0.27
<b>Melanoma of skin</b>	2	0.36	14	0.69	14	0.81	10	0.55	40	61.26	0.65*	-1.66
<b>Eye, orbit</b>	0	0.00	0	0.00	3	2.87	0	0.00	3	3.71	0.81	-0.06
<b>Brain, central nervous system</b>	2	0.74	10	1.05	5	0.68	6	0.91	23	26.23	0.88	-0.25
<b>Thyroid</b>	8	8.94*	8	2.61*	1	0.43	2	0.99	19	8.32	2.28*	0.84
<b>Lymphatic, hematopoietic</b>	23	1.24	78	1.17	48	0.87	43	0.79	192	195.19	0.98	-0.25
Hodgkin lymphoma	1	1.46	3	1.33	3	1.88	2	1.55	9	5.83	1.54	0.25
Non-Hodgkin lymphoma	13	1.70	41	1.47*	21	0.89	22	0.91	97	83.30	1.16	1.07
Myeloma	3	0.91	10	0.84	4	0.41	4	0.42	21	34.52	0.61*	-1.06
Leukemia	6	0.88	24	0.97	20	0.99	15	0.76	65	71.54	0.91	-0.51
Acute lymphocytic	0	0.00	0	0.00	0	0.00	2	4.29	2	1.81	1.10	0.01
Chronic lymphocytic	0	0.00	2	0.19*	5	0.59	3	0.38	10	29.50	0.34*	-1.53
Acute non-lymphocytic	6	2.74*	12	1.50	8	1.20	5	0.75	31	23.50	1.32	0.59
Chronic myeloid	0	0.00	5	1.53	5	1.87	3	1.12	13	9.55	1.36	0.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 6.2.6:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	23	4.31*	99	4.05*	66	2.03*	168	1.90*	356	150.91	2.36*	91.36
All excluding same site	22	4.21*	94	3.93*	66	2.07*	165	1.90*	347	147.98	2.34*	88.65
<b>Buccal cavity, pharynx</b>	4	12.76*	20	14.22*	12	7.06*	27	9.02*	63	6.41	9.82*	25.21
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.28
Tongue	2	29.94*	4	13.09*	3	8.04*	7	10.54*	16	1.41	11.35*	6.50
Salivary gland	0	0.00	0	0.00	1	10.04	1	4.75	2	0.42	4.78	0.70
Mouth	1	12.07	8	21.57*	2	4.46	4	5.38*	15	1.64	9.12*	5.95
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.13
Tonsil	0	0.00	6	29.38*	2	8.38	3	8.07*	11	0.86	12.78*	4.52
Oropharynx	0	0.00	0	0.00	1	19.10	2	19.31*	3	0.21	14.34*	1.24
Hypopharynx	1	35.89	0	0.00	2	10.44*	8	22.87*	11	0.71	15.53*	4.58
<b>Digestive system</b>	1	1.07	11	2.46*	5	0.81	22	1.37	39	27.70	1.41*	5.03
Esophagus	0	0.00	4	9.56*	2	3.53	5	3.81*	11	2.38	4.61*	3.84
Stomach	0	0.00	2	3.79	1	1.49	0	0.00	3	2.89	1.04	0.05
Small intestine	0	0.00	0	0.00	0	0.00	1	3.26	1	0.57	1.75	0.19
Colon	1	3.16	1	0.65	0	0.00	9	1.42	11	10.42	1.06	0.26
Rectum, rectosigmoid junction	0	0.00	2	2.32	1	0.81	3	0.97	6	5.36	1.12	0.28
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.18
Liver	0	0.00	1	4.22	1	3.26	3	3.82	5	1.38	3.62*	1.61
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.09
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	3.12	1	0.51	1.95	0.22
Pancreas	0	0.00	1	1.84	0	0.00	0	0.00	1	3.32	0.30	-1.03
<b>Respiratory system</b>	9	9.46*	51	10.79*	35	5.20*	60	3.53*	155	29.43	5.27*	55.93
Nose, nasal cavity, ear	0	0.00	1	16.36	0	0.00	0	0.00	1	0.28	3.53	0.32
Larynx	1	8.79	5	9.15*	0	0.00	3	1.96	9	2.93	3.07*	2.70
Lung, bronchus	8	9.78*	45	10.98*	35	5.93*	57	3.72*	145	26.13	5.55*	52.95
<b>Female breast</b>	0	0.00	3	1.15	5	1.80	5	1.01	13	10.99	1.18	3.92
<b>Female genital system</b>	3	11.71*	2	1.87	0	0.00	3	1.49	8	4.47	1.79	6.91
Cervix uteri	0	0.00	1	3.49	0	0.00	1	3.69	2	0.87	2.29	2.21
Corpus uteri	1	12.09	0	0.00	0	0.00	2	1.96	3	2.00	1.50	1.95
Ovary	2	26.99*	0	0.00	0	0.00	0	0.00	2	1.33	1.51	1.32
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.10
Vulva	0	0.00	1	32.82	0	0.00	0	0.00	1	0.13	7.63	1.70
<b>Male genital system</b>	0	0.00	1	0.48	0	0.00*	21	0.86	22	31.46	0.70	-5.46
Prostate	0	0.00	1	0.57	0	0.00*	21	0.87	22	30.51	0.72	-4.91
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.41
<b>Urinary system</b>	1	2.49	4	2.08	1	0.37	9	1.24	15	12.30	1.22	1.20
Urinary bladder	0	0.00	0	0.00	1	0.64	7	1.51	8	7.46	1.07	0.24
Kidney parenchyma	1	5.81	4	5.06*	0	0.00	2	0.87	7	4.29	1.63	1.21
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.25
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.07
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.09
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.36
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.43
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	5	1.77	5	5.97	0.84	-0.43
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.12
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	1.70	2	1.91	3	2.32	1.30	0.30
<b>Thyroid</b>	1	8.91	2	4.73	1	2.58	1	1.72	5	1.51	3.32*	1.56
<b>Lymphatic, hematopoietic</b>	2	3.51	3	1.25	4	1.42	7	1.13	16	11.98	1.34	1.79
Hodgkin lymphoma	1	14.88	0	0.00	0	0.00	0	0.00	1	0.74	1.34	0.11
Non-Hodgkin lymphoma	1	3.38	2	1.63	2	1.42	2	0.67	7	5.93	1.18	0.48
Myeloma	0	0.00	1	3.45	0	0.00	0	0.00	1	1.80	0.56	-0.36
Leukemia	0	0.00	0	0.00	2	2.50	5	2.62	7	3.50	2.00	1.56
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	14.68	1	0.16	6.35	0.38
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	1.24	1	1.36	0.74	-0.16
Acute non-lymphocytic	0	0.00	0	0.00	1	4.17	3	4.96	4	1.11	3.61	1.29
Chronic myeloid	0	0.00	0	0.00	1	8.17	0	0.00	1	0.52	1.91	0.21

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,112 PYR and for male cancers on 17,338 PYR.



# Larynx

## Both Sexes, 50-69 Years of Age

**Table 6.2.7:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	286	1.88*	1,323	2.14*	1,105	1.78*	967	1.43*	3,681	2,063.40	1.78*	153.51
All excluding same site	284	1.91*	1,308	2.16*	1,090	1.79*	957	1.43*	3,639	2,030.38	1.79*	152.66
<b>Buccal cavity, pharynx</b>	32	5.25*	132	5.99*	117	6.51*	88	5.74*	369	61.45	6.01*	29.19
Lip	2	2.42	5	1.60	1	0.36	6	2.25	14	9.36	1.49	0.44
Tongue	14	11.47*	35	7.92*	27	7.46*	24	7.90*	100	12.30	8.13*	8.32
Salivary gland	0	0.00	1	0.74	6	4.64*	3	2.01	10	4.47	2.24*	0.52
Mouth	9	5.67*	46	8.17*	36	8.13*	17	4.73*	108	15.25	7.08*	8.80
Nasopharynx	0	0.00	3	3.57	3	4.69	2	4.01	8	2.22	3.60*	0.55
Tonsil	2	2.94	18	7.71*	17	9.67*	16	12.26*	53	6.08	8.72*	4.45
Oropharynx	2	9.75*	3	4.14	6	10.35*	1	2.19	12	1.97	6.10*	0.95
Hypopharynx	3	3.95	12	4.37*	14	6.35*	12	7.17*	41	7.38	5.55*	3.19
<b>Digestive system</b>	41	1.29	204	1.60*	197	1.57*	173	1.26*	615	422.43	1.46*	18.27
Esophagus	8	3.23*	50	5.38*	35	4.18*	33	3.99*	126	28.42	4.43*	9.26
Stomach	8	2.25	13	0.93	20	1.49	16	1.12	57	45.33	1.26	1.11
Small intestine	1	2.13	1	0.53	3	1.60	3	1.45	8	6.30	1.27	0.16
Colon	10	0.80	70	1.35*	75	1.41*	70	1.13	225	179.28	1.26*	4.34
Rectum, rectosigmoid junction	6	0.96	26	1.05	31	1.34	17	0.73	80	77.35	1.03	0.25
Anus, anal canal	0	0.00	1	0.88	2	1.98	3	3.11	6	3.40	1.76	0.25
Liver	2	1.54	10	1.96	7	1.39	12	2.16*	31	16.98	1.83*	1.33
Gallbladder	0	0.00	2	1.83	3	2.68	0	0.00	5	3.76	1.33	0.12
Bile ducts, other biliary	0	0.00	6	2.61	1	0.41	4	1.25	11	8.51	1.29	0.24
Pancreas	6	1.56	24	1.58*	19	1.29	13	0.81	62	49.73	1.25	1.16
<b>Respiratory system</b>	116	3.38*	607	4.52*	445	3.55*	343	2.80*	1,511	416.29	3.63*	103.89
Nose, nasal cavity, ear	1	3.80	10	10.26*	3	3.49	0	0.00	14	2.97	4.71*	1.05
Larynx	2	0.62	15	1.27	15	1.52	10	1.24	42	33.01	1.27	0.85
Lung, bronchus	111	3.61*	577	4.77*	427	3.74*	332	2.93*	1,447	379.35	3.81*	101.32
<b>Female breast</b>	8	1.23	33	1.38	20	0.97	17	0.91	78	69.59	1.12	4.58
<b>Female genital system</b>	0	0.00	17	1.46	14	1.50	5	0.64	36	32.08	1.12	2.14
Cervix uteri	0	0.00	4	3.04	2	2.24	0	0.00	6	3.24	1.85	1.50
Corpus uteri	0	0.00	5	0.78	4	0.79	3	0.73	12	17.44	0.69	-2.96
Ovary	0	0.00	5	1.55	7	2.59*	2	0.84	14	9.19	1.52	2.62
Vagina	0	0.00	1	6.97	1	7.94	0	0.00	2	0.43	4.61	0.85
Vulva	0	0.00	1	2.94	0	0.00	0	0.00	1	1.14	0.88	-0.08
<b>Male genital system</b>	32	0.93	148	0.95	150	0.83*	174	0.81*	504	585.60	0.86*	-9.38
Prostate	31	0.91	148	0.96	148	0.83*	172	0.81*	499	580.88	0.86*	-9.41
Testis	0	0.00	0	0.00	0	0.00	1	4.28	1	1.35	0.74	-0.04
<b>Urinary system</b>	21	1.61	79	1.48*	77	1.42*	80	1.28*	257	182.83	1.41*	7.04
Urinary bladder	11	1.27	51	1.41*	55	1.46*	60	1.33*	177	127.67	1.39*	4.68
Kidney parenchyma	10	2.77*	23	1.64*	17	1.27	15	1.10	65	44.71	1.45*	1.93
Renal pelvis, other urinary	0	0.00	5	1.60	5	1.60	5	1.45	15	10.45	1.44	0.43
Ureter	0	0.00	2	1.93	2	1.89	1	0.86	5	3.51	1.42	0.14
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	3	6.87*	3	1.63	1.84	0.13
<b>Soft tissue including heart</b>	1	1.72	2	0.90	0	0.00	1	0.42	4	7.31	0.55	-0.31
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.75	0.00	-0.17
<b>Melanoma of skin</b>	2	0.56	11	0.79	13	0.97	6	0.39*	32	46.22	0.69*	-1.35
<b>Eye, orbit</b>	0	0.00	0	0.00	2	2.38	0	0.00	2	2.86	0.70	-0.08
<b>Brain, central nervous system</b>	1	0.53	8	1.13	6	0.97	4	0.68	19	21.07	0.90	-0.20
<b>Thyroid</b>	10	12.80*	5	1.80	0	0.00	1	0.51	16	7.79	2.05*	0.78
<b>Lymphatic, hematopoietic</b>	15	1.42	50	1.18	38	0.90	40	0.83	143	143.34	1.00	-0.03
Hodgkin lymphoma	0	0.00	0	0.00	3	2.38	3	2.72	6	4.41	1.36	0.15
Non-Hodgkin lymphoma	9	1.95	26	1.41	17	0.92	23	1.06	75	63.28	1.19	1.11
Myeloma	3	1.58	9	1.18	4	0.53	3	0.35	19	25.75	0.74	-0.64
Leukemia	3	0.84	15	1.03	14	0.95	11	0.65	43	49.90	0.86	-0.65
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	2.55	1	1.28	0.78	-0.03
Chronic lymphocytic	0	0.00	1	0.16*	4	0.64	2	0.29	7	20.94	0.33*	-1.32
Acute non-lymphocytic	3	2.73	6	1.30	5	1.03	3	0.51	17	16.45	1.03	0.05
Chronic myeloid	0	0.00	3	1.59	3	1.59	3	1.30	9	6.55	1.37	0.23

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 18,362 PYR and for male cancers on 87,013 PYR.

**Table 6.2.8:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	206	1.50*	635	1.51*	306	1.34*	93	1.08	1,240	873.10	1.42*	130.79
All excluding same site	203	1.49*	630	1.52*	305	1.34*	93	1.08	1,231	864.29	1.42*	130.72
<b>Buccal cavity, pharynx</b>	9	2.77*	36	3.83*	14	3.00*	3	1.78	62	19.02	3.26*	15.32
Lip	0	0.00	1	0.46	2	1.75	0	0.00	3	4.46	0.67	-0.52
Tongue	4	6.94*	16	9.77*	5	6.46*	0	0.00	25	3.24	7.72*	7.76
Salivary gland	0	0.00	2	2.07	1	1.69	0	0.00	3	2.14	1.40	0.31
Mouth	2	2.61	10	4.51*	2	1.82	2	5.14	16	4.47	3.58*	4.11
Nasopharynx	1	10.14	0	0.00	1	8.08	0	0.00	2	0.54	3.71	0.52
Tonsil	1	4.11	1	1.48	0	0.00	0	0.00	2	1.30	1.54	0.25
Oropharynx	0	0.00	1	4.49	1	9.99	1	32.80	3	0.43	6.93*	0.92
Hypopharynx	1	3.00	1	1.09	2	5.09	0	0.00	4	1.76	2.27	0.80
<b>Digestive system</b>	32	1.01	121	1.24*	61	1.11	26	1.19	240	206.52	1.16*	11.93
Esophagus	5	3.15*	11	2.36*	13	5.40*	2	2.21	31	9.56	3.24*	7.64
Stomach	4	1.08	11	0.98	7	1.13	1	0.40	23	23.66	0.97	-0.24
Small intestine	0	0.00	3	2.51	2	3.04	1	3.77	6	2.51	2.39	1.24
Colon	16	1.11	53	1.17	22	0.83	12	1.11	103	97.16	1.06	2.08
Rectum, rectosigmoid junction	2	0.37	18	1.11	7	0.81	5	1.59	32	33.50	0.96	-0.53
Anus, anal canal	0	0.00	1	1.80	0	0.00	0	0.00	1	1.16	0.87	-0.06
Liver	1	0.95	8	2.50*	3	1.76	0	0.00	12	6.59	1.82	1.93
Gallbladder	0	0.00	2	1.80	2	3.15	0	0.00	4	2.37	1.69	0.58
Bile ducts, other biliary	1	1.50	1	0.46	1	0.74	0	0.00	3	4.81	0.62	-0.64
Pancreas	3	0.82	13	1.16	4	0.64	5	2.03	25	23.52	1.06	0.53
<b>Respiratory system</b>	73	2.95*	229	3.13*	98	2.66*	30	2.41*	430	147.24	2.92*	100.80
Nose, nasal cavity, ear	1	5.34	4	6.97*	0	0.00	0	0.00	5	1.21	4.12*	1.35
Larynx	3	1.87	5	1.10	1	0.49	0	0.00	9	8.81	1.02	0.07
Lung, bronchus	69	3.01*	219	3.22*	97	2.82*	30	2.57*	415	136.84	3.03*	99.16
<b>Female breast</b>	2	0.58	13	1.30	5	0.88	3	1.46	23	21.17	1.09	3.92
<b>Female genital system</b>	4	2.64	3	0.70	4	1.74	1	1.23	12	8.91	1.35	6.61
Cervix uteri	1	7.22	0	0.00	0	0.00	0	0.00	1	0.78	1.29	0.48
Corpus uteri	1	1.31	1	0.47	2	1.85	1	2.91	5	4.30	1.16	1.49
Ovary	1	2.20	1	0.77	1	1.37	0	0.00	3	2.76	1.09	0.51
Vagina	0	0.00	1	11.63	0	0.00	0	0.00	1	0.19	5.38	1.74
Vulva	0	0.00	0	0.00	1	5.55	0	0.00	1	0.63	1.59	0.79
<b>Male genital system</b>	53	1.30	115	0.92	63	0.94	13	0.54*	244	257.08	0.95	-5.60
Prostate	53	1.31	113	0.91	62	0.93	13	0.54*	241	255.08	0.94	-6.03
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.11
<b>Urinary system</b>	12	0.94	57	1.42*	30	1.33	7	0.78	106	84.29	1.26*	7.74
Urinary bladder	8	0.84	40	1.33	25	1.45	5	0.72	78	63.77	1.22	5.07
Kidney parenchyma	4	1.62	14	1.87*	2	0.50	2	1.39	22	15.37	1.43	2.36
Renal pelvis, other urinary	0	0.00	3	1.21	3	2.23	0	0.00	6	5.15	1.16	0.30
Ureter	0	0.00	1	1.17	2	4.35	0	0.00	3	1.76	1.71	0.44
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.20
<b>Soft tissue including heart</b>	2	4.15	0	0.00	2	2.32	1	2.67	5	3.22	1.55	0.64
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-0.31
<b>Melanoma of skin</b>	0	0.00	3	0.41	3	0.70	1	0.53	7	15.77	0.44*	-3.12
<b>Eye, orbit</b>	0	0.00	0	0.00	1	3.56	0	0.00	1	1.08	0.92	-0.03
<b>Brain, central nervous system</b>	1	0.93	2	0.62	0	0.00	1	1.73	4	6.54	0.61	-0.91
<b>Thyroid</b>	2	5.87	2	2.03	0	0.00	0	0.00	4	1.98	2.02	0.72
<b>Lymphatic, hematopoietic</b>	9	0.90	36	1.16	18	1.01	3	0.41	66	66.24	1.00	-0.08
Hodgkin lymphoma	0	0.00	3	4.11	1	2.80	0	0.00	4	1.46	2.74	0.90
Non-Hodgkin lymphoma	3	0.75	17	1.35	10	1.36	1	0.34	31	26.91	1.15	1.46
Myeloma	2	1.11	5	0.89	2	0.64	2	1.60	11	11.77	0.93	-0.28
Leukemia	4	1.02	11	0.90	5	0.71	0	0.00	20	26.09	0.77	-2.17
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.22
Chronic lymphocytic	1	0.64	1	0.21	1	0.36	0	0.00	3	10.33	0.29*	-2.61
Acute non-lymphocytic	3	2.29	8	1.94	3	1.27	0	0.00	14	8.76	1.60	1.87
Chronic myeloid	0	0.00	2	1.21	1	1.02	0	0.00	3	3.56	0.84	-0.20

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 4,683 PYR and for male cancers on 23,369 PYR.

# Larynx

## Both Sexes, Radiotherapy

**Table 6.2.9:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	387	17,617	1,525	1.95*	1,050	1.68*	839	1.52*	3,801	2,178.17	1.75*	148.48
All excluding same site	384	13,570	1,513	1.97*	1,039	1.69*	831	1.52*	3,767	2,146.93	1.75*	148.22
<b>Buccal cavity, pharynx</b>	36	13,570	133	5.61*	119	7.00*	78	6.03*	366	60.75	6.02*	27.93
Lip	2	13,570	5	1.30	2	0.71	1	0.46	10	9.99	1.00	0.00
Tongue	15	13,570	39	8.46*	29	8.69*	19	7.44*	102	11.89	8.58*	8.24
Salivary gland	0	13,570	3	1.71	6	4.26*	2	1.55	11	4.96	2.22*	0.55
Mouth	11	13,570	47	7.95*	35	8.41*	16	5.23*	109	14.92	7.31*	8.61
Nasopharynx	1	13,570	2	2.30	3	5.02*	1	2.29	7	2.17	3.22*	0.44
Tonsil	2	13,570	17	7.31*	14	8.77*	14	12.26*	47	5.78	8.13*	3.77
Oropharynx	1	13,570	3	4.18	8	15.60*	2	5.25	14	1.83	7.66*	1.11
Hypopharynx	4	13,570	8	2.92*	16	8.27*	15	10.86*	43	6.89	6.25*	3.30
<b>Digestive system</b>	52	13,570	252	1.50*	178	1.35*	149	1.30*	631	462.98	1.36*	15.37
Esophagus	6	13,570	54	5.11*	33	4.11*	33	4.84*	126	28.53	4.42*	8.92
Stomach	11	13,570	20	1.06	17	1.18	10	0.83	58	50.80	1.14	0.66
Small intestine	0	13,570	3	1.27	2	1.05	4	2.33	9	6.64	1.36	0.22
Colon	19	13,570	92	1.27*	64	1.10	57	1.11	232	202.07	1.15*	2.74
Rectum, rectosigmoid junction	5	13,570	32	1.05	26	1.12	17	0.89	80	81.53	0.98	-0.14
Anus, anal canal	0	13,570	1	0.77	1	1.00	1	1.21	3	3.50	0.86	-0.05
Liver	2	13,570	17	2.66*	11	2.17*	10	2.19*	40	17.86	2.24*	2.03
Gallbladder	0	13,570	0	0.00	4	3.13	0	0.00	4	4.48	0.89	-0.04
Bile ducts, other biliary	1	13,570	5	1.49	2	0.72	3	1.10	11	9.82	1.12	0.11
Pancreas	8	13,570	27	1.37	17	1.11	12	0.90	64	53.98	1.19	0.92
<b>Respiratory system</b>	153	13,570	657	4.25*	419	3.53*	299	3.04*	1,528	416.15	3.67*	101.73
Nose, nasal cavity, ear	1	13,570	11	9.38*	1	1.13	0	0.00	13	3.14	4.14*	0.90
Larynx	3	13,570	12	0.98	11	1.25	8	1.21	34	31.24	1.09	0.25
Lung, bronchus	147	13,570	631	4.48*	407	3.75*	291	3.20*	1,476	380.78	3.88*	100.20
<b>Female breast</b>	8	13,570	35	1.30	18	0.87	22	1.31	83	72.46	1.15	5.29
<b>Female genital system</b>	5	13,570	14	1.12	11	1.22	8	1.15	38	32.25	1.18	2.89
Cervix uteri	1	13,570	3	2.08	1	1.08	1	1.60	6	3.46	1.73	1.28
Corpus uteri	0	13,570	5	0.76	4	0.85	5	1.39	14	16.83	0.83	-1.42
Ovary	3	13,570	3	0.84	5	1.87	2	0.94	13	9.44	1.38	1.79
Vagina	0	13,570	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.24
Vulva	0	13,570	2	4.17	1	2.58	0	0.00	3	1.36	2.21	0.83
<b>Male genital system</b>	64	13,570	188	0.89	151	0.84*	146	0.86	549	620.10	0.89*	-7.95
Prostate	63	13,570	186	0.89	149	0.83*	144	0.85	542	614.73	0.88*	-8.14
Testis	0	13,570	0	0.00	0	0.00	1	4.12	1	1.60	0.63	-0.07
<b>Urinary system</b>	24	13,570	111	1.59*	60	1.07	60	1.18	255	196.32	1.30*	5.37
Urinary bladder	14	13,570	76	1.55*	49	1.22	45	1.23	184	139.58	1.32*	4.06
Kidney parenchyma	10	13,570	29	1.76*	8	0.62	11	0.97	58	45.43	1.28	1.15
Renal pelvis, other urinary	0	13,570	6	1.45	3	0.93	4	1.44	13	11.31	1.15	0.15
Ureter	0	13,570	1	0.72	2	1.84	1	1.07	4	3.79	1.05	0.02
<b>Bone, joints</b>	0	13,570	0	0.00	0	0.00	2	5.36	2	1.68	1.19	0.03
<b>Soft tissue including heart</b>	3	13,570	2	0.70	1	0.45	1	0.49	7	7.99	0.88	-0.09
<b>Kaposi sarcoma</b>	0	13,570	0	0.00	0	0.00	0	0.00	0	2.53	0.00	-0.23
<b>Melanoma of skin</b>	2	13,570	12	0.72	13	0.95	8	0.62	35	47.94	0.73	-1.18
<b>Eye, orbit</b>	0	13,570	0	0.00	2	2.40	0	0.00	2	2.94	0.68	-0.09
<b>Brain, central nervous system</b>	2	13,570	8	1.02	5	0.84	6	1.24	21	20.95	1.00	0.00
<b>Thyroid</b>	9	13,570	9	2.93*	1	0.45	0	0.00	19	7.99	2.38*	1.01
<b>Lymphatic, hematopoietic</b>	14	13,570	67	1.20	47	1.05	34	0.85	162	156.23	1.04	0.53
Hodgkin lymphoma	1	13,570	3	1.64	2	1.58	3	3.17	9	4.61	1.95	0.40
Non-Hodgkin lymphoma	5	13,570	34	1.43	22	1.13	16	0.89	77	67.94	1.13	0.83
Myeloma	3	13,570	12	1.21	6	0.76	4	0.56	25	27.81	0.90	-0.26
Leukemia	5	13,570	18	0.90	17	1.06	11	0.78	51	55.87	0.91	-0.45
Acute lymphocytic	0	13,570	0	0.00	0	0.00	2	5.90	2	1.44	1.39	0.05
Chronic lymphocytic	1	13,570	1	0.12*	4	0.61	1	0.18*	7	22.86	0.31*	-1.45
Acute non-lymphocytic	4	13,570	10	1.52	6	1.13	5	1.03	25	18.56	1.35	0.59
Chronic myeloid	0	13,570	4	1.50	5	2.36	1	0.52	10	7.49	1.33	0.23

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 19,917 PYR and for male cancers on 89,381 PYR.

**Table 6.2.10:** Risk of subsequent primary cancers after cancer of the larynx, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	128	1.74*	532	1.89*	427	1.67*	389	1.30*	1,476	909.24	1.62*	121.68
All excluding same site	125	1.73*	519	1.88*	422	1.67*	384	1.30*	1,450	895.73	1.62*	119.00
<b>Buccal cavity, pharynx</b>	9	3.55*	55	6.01*	24	3.27*	40	5.65*	128	26.13	4.90*	21.87
Lip	0	0.00	1	0.64	1	0.81	5	4.09*	7	4.47	1.57	0.54
Tongue	5	10.37*	16	9.12*	6	4.21*	12	8.57*	39	5.06	7.70*	7.29
Salivary gland	0	0.00	0	0.00	2	3.48	2	2.89	4	2.07	1.93	0.41
Mouth	1	1.55	17	7.36*	5	2.76	7	4.19*	30	6.44	4.66*	5.06
Nasopharynx	0	0.00	1	3.15	1	4.04	1	4.38	3	0.88	3.39	0.45
Tonsil	1	3.96	8	9.00*	5	7.24*	5	8.02*	19	2.46	7.74*	3.55
Oropharynx	1	13.07	1	3.65	0	0.00	2	9.50*	4	0.78	5.12*	0.69
Hypopharynx	1	3.42	5	4.71*	2	2.35	5	6.57*	13	2.97	4.38*	2.15
<b>Digestive system</b>	22	1.35	84	1.36*	85	1.56*	72	1.17	263	193.68	1.36*	14.88
Esophagus	7	6.74*	11	2.88*	17	5.13*	7	1.91	42	11.85	3.55*	6.47
Stomach	1	0.53	6	0.87	11	1.86	7	1.10	25	21.07	1.19	0.84
Small intestine	1	4.59	1	1.21	3	3.90	1	1.08	6	2.74	2.19	0.70
Colon	8	1.16	32	1.21	33	1.38	34	1.23	107	84.78	1.26*	4.77
Rectum, rectosigmoid junction	3	0.98	14	1.22	13	1.32	8	0.77	38	34.67	1.10	0.71
Anus, anal canal	0	0.00	1	2.13	1	2.44	2	4.45	4	1.45	2.75	0.55
Liver	1	1.74	2	0.92	0	0.00	5	2.09	8	7.10	1.13	0.19
Gallbladder	0	0.00	4	6.66*	1	1.92	0	0.00	5	1.85	2.70	0.68
Bile ducts, other biliary	0	0.00	2	1.70	0	0.00	2	1.39	4	4.01	1.00	0.00
Pancreas	1	0.52	11	1.52	6	0.95	6	0.85	24	22.58	1.06	0.30
<b>Respiratory system</b>	45	2.92*	230	3.99*	159	3.17*	134	2.50*	568	176.82	3.21*	83.98
Nose, nasal cavity, ear	1	8.37	4	9.14*	2	5.41	0	0.00	7	1.32	5.28*	1.22
Larynx	3	2.30	13	2.75*	5	1.30	5	1.37	26	13.52	1.92*	2.68
Lung, bronchus	41	2.94*	210	4.01*	152	3.32*	128	2.59*	531	161.54	3.29*	79.32
<b>Female breast</b>	2	0.78	14	1.48	12	1.42	3	0.34*	31	29.28	1.06	2.08
<b>Female genital system</b>	2	1.58	8	1.76	7	1.87	1	0.27	18	13.20	1.36	5.83
Cervix uteri	0	0.00	2	3.72	1	2.55	0	0.00	3	1.43	2.10	1.91
Corpus uteri	2	2.97	1	0.42	2	1.02	1	0.53	6	6.92	0.87	-1.11
Ovary	0	0.00	3	2.35	3	2.73	0	0.00	6	3.84	1.56	2.62
Vagina	0	0.00	2	32.15*	1	18.33	0	0.00	3	0.19	15.68*	3.41
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.66
<b>Male genital system</b>	21	1.16	76	1.06	62	0.87	62	0.67*	221	254.05	0.87*	-8.62
Prostate	21	1.17	76	1.07	61	0.86	62	0.67*	220	251.74	0.87*	-8.28
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.19
<b>Urinary system</b>	10	1.50	29	1.13	48	2.07*	36	1.30	123	83.10	1.48*	8.57
Urinary bladder	5	1.07	15	0.83	32	1.94*	27	1.35	79	59.32	1.33*	4.23
Kidney parenchyma	5	3.21*	12	2.03*	11	2.06*	8	1.30	36	18.94	1.90*	3.66
Renal pelvis, other urinary	0	0.00	2	1.28	5	3.69*	1	0.66	8	4.85	1.65	0.68
Ureter	0	0.00	2	3.81	2	4.35	0	0.00	4	1.63	2.45	0.51
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	4.84	1	0.72	1.38	0.06
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	1.09	1	0.92	2	3.33	0.60	-0.29
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.07	0.00	-0.23
<b>Melanoma of skin</b>	0	0.00	2	0.34	3	0.54	4	0.57	9	20.01	0.45*	-2.36
<b>Eye, orbit</b>	0	0.00	0	0.00	1	2.82	0	0.00	1	1.27	0.79	-0.06
<b>Brain, central nervous system</b>	0	0.00	2	0.67	2	0.79	1	0.37	5	8.98	0.56	-0.85
<b>Thyroid</b>	4	13.08*	0	0.00	0	0.00	2	2.10	6	3.29	1.83	0.58
<b>Lymphatic, hematopoietic</b>	12	2.27*	22	1.09	13	0.71	16	0.74	63	65.32	0.96	-0.50
Hodgkin lymphoma	0	0.00	0	0.00	2	3.63	0	0.00	2	2.00	1.00	0.00
Non-Hodgkin lymphoma	8	3.65*	11	1.30	7	0.89	10	1.03	36	28.18	1.28	1.68
Myeloma	2	2.14	3	0.85	0	0.00	1	0.26	6	11.52	0.52	-1.18
Leukemia	2	1.03	8	1.08	4	0.61	5	0.65	19	23.62	0.80	-0.99
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.13
Chronic lymphocytic	0	0.00	1	0.32	1	0.36	2	0.64	4	9.77	0.41	-1.24
Acute non-lymphocytic	2	3.21	4	1.68	3	1.39	1	0.38	10	7.77	1.29	0.48
Chronic myeloid	0	0.00	1	1.02	0	0.00	2	1.92	3	3.14	0.95	-0.03

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,241 PYR and for male cancers on 38,338 PYR.

## Nasal Cavities Both Sexes

**Table 6.3.1:** Characteristics of patients with an initial cancer of the nose, nasal cavities or middle ear, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	2,063	100.0	1,480	100.0	3,543	100.0
<b>Initial treatment</b>						
Any radiation	1,366	66.2	939	63.4	2,305	65.1
With surgery	878	42.6	584	39.5	1,462	41.3
Without surgery	488	23.7	355	24.0	843	23.8
No radiation	697	33.8	541	36.6	1,238	34.9
With surgery	567	27.5	431	29.1	998	28.2
Without surgery	130	6.3	110	7.4	240	6.8
<b>Race</b>						
White	1,683	81.6	1,222	82.6	2,905	82.0
Black	187	9.1	135	9.1	322	9.1
Other	180	8.7	117	7.9	297	8.4
Unknown	13	0.6	6	0.4	19	0.5
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	89	4.3	85	5.7	174	4.9
30–49	354	17.2	227	15.3	581	16.4
50–69	1,012	49.1	616	41.6	1,628	45.9
70–79	410	19.9	323	21.8	733	20.7
≥ 80	198	9.6	229	15.5	427	12.1
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	1,835	88.9	1,350	91.2	3,185	89.9
1st and 2nd cancers	198	9.6	118	8.0	316	8.9
1st, 2nd, and 3rd cancers	28	1.4	10	0.7	38	1.1
1st, 2nd, 3rd, and additional cancers	2	0.1	2	0.1	4	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	62.3	—	65.0	—	63.4	—
Median year of 1st cancer diagnosis	1987.6	—	1988.0	—	1987.8	—
Median person-years at risk	2.5	—	2.9	—	2.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	90.4	—	96.2	—	92.5
1st, 2nd, and additional cancers	—	90.4	—	96.2	—	92.5
1st cancer only	—	8.8	—	3.8	—	7.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 6.3.2:** Risk of subsequent primary cancers after cancer of the nose, nasal cavities, or middle ear, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	60	1.71*	154	1.52*	100	1.33*	91	1.32*	405	280.68	1.44*	67.65
All excluding same site	57	1.62*	153	1.51*	98	1.30*	88	1.28*	396	280.26	1.41*	62.98
<b>Buccal cavity, pharynx</b>	6	6.10*	12	4.35*	4	2.09	6	3.84*	28	7.22	3.88*	11.31
Lip	3	19.40*	3	7.07*	0	0.00	1	4.19	7	1.11	6.29*	3.20
Tongue	0	0.00	2	3.68	0	0.00	2	6.27	4	1.43	2.79	1.40
Salivary gland	0	0.00	1	4.35	0	0.00	1	6.40	2	0.64	3.14	0.74
Mouth	3	11.60*	4	5.56*	0	0.00	1	2.53	8	1.87	4.29*	3.34
Nasopharynx	0	0.00	0	0.00	0	0.00	1	16.22	1	0.31	3.23	0.38
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.36
Oropharynx	0	0.00	1	12.96	0	0.00	0	0.00	1	0.20	4.94	0.43
Hypopharynx	0	0.00	1	3.48	3	15.24*	0	0.00	4	0.74	5.42*	1.77
<b>Digestive system</b>	12	1.47	33	1.44	28	1.70*	14	0.96	87	62.17	1.40*	13.51
Esophagus	1	2.46	2	1.76	2	2.44	1	1.34	6	3.11	1.93	1.57
Stomach	0	0.00	8	3.23*	0	0.00	3	2.12	11	6.49	1.69	2.45
Small intestine	0	0.00	0	0.00	1	4.36	0	0.00	1	0.86	1.16	0.08
Colon	3	0.82	12	1.17	17	2.27*	4	0.60	36	28.05	1.28	4.33
Rectum, rectosigmoid junction	6	4.22*	5	1.25	4	1.41	3	1.24	18	10.68	1.68	3.98
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.30
Liver	0	0.00	2	2.45	1	1.70	0	0.00	3	2.24	1.34	0.41
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.45
Bile ducts, other biliary	0	0.00	1	2.03	1	2.70	0	0.00	2	1.39	1.44	0.33
Pancreas	2	2.05	3	1.10	2	1.02	3	1.72	10	7.38	1.35	1.42
<b>Respiratory system</b>	17	2.75*	48	2.69*	23	1.76*	25	2.15*	113	48.77	2.32*	34.95
Nose, nasal cavity, ear	3	50.50*	1	6.37	2	18.36*	3	31.68*	9	0.42	21.43*	4.67
Larynx	2	4.60	3	2.43	1	1.15	2	2.86	8	3.24	2.47*	2.59
Lung, bronchus	12	2.11*	44	2.68*	20	1.65*	20	1.85*	96	44.99	2.13*	27.76
<b>Female breast</b>	6	1.86	13	1.40	9	1.33	6	0.95	34	25.67	1.32	10.35
<b>Female genital system</b>	0	0.00	6	1.40	1	0.34	3	1.16	10	11.34	0.88	-1.66
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.28	0.00	-1.59
Corpus uteri	0	0.00	2	0.92	1	0.67	0	0.00	3	5.74	0.52	-3.41
Ovary	0	0.00	2	1.62	0	0.00	2	2.51	4	3.35	1.19	0.80
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.22
Vulva	0	0.00	2	10.41*	0	0.00	1	7.56	3	0.53	5.65*	3.07
<b>Male genital system</b>	5	0.73	14	0.68	9	0.55	11	0.69	39	59.67	0.65*	-20.00
Prostate	5	0.74	14	0.69	9	0.55	11	0.70	39	59.02	0.66*	-19.38
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.26
<b>Urinary system</b>	3	1.06	11	1.34	9	1.46	7	1.23	30	22.87	1.31	3.88
Urinary bladder	3	1.53	7	1.23	7	1.63	6	1.50	23	15.94	1.44	3.84
Kidney parenchyma	0	0.00	2	1.01	2	1.35	0	0.00	4	5.52	0.72	-0.83
Renal pelvis, other urinary	0	0.00	2	3.86	0	0.00	1	3.03	3	1.41	2.13	0.87
Ureter	0	0.00	1	5.78	0	0.00	0	0.00	1	0.47	2.13	0.29
<b>Bone, joints</b>	1	30.59	0	0.00	0	0.00	1	18.30	2	0.24	8.21	0.96
<b>Soft tissue including heart</b>	0	0.00	1	2.52	3	10.37*	2	7.52	6	1.09	5.49*	2.67
<b>Kaposi sarcoma</b>	0	0.00	1	6.47	0	0.00	0	0.00	1	0.39	2.54	0.33
<b>Melanoma of skin</b>	1	1.38	1	0.45	0	0.00	3	1.80	5	6.30	0.79	-0.70
<b>Eye, orbit</b>	1	19.40	0	0.00	0	0.00	0	0.00	1	0.40	2.52	0.33
<b>Brain, central nervous system</b>	0	0.00	1	0.96	1	1.33	1	1.52	3	2.82	1.07	0.10
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.51	0.00	-0.82
<b>Lymphatic, hematopoietic</b>	6	2.28	9	1.19	8	1.43	9	1.74	32	20.94	1.53*	6.02
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	7.10	1	0.68	1.48	0.18
Non-Hodgkin lymphoma	4	3.50	4	1.19	3	1.18	5	2.07	16	9.46	1.69	3.56
Myeloma	1	2.20	3	2.36	0	0.00	0	0.00	4	3.53	1.13	0.26
Leukemia	1	1.07	2	0.76	5	2.57	3	1.71	11	7.28	1.51	2.02
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.12
Chronic lymphocytic	0	0.00	0	0.00	2	2.58	2	2.89	4	2.89	1.38	0.60
Acute non-lymphocytic	1	3.20	1	1.12	1	1.52	0	0.00	3	2.47	1.21	0.29
Chronic myeloid	0	0.00	0	0.00	2	7.62	0	0.00	2	0.99	2.03	0.55

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,043 PYR and for male cancers on 10,334 PYR.



## Nasal Cavities Females

**Table 6.3.3:** Risk of subsequent primary cancers after cancer of the nose, nasal cavities, or middle ear, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	1,480	1,075	21	1.80*	48	1.45*	41	1.73*	35	1.58*	145	90.63	1.60*	67.60
All excluding same site	1,480	1,075	19	1.63	48	1.45*	39	1.65*	34	1.53*	140	90.50	1.55*	61.54
<b>Buccal cavity, pharynx</b>	1,480	1,075	3	14.22*	5	8.34*	0	0.00	3	8.02*	11	1.61	6.84*	11.68
Lip	1,480	1,075	1	71.54	0	0.00	0	0.00	1	37.44	2	0.11	18.53*	2.35
Tongue	1,480	1,075	0	0.00	1	7.58	0	0.00	1	11.88	2	0.36	5.62	2.04
Salivary gland	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.22
Mouth	1,480	1,075	2	27.24*	3	14.47*	0	0.00	0	0.00	5	0.56	9.01*	5.53
Nasopharynx	1,480	1,075	0	0.00	0	0.00	0	0.00	1	61.43	1	0.07	13.94	1.15
Tonsil	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.17
Oropharynx	1,480	1,075	0	0.00	1	65.73	0	0.00	0	0.00	1	0.04	24.74	1.19
Hypopharynx	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.13
<b>Digestive system</b>	1,480	1,075	4	1.41	10	1.28	10	1.85	5	0.99	29	21.13	1.37	9.79
Esophagus	1,480	1,075	0	0.00	2	9.57*	0	0.00	1	7.11	3	0.57	5.24*	3.02
Stomach	1,480	1,075	0	0.00	1	1.52	0	0.00	2	5.23	3	1.71	1.76	1.61
Small intestine	1,480	1,075	0	0.00	0	0.00	1	12.80	0	0.00	1	0.30	3.36	0.87
Colon	1,480	1,075	2	1.42	3	0.78	6	2.22	1	0.40	12	10.50	1.14	1.86
Rectum, rectosigmoid junction	1,480	1,075	1	2.25	2	1.62	2	2.37	1	1.32	6	3.28	1.83	3.39
Rectum	1,480	1,075	1	3.45	2	2.49	1	1.81	0	0.00	4	2.15	1.86	2.30
Anus, anal canal	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.34
Liver	1,480	1,075	0	0.00	2	11.26*	0	0.00	0	0.00	2	0.49	4.07	1.88
Gallbladder	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.59
Bile ducts, other biliary	1,480	1,075	0	0.00	0	0.00	1	8.05	0	0.00	1	0.48	2.07	0.64
Pancreas	1,480	1,075	1	2.71	0	0.00	0	0.00	0	0.00	1	2.77	0.36	-2.20
<b>Respiratory system</b>	1,480	1,075	5	3.43*	10	2.35*	8	2.47*	8	2.50*	31	12.15	2.55*	23.44
Nose, nasal cavity, ear	1,480	1,075	2	110.66*	0	0.00	2	61.53*	1	33.31	5	0.13	39.09*	6.06
Larynx	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.47
Lung, bronchus	1,480	1,075	3	2.16	10	2.47*	6	1.94	7	2.28	26	11.61	2.24*	17.89
<b>Female breast</b>	1,480	1,075	6	1.86	13	1.40	9	1.33	6	0.95	34	25.67	1.32	10.35
<b>Female genital system</b>	1,480	1,075	0	0.00	6	1.40	1	0.34	3	1.16	10	11.34	0.88	-1.66
Cervix uteri	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	1.28	0.00	-1.59
Corpus uteri	1,480	1,075	0	0.00	2	0.92	1	0.67	0	0.00	3	5.74	0.52	-3.41
Ovary	1,480	1,075	0	0.00	2	1.62	0	0.00	2	2.51	4	3.35	1.19	0.80
Vagina	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.22
Vulva	1,480	1,075	0	0.00	2	10.41*	0	0.00	1	7.56	3	0.53	5.65*	3.07
<b>Urinary system</b>	1,480	1,075	0	0.00	1	0.64	2	1.77	0	0.00	3	4.35	0.69	-1.68
Urinary bladder	1,480	1,075	0	0.00	1	1.07	2	3.01	0	0.00	3	2.57	1.17	0.53
Kidney parenchyma	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	1.42	0.00	-1.77
Renal pelvis, other urinary	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.45
Ureter	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.14
<b>Bone, joints</b>	1,480	1,075	1	88.32*	0	0.00	0	0.00	0	0.00	1	0.09	11.55	1.14
<b>Soft tissue including heart</b>	1,480	1,075	0	0.00	0	0.00	2	21.17*	2	22.26*	4	0.37	10.95*	4.52
<b>Kaposi sarcoma</b>	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.04
<b>Melanoma of skin</b>	1,480	1,075	0	0.00	1	1.56	0	0.00	2	4.33	3	1.80	1.67	1.49
<b>Eye, orbit</b>	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.16
<b>Brain, central nervous system</b>	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.93	0.00	-1.16
<b>Thyroid</b>	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-1.07
<b>Lymphatic, hematopoietic</b>	1,480	1,075	2	2.24	1	0.40	5	2.74	5	2.86	13	6.99	1.86	7.48
Hodgkin lymphoma	1,480	1,075	0	0.00	0	0.00	0	0.00	1	19.76	1	0.22	4.49	0.97
Non-Hodgkin lymphoma	1,480	1,075	2	4.79	1	0.83	2	2.23	2	2.28	7	3.39	2.06	4.48
Myeloma	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-1.48
Leukemia	1,480	1,075	0	0.00	0	0.00	3	5.33*	2	3.79	5	2.18	2.29	3.51
Acute lymphocytic	1,480	1,075	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.09
Chronic lymphocytic	1,480	1,075	0	0.00	0	0.00	0	0.00	1	5.01	1	0.83	1.21	0.21
Acute non-lymphocytic	1,480	1,075	0	0.00	0	0.00	1	4.96	0	0.00	1	0.78	1.28	0.27
Chronic myeloid	1,480	1,075	0	0.00	0	0.00	2	25.76*	0	0.00	2	0.30	6.65	2.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 6.3.4:** Risk of subsequent primary cancers after cancer of the nose, nasal cavities, or middle ear, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	39	1.66*	106	1.55*	59	1.14	56	1.20	260	190.05	1.37*	67.69
All excluding same site	38	1.62*	105	1.54*	59	1.15	54	1.16	256	189.76	1.35*	64.10
<b>Buccal cavity, pharynx</b>	3	3.88	7	3.24*	4	2.68	3	2.53	17	5.61	3.03*	11.02
Lip	2	14.22*	3	7.78*	0	0.00	0	0.00	5	1.01	4.97*	3.87
Tongue	0	0.00	1	2.43	0	0.00	1	4.26	2	1.08	1.86	0.89
Salivary gland	0	0.00	1	6.06	0	0.00	1	8.83	2	0.46	4.35	1.49
Mouth	1	5.40	1	1.95	0	0.00	1	3.76	3	1.31	2.29	1.63
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.23
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.51
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.16
Hypopharynx	0	0.00	1	4.06	3	17.88*	0	0.00	4	0.63	6.35*	3.26
<b>Digestive system</b>	8	1.50	23	1.52	18	1.63	9	0.94	58	41.04	1.41*	16.41
Esophagus	1	3.02	0	0.00	2	2.97	0	0.00	3	2.54	1.18	0.45
Stomach	0	0.00	7	3.85*	0	0.00	1	0.97	8	4.79	1.67	3.11
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.54
Colon	1	0.45	9	1.41	11	2.30*	3	0.72	24	17.55	1.37	6.25
Rectum, rectosigmoid junction	5	5.11*	3	1.08	2	1.00	2	1.20	12	7.41	1.62	4.44
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.27
Liver	0	0.00	0	0.00	1	2.15	0	0.00	1	1.75	0.57	-0.73
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.34
Bile ducts, other biliary	0	0.00	1	3.14	0	0.00	0	0.00	1	0.90	1.11	0.09
Pancreas	1	1.65	3	1.76	2	1.61	3	2.82	9	4.62	1.95	4.24
<b>Respiratory system</b>	12	2.54*	38	2.80*	15	1.52	17	2.01*	82	36.62	2.24*	43.91
Nose, nasal cavity, ear	1	24.19	1	9.13	0	0.00	2	30.92*	4	0.29	13.70*	3.59
Larynx	2	5.16	3	2.73	1	1.31	2	3.28	8	2.86	2.80*	4.97
Lung, bronchus	9	2.10	34	2.76*	14	1.56	13	1.68	70	33.37	2.10*	35.44
<b>Male breast</b>	1	22.14	0	0.00	0	0.00	0	0.00	1	0.35	2.82	0.62
<b>Male genital system</b>	5	0.73	14	0.68	9	0.55	11	0.69	39	59.67	0.65*	-20.00
Prostate	5	0.74	14	0.69	9	0.55	11	0.70	39	59.02	0.66*	-19.38
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.26
<b>Urinary system</b>	3	1.32	10	1.51	7	1.39	7	1.52	27	18.52	1.46	8.21
Urinary bladder	3	1.84	6	1.26	5	1.37	6	1.79	20	13.37	1.50	6.41
Kidney parenchyma	0	0.00	2	1.35	2	1.80	0	0.00	4	4.10	0.98	-0.09
Renal pelvis, other urinary	0	0.00	2	5.19	0	0.00	1	4.12	3	1.04	2.87	1.89
Ureter	0	0.00	1	7.62	0	0.00	0	0.00	1	0.36	2.80	0.62
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	28.97	1	0.16	6.37	0.82
<b>Soft tissue including heart</b>	0	0.00	1	3.80	1	5.14	0	0.00	2	0.73	2.75	1.23
<b>Kaposi sarcoma</b>	0	0.00	1	7.05	0	0.00	0	0.00	1	0.36	2.77	0.62
<b>Melanoma of skin</b>	1	1.95	0	0.00	0	0.00	1	0.83	2	4.49	0.44	-2.41
<b>Eye, orbit</b>	1	29.23	0	0.00	0	0.00	0	0.00	1	0.27	3.76	0.71
<b>Brain, central nervous system</b>	0	0.00	1	1.42	1	1.98	1	2.31	3	1.88	1.59	1.08
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.63
<b>Lymphatic, hematopoietic</b>	4	2.30	8	1.60	3	0.79	4	1.17	19	13.96	1.36	4.88
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.44
Non-Hodgkin lymphoma	2	2.75	3	1.39	1	0.61	3	1.94	9	6.07	1.48	2.84
Myeloma	1	3.38	3	3.58	0	0.00	0	0.00	4	2.34	1.71	1.61
Leukemia	1	1.54	2	1.09	2	1.45	1	0.82	6	5.10	1.18	0.87
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.14
Chronic lymphocytic	0	0.00	0	0.00	2	3.57	1	2.03	3	2.06	1.46	0.91
Acute non-lymphocytic	1	4.74	1	1.64	0	0.00	0	0.00	2	1.69	1.18	0.30
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.66

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Mesothelioma Both Sexes

**Table 6.4.1:** Characteristics of patients with an initial mesothelioma, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	3,213	100.0	893	100.0	4,106	100.0
<b>Initial treatment</b>						
Any radiation	732	22.8	173	19.4	905	22.0
With surgery	220	6.8	57	6.4	277	6.7
Without surgery	512	15.9	116	13.0	628	15.3
No radiation	2,481	77.2	720	80.6	3,201	78.0
With surgery	524	16.3	220	24.6	744	18.1
Without surgery	1,957	60.9	500	56.0	2,457	59.8
<b>Race</b>						
White	2,957	92.0	814	91.2	3,771	91.8
Black	136	4.2	52	5.8	188	4.6
Other	114	3.5	25	2.8	139	3.4
Unknown	6	0.2	2	0.2	8	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	12	0.4	16	1.8	28	0.7
30–49	229	7.1	117	13.1	346	8.4
50–69	1,560	48.6	388	43.4	1,948	47.4
70–79	1,056	32.9	254	28.4	1,310	31.9
≥ 80	356	11.1	118	13.2	474	11.5
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	3,149	98.0	874	97.9	4,023	98.0
1st and 2nd cancers	60	1.9	16	1.8	76	1.9
1st, 2nd, and 3rd cancers	4	0.1	2	0.2	6	0.1
1st, 2nd, 3rd, and additional cancers	0	0.0	1	0.1	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	68.6	—	66.8	—	68.3	—
Median year of 1st cancer diagnosis	1989.9	—	1988.8	—	1989.7	—
Median person-years at risk	0.6	—	0.7	—	0.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	92.2	—	94.7	—	92.8
1st, 2nd, and additional cancers	—	92.2	—	94.7	—	92.8
1st cancer only	—	4.7	—	0.0	—	3.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 6.4.2:** Risk of subsequent primary cancers after mesothelioma, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	34	0.86	42	1.18	5	0.54	10	1.18	91	92.79	0.98	-3.18
All excluding same site	33	0.84	41	1.15	5	0.54	10	1.18	89	92.49	0.96	-6.21
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.49	0.00	-4.43
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.73
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.88
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.38
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-1.12
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.16
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.41
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.13
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.47
<b>Digestive system</b>	7	0.82	12	1.59	0	0.00	2	1.16	21	19.77	1.06	2.19
Esophagus	0	0.00	1	2.41	0	0.00	0	0.00	1	1.08	0.93	-0.13
Stomach	1	1.10	0	0.00	0	0.00	0	0.00	1	2.04	0.49	-1.84
Small intestine	1	8.62	0	0.00	0	0.00	0	0.00	1	0.28	3.54	1.28
Colon	2	0.53	7	2.07	0	0.00	2	2.54	11	8.83	1.25	3.86
Rectum, rectosigmoid junction	3	1.95	3	2.22	0	0.00	0	0.00	6	3.51	1.71	4.44
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.30
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-1.25
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.40
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.76
Pancreas	0	0.00	1	1.12	0	0.00	0	0.00	1	2.33	0.43	-2.37
<b>Respiratory system</b>	4	0.54	7	1.08	1	0.63	2	1.42	14	16.89	0.83	-5.15
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.24
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-2.13
Lung, bronchus	4	0.59	7	1.17	1	0.68	2	1.52	14	15.52	0.90	-2.71
<b>Female breast</b>	1	0.62	2	0.79	1	0.86	0	0.00	4	6.52	0.61	-12.21
<b>Female genital system</b>	0	0.00	2	1.74	0	0.00	1	2.02	3	2.89	1.04	0.52
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-1.62
Corpus uteri	0	0.00	0	0.00	0	0.00	1	4.04	1	1.48	0.68	-2.32
Ovary	0	0.00	2	5.99	0	0.00	0	0.00	2	0.85	2.35	5.56
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.20
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.60
<b>Male genital system</b>	13	1.24	7	0.83	1	0.60	2	1.28	23	22.21	1.04	2.22
Prostate	13	1.25	6	0.72	1	0.60	2	1.29	22	21.99	1.00	0.03
Testis	0	0.00	1	30.18	0	0.00	0	0.00	1	0.08	12.32	2.59
<b>Urinary system</b>	5	1.39	3	0.98	1	1.42	0	0.00	9	7.99	1.13	1.80
Urinary bladder	2	0.78	1	0.46	1	2.10	0	0.00	4	5.63	0.71	-2.90
Kidney parenchyma	3	3.72	2	2.75	0	0.00	0	0.00	5	1.89	2.65	5.54
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.85
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.28
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.63
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.21
<b>Melanoma of skin</b>	1	1.12	3	3.53	0	0.00	1	4.68	5	2.18	2.29	5.02
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.24
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.95	0.00	-1.69
<b>Thyroid</b>	0	0.00	2	11.14*	0	0.00	1	17.57	3	0.45	6.61*	4.53
<b>Lymphatic, hematopoietic</b>	1	0.35	3	1.15	1	1.45	1	1.60	6	6.80	0.88	-1.43
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.39
Non-Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.04	0.00	-5.41
Myeloma	0	0.00	1	2.26	0	0.00	0	0.00	1	1.15	0.87	-0.27
Leukemia	1	0.96	2	2.19	1	4.34	1	5.01	5	2.39	2.09	4.65
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
Chronic lymphocytic	0	0.00	1	2.70	0	0.00	1	12.76	2	0.97	2.07	1.84
Acute non-lymphocytic	1	2.89	0	0.00	1	12.76	0	0.00	2	0.80	2.50	2.13
Chronic myeloid	0	0.00	1	8.12	0	0.00	0	0.00	1	0.32	3.12	1.21

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,065 PYR and for male cancers on 3,552 PYR.



# Chapter 7

## New Malignancies Following Breast Cancer

Rochelle E. Curtis, Elaine Ron, Benjamin F. Hankey, Robert N. Hoover

### Synopsis

The overall risk of subsequent cancer was increased by 18% among 322,863 women diagnosed with a first primary cancer of the breast during 1973-2000 (O/E=1.18, O=34,500, EAR=23 per 10,000 person-years). The highest cancer risks for a new cancer occurred after early-onset breast cancer (ages <40 years, O/E=3.33, EAR=71; ages 40-49 years, O/E=1.59, EAR=38). New primary cancers of the breast accounted for nearly 40% of all subsequent malignancies, with increased risks likely reflecting hormonal, genetic, and other risk factors that predisposed women to the initial breast malignancy, as well as intensive medical screening of the opposite breast. Genetic predisposition, notably from BRCA1/2 susceptibility genes, probably contributed to the pronounced excesses of subsequent breast and ovarian malignancies among younger women (ages <50 years). Risks were significantly elevated for subsequent cancers of the uterine corpus, which have been reported in association with the wide use of tamoxifen therapy since the early 1980s. In addition, the constellation of multiple primary cancers involving the breast, ovary, and uterine corpus may reflect shared hormonal, genetic, and lifestyle factors, such as nulliparity. Radiotherapy appeared to account for the observed excesses of cancers of the esophagus, lung, bone, and soft tissues among long-term survivors, while chemotherapy probably played the primary role in the elevated risk of acute non-lymphocytic leukemia. The increased risks for thyroid cancer and cutaneous melanoma after breast cancer, as well as reciprocally elevated risks of breast cancer after these tumors, provide clues to shared etiologic factors, including genetic susceptibility (e.g., BRCA2 and melanoma). Other cancer excesses may be related to increased medical surveillance (salivary gland cancer) or, in unusual cases, misclassified metastases (stomach cancer). Women with breast cancer also had significantly lower than expected risks for several subsequent malignancies, particularly cancers of the pancreas, cervix, and lung, as well as non-Hodgkin lymphoma and chronic lymphocytic leukemia. Some of these decreased risks have been related to lower rates of tobacco use among women with breast cancer than

those seen in the general population, or to other differences in social-class-related lifestyle factors.

The overall risk of subsequent cancers among 2,158 men diagnosed with breast cancer showed a borderline significant elevation (O/E=1.11, O=355, EAR=24). The large excess of new breast cancers was probably related to genetic predisposition, particularly BRCA2 mutations. A moderate elevation in risk of prostate cancer, noted only in the most recent period (1995 and later), may be related to increased medical surveillance or, less commonly, genetic factors such as BRCA2 mutations.

### Female Breast Cancer

Invasive breast cancer is the most frequently diagnosed new malignancy and the second most common cause of cancer death, after lung cancer, among women in the U.S. This malignancy currently accounts for 32% of all new cancer cases and 15% of cancer deaths among American women (Jemal et al, 2005). Incidence rates in the SEER database vary greatly by race and ethnic group, with lower rates seen for black, Asian, and Hispanic women than for white women. Although breast cancer incidence rates have been increasing since the 1980s, death rates have declined by about 2.3% per year since 1990 (Edwards et al, 2005), with some of the downturn related to increases in early detection by mammography and to effective treatment with adjuvant chemotherapy (Berry et al, 2005). About 72% of the invasive breast cancers reported to SEER are ductal carcinomas, not otherwise specified (NOS); 9% are lobular carcinomas; and the remaining 19% are other histologic types. The current relative survival rates for all breast cancers combined are 88.8% at 5 years (79.5% at 10 years) for white females, but only 75.3% at 5 years (63.9% at 10 years) for black females. Treatment for early-stage invasive breast cancer shifted in the 1980s and 1990s from radical mastectomy with or without regional radiotherapy to the chest wall and lymph nodes (post-mastectomy radiation) to increasing use of breast-conserving surgery followed by breast radiation (post-lumpectomy radiation) (Veronesi et al, 2005; Wood et al, 2005). Adjuvant chemotherapy (including alkylating agents) and hormones (tamoxifen) are also widely used.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

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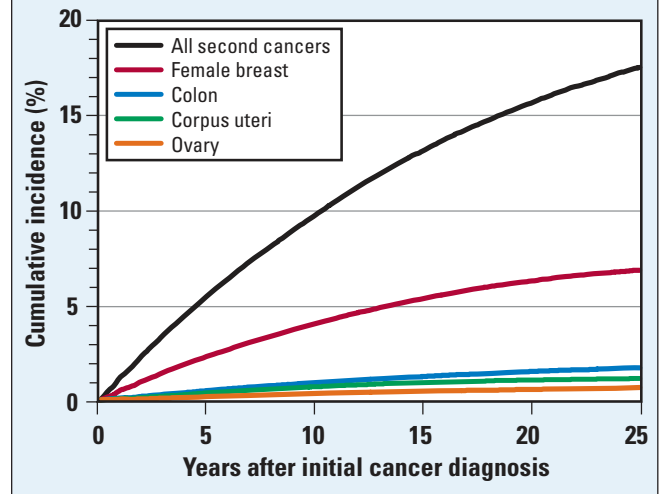
A large body of epidemiologic evidence links reproductive risk factors to breast cancer risk (Willett et al, 2000; Brinton et al, 2002). There is strong evidence that exogenous estrogens increase breast cancer risk close in time to the diagnosis, and that specific endogenous hormones play an important role in explaining risk. Factors consistently associated with an increased risk of breast cancer include late age at first birth, low parity (less than 2 births), early onset of menarche, late age at menopause, and hormone replacement therapy, while early menopause from ovarian ablation and longer lactation periods are associated with a reduction in risk. In addition, physical inactivity, regular alcohol use (>1 drink/day), greater height, and postmenopausal obesity have been shown to heighten risk. Breast cancer incidence is positively associated with higher socioeconomic status, which has been explained largely by known lifestyle and reproductive risk factors. Although relatively uncommon, exposure to ionizing radiation before the age of 40 years increases the risk of breast cancer, with elevated risks detected even from low-dose exposures (Ronckers et al, 2005a).

A family history of breast cancer is an important risk factor for this disease (Willett et al, 2000; Brinton et al, 2002; Thompson and Easton, 2004). The increased risk of breast cancer among women with at least one affected first-degree relative is about 2-fold, and the risk rises with increasing numbers and younger ages of affected relatives. Approximately 2% to 5% of breast cancers are probably attributable to the inheritance of rare, highly penetrant susceptibility genes, such as BRCA1/2. Women with BRCA1/2 mutations have a high cumulative risk of developing cancers of the breast (35%-84% by age 70 years) and ovary (10%-50%), with tumors tending to arise at an earlier age compared with sporadic cases (Nelson et al, 2005). Germline mutations of p53 (Li-Fraumeni syndrome) and the PTEN gene (Cowden disease) are rare and account for less than 1% of inherited breast cancer (Wood et al, 2005).

## Results and Discussion

A total of 34,500 subsequent primary cancers were observed among 322,863 women who had survived 2 months or more after an invasive breast cancer diagnosed during 1973-2000, reflecting an overall 18% elevation in the risk of new primary malignancies (O/E=1.18, 95% CI=1.17-1.20, EAR=23 per 10,000 person-years). Subsequent cancers occurred excessively in all follow-up intervals except among women surviving 20 years or more. The cumulative incidence of developing any second cancer after breast cancer, in analyses accounting for the competing risk of death, was 17.6% at 25 years (95% CI=17.4%-17.8%), which included a 6.9% incidence of new primary breast cancers (Figure 7.1). For all cancers combined, black women had higher risks of new malignancies than white women (O/E=1.52, EAR=52 versus O/E=1.16, EAR=20). The risk of subsequent cancer did not differ by histologic type of the original breast cancer

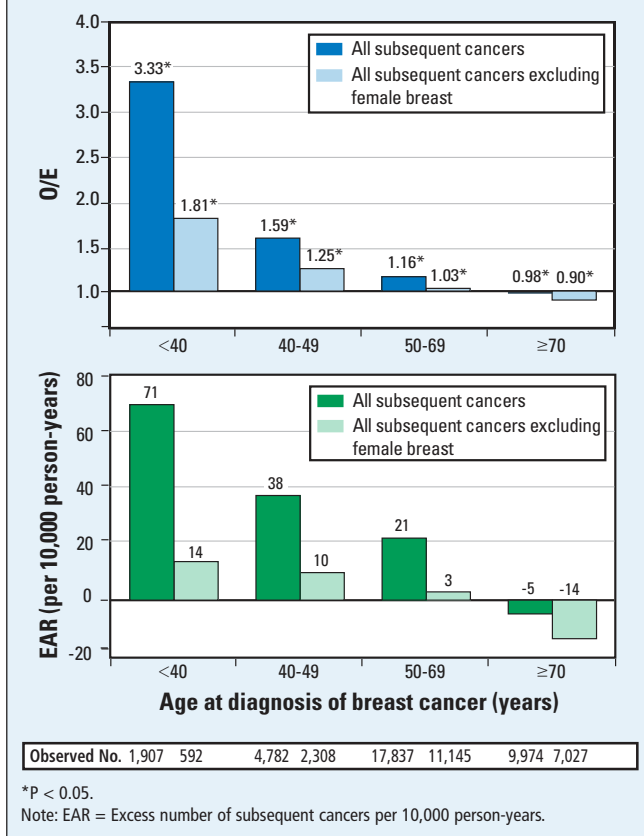
**Figure 7.1:** Cumulative incidence of developing a second cancer among patients with cancer of the breast, females, SEER 1973-2000.



(ductal versus lobular carcinomas). A strong inverse trend in subsequent cancer risk was observed with increasing age at first breast cancer diagnosis, with the highest risks occurring after early-onset breast cancer (ages <40 years, O/E=3.33, EAR=71; ages 40-49 years, O/E=1.59, EAR=38) (Figure 7.2). No excess risk was evident among women with breast cancer diagnosed at 70 years or older (O/E=0.98). When subsequent primary breast cancers were excluded from the analysis, the overall risk for all subsequent cancers combined declined to near unity (O/E=1.01); however, significant elevations in risk persisted for the younger age groups (ages <40 years, O/E=1.81, EAR=14; ages 40-49 years, O/E=1.25, EAR=10) (Figure 7.2). Women with an initial breast malignancy experienced significantly elevated risks for subsequent cancers of the salivary gland, esophagus, stomach, colon, breast, uterine corpus, ovary, thyroid, and soft tissues, as well as melanoma of the skin and acute non-lymphocytic leukemia (ANLL). Significant deficits in risk were observed for cancers of the liver, gallbladder, pancreas, lung (ages ≥60 years), cervix, vagina, vulva, and brain and other parts of the central nervous system, as well as for non-Hodgkin lymphoma and chronic lymphocytic leukemia.

Second cancers after breast cancer have been extensively studied over the last 3 decades (reviewed in Daly and Costalas, 1999; Matesich and Shapiro, 2003; van Leeuwen and Travis, 2005), and many surveys using the SEER database have been published recently (Newcomb et al, 1999; Hall et al, 2001; Huang and Mackillop, 2001; Huang et al, 2001; Newschaffer et al, 2001; Yap et al, 2002; Bernstein et al, 2003; Gao et al, 2003; Kmet et al, 2003; Zablotska and Neugut, 2003; Curtis et al, 2004; Goggins et al, 2004; Zablotska et al, 2005). Overall estimates of second cancer risk from other registry-based studies have varied widely, with O/E ratios ranging from 1.0 to 2.4 (Adami et al, 1984; Ewertz and Mouridsen, 1985; Harvey and Brinton, 1985; Teppo et al, 1985;

**Figure 7.2:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after cancer of the breast, females, SEER 1973-2000.



Brenner et al, 1993; Volk and Pompe-Kirn, 1997; Dong and Hemminki, 2001a; Evans et al, 2001; Levi et al, 2003; Soerjomataram et al, 2005; Mellekjaer et al, 2006).

Subsequent breast cancers, occurring predominantly in the opposite breast, accounted for nearly 40% of all new malignancies after an initial breast cancer in the current study. The risk of developing a new breast cancer was increased 67% over that expected in the general population during the first 10 years of follow-up, with significant elevations persisting at lower levels for at least 2 decades, consistent with the intense surveillance of the opposite breast for new disease. Young age at initial diagnosis (<50 years) and black race—but not histology (ductal versus lobular)—were strong predictors of elevated risk, similar to the results in previous studies (Chen et al, 1999; reviewed in Daly and Costalas, 1999; Gao et al, 2003). Genetic predisposition—in particular, germline mutations in the BRCA1/2 genes, which predispose to early-onset breast and ovarian cancers (Metcalf et al, 2004; Thompson and Easton, 2004)—probably contributed to the notably high risks of subsequent breast cancers that occurred after an initial cancer diagnosed at ages younger than 40 years (O/E=5.36) and ages 40 to 49 years (O/E=2.13). In the current SEER study, women treated with radiotherapy had marginally higher risks of developing a subsequent breast tumor than nonirradiated women. While these results are

generally consistent with the estimated 18% excess of contralateral breast cancer observed among irradiated women treated in randomized clinical trials (Clarke et al, 2005), other studies have reported that radiation has no effect on the overall risk of new breast cancers (Storm et al, 1992; Chen et al, 1999), except possibly for long-term survivors who were irradiated at a young age (Boice et al, 1992; Chen et al, 1999; Gao et al, 2003; van Leeuwen and Travis, 2005). In contrast, there is strong evidence that hormonal therapy with tamoxifen substantially reduces the risk of subsequent breast cancer by an estimated 33% (EBCTCG, 2005), and that adjuvant chemotherapy is associated with a modest protective effect. Other risk factors for second breast cancer risk cited in some, but not all, studies include higher body-mass index (Dignam et al, 2003; Li et al, 2003) and reproductive risk factors (late age at first birth, low parity) (Cook et al, 1996; Chen et al, 1999; Vaitinen and Hemminki, 2000).

The risk of subsequent ovarian cancer fell sharply with increasing age at initial breast cancer diagnosis (O/E=4.18, 1.78, and 1.30 for ages <40, 40-49, and 50-59 years, respectively); little or no excess was observed for ages 60 to 69 years (O/E=1.08) or 70 years or more (O/E=0.97). Breast cancer also occurred excessively after early-onset ovarian cancer (ages <50 years). This reciprocally increased risk in younger survivors has been noted in earlier registry-based studies (Evans et al, 2001; Hall et al, 2001; Mellekjaer et al, 2006) and is partly related to BRCA1/2 heritable syndromes. In addition, breast and ovarian cancers share endocrine-related risk factors, such as nulligravida, which may also contribute to these excesses (Hall et al, 2001; Brinton et al, 2005).

Breast cancer patients had an overall 35% increased risk of subsequent cancers of the uterine corpus. Significantly increased risks were observed in all age groups, with the highest absolute risk of uterine malignancies occurring among women ages 70 years or more at breast cancer diagnosis (O/E=1.59, EAR=5). Previous studies have indicated that tamoxifen therapy for breast cancer is associated with a 2- to 3-fold increased risk of adenocarcinomas of the uterine corpus, with risks rising with increasing duration of tamoxifen use (Fisher et al, 1994; Curtis et al, 1996, 2004; EBCTCG, 2005; Swerdlow et al, 2005). In addition, notably higher risks (4- to 13-fold) have been reported for tamoxifen-related uterine sarcomas, although these tumors are very rare and the excess absolute risk is small (Curtis et al, 2004; Swerdlow et al, 2005). Breast and uterine corpus cancers also share common risk factors, such as low parity, obesity, and hormone replacement therapy (Brinton et al, 2002, 2005), which may contribute to the reciprocally elevated risks observed for these tumors at older ages (ages ≥70 years).

Previous investigators have attributed the elevated risks of ANLL following breast cancer primarily to alkylating agent chemotherapy, with radiotherapy possibly adding to this risk (Curtis et al, 1992; Diamandidou et al, 1996; Smith et al, 2003; Praga et al, 2005). Some

studies (Fisher et al, 1985; Curtis et al, 1992), but not all (Curtis et al, 1989), have suggested that post-mastectomy radiotherapy (without chemotherapy) may confer a small increased risk of leukemia, with risks rising in relation to increasing bone marrow dose. Melphalan-based chemotherapy, which was used mainly in the 1970s, is known to be highly leukemogenic (Fisher et al, 1985; Curtis et al, 1992); however, only a negligible or small increase in risk has been reported following standard dose cyclophosphamide-methotrexate-fluorouracil (CMF) chemotherapy (Curtis et al, 1992; Valagussa et al, 1994; Tallman et al, 1995; Kaplan et al, 2004).

Cyclophosphamide-anthracycline-based regimens, in wider use in recent years, may be associated with higher leukemia risks, but in absolute terms the risk appears low when standard doses are administered (cumulative incidence less than 0.5% at 8-10 years) (Smith et al, 2003). However, at least 2 reports from clinical trial series indicate that leukemia risk may rise sharply with more intensive, higher-dose chemotherapy regimens (Smith et al, 2003; Praga et al, 2005), indicating that these patients need to be monitored closely for the late effects of therapy.

Although there was an overall decreased lung cancer risk following breast cancer, women who were initially treated with radiation had a significantly elevated risk for developing a new lung malignancy 10 years or more after irradiation (O/E=1.47, EAR=9), with the highest risk occurring among 20-year survivors (O/E=1.86, EAR=21). Risk was greater for the lung on the same side as the initial breast cancer, which would have received the higher radiation dose. Previous studies have also reported excess lung cancer incidence (Deutsch et al, 2003; Zablotska and Neugut, 2003; Clarke et al, 2005; Mellekjaer et al, 2006) and mortality (Clarke et al, 2005; Darby et al, 2005) among women treated with radiation for breast malignancies. Most investigators have attributed the increased risk to post-mastectomy radiotherapy, which typically delivers high doses to thoracic organs, including the lungs, with a Connecticut study indicating that lung cancer risk increases with the radiation dose received (Inskip et al, 1994). Smoking may further heighten the risk of radiation-related lung cancer (Neugut et al, 1994; Ford et al, 2003), as has been observed following irradiation for Hodgkin disease (Travis et al, 2002). While no significant lung cancer excess has been reported following newer treatments with post-lumpectomy breast radiation (Zablotska and Neugut, 2003), the long-term hazards of these therapies remain to be clarified.

Radiation also appeared to contribute to the elevated risk of cancers of the esophagus, bone, and soft tissue among long-term survivors of breast cancer, with higher risks observed among irradiated patients compared with nonirradiated patients. The heightened risk of esophageal cancer was evident 5 years or more after radiation treatment, and risk rose to nearly 3-fold among 10-year survivors (O/E=2.93, O=28). Similar results were reported in a previous SEER survey (Zablotska et al, 2005) and in a study of women

enrolled in breast cancer clinical trials (Clarke et al, 2005). Increased risks involved mainly squamous cell carcinomas of the esophagus arising in the upper and middle sections (Zablotska et al, 2005), which would have received the highest radiation doses. Elevated risks of radiation-related bone sarcomas in our series appeared 10 years or more after initial exposure (O/E=6.11, O=8), while excesses of soft tissue sarcomas after radiotherapy were evident earlier in the follow-up period ( $\geq 5$  years, O/E=3.24, O=46). Particularly high risks were observed for subsequent angiosarcomas (O/E=17.44, O=11) and fibrosarcomas/fibrous histiocytomas (O/E=4.25, O=20) occurring 5 or more years after irradiation, whereas no excess of either tumor type was evident among patients treated with surgery alone. Several earlier studies have reported an elevated risk of radiation-related soft tissue sarcomas (Huang and Mackillop, 2001; Clarke et al, 2005; Kirova et al, 2005; Rubino et al, 2005) arising in the irradiated breast (after breast-conserving therapy), the chest/chest wall, or upper limb/shoulders. Some soft tissue sarcomas of the upper limbs may be related to the lymphedema that may complicate radical mastectomy and predispose to lymphangiosarcoma in the Stewart-Treves syndrome (Stewart and Treves, 1948). In rare cases, breast cancer and sarcomas may arise as components of the heritable Li-Fraumeni syndrome.

Although the increased risk of melanoma of the skin appeared to be limited to breast cancer patients treated with radiation (O/E=1.46 for irradiated patients versus O/E=1.07 for nonirradiated patients), a direct carcinogenic effect from radiation seems unlikely. There was no evidence of an increasing trend in risk over time, as might be expected with radiation-related solid tumors, and risks were similarly increased for melanomas that occurred at sites distant from the radiation fields, as well as for sites within or close to irradiated areas. Another possibility is that immunologic alterations associated with radiotherapy or chemotherapy may be involved. However, a reciprocally elevated risk of breast cancer after cutaneous melanoma suggests that these tumors may share hormonal or genetic mechanisms, such as BRCA2 mutations (Goggins et al, 2004; Thompson and Easton, 2004; Mellekjaer et al, 2006).

The co-occurrence of breast and thyroid cancer at increased levels has been reported in several previous surveys (Harvey and Brinton, 1985; Huang et al, 2001; Sadezki et al, 2003; Ronckers et al, 2005b; Mellekjaer et al, 2006), but reasons for this association remain unclear. Although female gender is a risk factor for thyroid cancer, only weak associations with hormonal risk factors have been noted previously (Negri et al, 1999). Both breast and follicular thyroid cancers are linked to Cowden disease, but this genetic condition is rare. Risks in the current study (Ronckers et al, 2005b) were similar among irradiated and nonirradiated women (O/E=1.28 versus 1.33), in agreement with most other investigations (Harvey and Brinton, 1985; Huang et al, 2001; Sadezki et al, 2003; Clarke et al, 2005) and with reports indicating



little or no elevation in thyroid cancer following radiation exposures at older ages (Ron et al, 1995).

Although a history of breast cancer has long been thought to be a risk factor for colorectal cancer, only a small increased risk of subsequent colon cancer ( $O/E=1.04$ ) and no excess of rectal cancer ( $O/E=0.95$ ) were observed in the current survey. The lack of a substantial elevated risk of colorectal cancer after breast cancer is consistent with 2 other registry-based studies (Evans et al, 2001; Levi et al, 2003) and a previous SEER analysis (Newschaffer et al, 2001). However, other surveys of breast cancer patients have reported 20% to 80% increased risks of subsequent colon and/or rectal cancer compared with that expected in the general population (Harvey and Brinton, 1985; Murakami et al, 1987; Neugut et al, 1991; Soerjomataram et al, 2005; Mellekjær et al, 2006), leading previous investigators to hypothesize that breast and colorectal cancers may share common dietary and hormonal risk factors. A recent study observed a 2-fold increase in the risk of colon cancer among breast cancer patients who had either a family history of breast cancer or a high body-mass index; the risk was unrelated to menopausal status, prior hormonal replacement therapy, or parity (Kmet et al, 2003). Although it has been reported that breast cancer may be part of the hereditary nonpolyposis colon cancer syndrome (Risinger et al, 1996), we did not observe an increased risk of breast cancer at any age after an initial cancer of the colon or rectum.

The increased risk of stomach cancer was restricted to women with lobular breast cancer ( $O/E=2.36$ ,  $O=80$ ). One explanation for this association may be misclassification of the stomach cancer, because the lobular subtype is overrepresented in gastric metastases secondary to the breast (Taal et al, 2000). A small number of subsequent stomach malignancies may be related to genetic predisposition, since carriers of BRCA2 mutations have been reported to have an increased risk of stomach cancer (Thompson and Easton, 2004).

Most of the heightened risk of salivary gland cancer was observed in the first 5 years following breast cancer diagnosis, suggesting increased diagnostic scrutiny of the head and neck area in the initial follow-up period. Although the salivary glands may receive substantial radiation doses during breast cancer therapy, the excesses in our study were observed among both irradiated and nonirradiated patients. No reciprocal elevation of breast cancer was noted after salivary gland cancer.

Significant deficits in risk of several subsequent smoking-related cancers, such as cancers of the respiratory tract, pancreas, and cervix, probably reflect lower rates of smoking and social-class-related lifestyle differences among breast cancer survivors. Significantly lower than expected risks of non-Hodgkin lymphoma and chronic lymphocytic leukemia were confined to the first 10 years of follow-up.

## Male Breast Cancer

Breast cancer among men is uncommon, accounting for less than 1% of breast cancers in the U.S. (Weiss et al, 2005). Incidence, however, has been rising (Giordano, 2005), and almost 1,700 new cases were expected to be diagnosed in 2005 (Jemal et al, 2005). Geographic and temporal variation in incidence rates resembles that for female breast cancer, with higher rates in Europe and North America (Weiss et al, 2005). Treatment for male breast cancer is similar to that for females, although conservative surgery is less frequently used (Winchester, 2002). Relative survival rates in SEER are somewhat lower for males (80.8% at 5 years and 68.6% at 10 years) than for females, reflecting in part a tendency toward a higher stage of disease at presentation for men. The histologic distribution of male and female breast cancer differed somewhat, with males having a higher percentage of ductal carcinoma and a lower percentage of lobular carcinoma than females.

Although the etiology of breast cancer in men is not well understood, hormonal and genetic factors appear to play a role (Weiss et al, 2005). As in women, an increased risk of breast cancer in men has been associated with a family history of breast cancer. BRCA2 mutations account for a higher percentage of inherited cases of male breast cancer than BRCA1 mutations (Winchester, 2002; Thompson and Easton, 2004). Other known or suspected risk factors include hormonal abnormalities, such as Klinefelter syndrome, gynecomastia, testicular disease, liver cirrhosis, treatment with exogenous estrogens, and radiation exposure.

## Results and Discussion

A borderline significant increased risk of subsequent cancers was observed among 2,158 men who survived 2 months or more following a diagnosis of breast cancer between 1973 and 2000 ( $O/E=1.11$ ,  $O=355$ , 95% CI=0.99-1.23, EAR=24). Overall risk of developing a new malignancy was increased 31% among men initially diagnosed at ages younger than 65 years, whereas no excess was noted among older men ( $O/E=0.99$ ). The cumulative incidence of developing a second cancer after male breast cancer rose to 21.8% (95% CI=19.4%-24.2%) at 25 years. Few studies have evaluated risks of new malignancies among men with breast cancer, although increased risks have been reported for second cancers of the contralateral breast, small intestine, rectum, pancreas, and prostate, as well as non-melanoma skin cancer and myeloid leukemia (Dong and Hemminki, 2001b; Auvinen et al, 2002; Hemminki et al, 2005).

The risk of subsequent breast cancer was strongly elevated ( $O/E=29.36$ ,  $O=18$ , EAR=12), as was also reported in an earlier survey from the SEER registries (Auvinen et al, 2002) and a study from the Swedish Family-Cancer Database (Dong and Hemminki, 2001b). Men diagnosed with their first breast cancer before age 65 years had a higher relative risk of developing a new breast malignancy ( $O/E=44.51$ ) than older men ( $O/E=20.60$ ), although the

excess absolute risks were equivalent (close to 12 in both age groups). Risks were significantly elevated throughout the follow-up period. While the risk of subsequent breast cancer was about 2 times higher among men who received radiation compared with those who did not, the difference between the groups was not statistically significant. These findings are consistent with genetic predisposition in male breast cancer, due mainly to BRCA2 germline mutations (Giordano, 2005) or to hormonal factors, as illustrated by the elevated risk in Klinefelter syndrome.

Our survey revealed a statistically increased risk of subsequent prostate cancer (O/E=1.22) that was not detected in an earlier SEER survey of cases diagnosed through 1996 (Auvinen et al, 2002). A similarly elevated risk of prostate cancer after breast cancer was noted in a large international cancer registry study of 3,409 men with breast cancer (Hemminki et al, 2005). On the other hand, no significant excess of male breast cancer following prostate cancer was seen in the international study or in our survey, although an increased risk (2-fold) was noted in a Swedish registry series (Thellenberg et al, 2003). Genetic factors may contribute to the association because BRCA2 mutation carriers appear to have an increased risk of prostate cancer as well as male breast cancer (Kirchhoff et al, 2004). Medical surveillance may also play a role, as prostate-specific antigen (PSA) testing has increased among cancer patients in more recent years, and the excess risk in our series was limited to men diagnosed with localized-stage prostate cancer during the period 1995 to 2000.

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**Table 7.1.1:** Characteristics of patients with an initial cancer of the breast, females, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	—	—	322,863	100.0	322,863	100.0
<b>Initial treatment</b>						
Any radiation	—	—	109,188	33.8	109,188	33.8
With surgery	—	—	103,445	32.0	103,445	32.0
Without surgery	—	—	5,743	1.8	5,743	1.8
No radiation	—	—	213,675	66.2	213,675	66.2
With surgery	—	—	201,453	62.4	201,453	62.4
Without surgery	—	—	12,222	3.8	12,222	3.8
<b>Race</b>						
White	—	—	281,056	87.1	281,056	87.1
Black	—	—	24,378	7.6	24,378	7.6
Other	—	—	16,341	5.1	16,341	5.1
Unknown	—	—	1,088	0.3	1,088	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	—	—	2,372	0.7	2,372	0.7
30–49	—	—	76,342	23.6	76,342	23.6
50–69	—	—	145,405	45.0	145,405	45.0
70–79	—	—	63,896	19.8	63,896	19.8
≥ 80	—	—	34,848	10.8	34,848	10.8
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	—	—	291,176	90.2	291,176	90.2
1st and 2nd cancers	—	—	29,092	9.0	29,092	9.0
1st, 2nd, and 3rd cancers	—	—	2,391	0.7	2,391	0.7
1st, 2nd, 3rd, and additional cancers	—	—	204	0.1	204	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	—	—	61.7	—	61.7	—
Median year of 1st cancer diagnosis	—	—	1989.5	—	1989.5	—
Median person-years at risk	—	—	5.6	—	5.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	—	—	96.8	—	96.8
1st, 2nd, and additional cancers	—	—	—	96.4	—	96.4
1st cancer only	—	—	—	2.9	—	2.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 7.1.2:** Risk of subsequent primary cancers after cancer of the breast, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	3,054	1.13*	12,656	1.22*	9,859	1.19*	8,931	1.15*	34,500	29,141.37	1.18*	22.54
All excluding same site	1,788	0.94*	7,396	1.00	6,071	1.03*	5,817	1.04*	21,072	20,761.09	1.01*	1.31
<b>Buccal cavity, pharynx</b>	49	1.00	189	1.02	171	1.18*	142	1.09	551	510.33	1.08	0.17
Lip	2	0.64	10	0.81	7	0.69	14	1.42	33	35.48	0.93	-0.01
Tongue	14	1.30	43	1.05	35	1.09	29	1.00	121	113.04	1.07	0.03
Salivary gland	12	2.22*	36	1.74*	21	1.30	22	1.45	91	57.44	1.58*	0.14
Mouth	13	0.78	56	0.88	62	1.24	45	0.99	176	176.26	1.00	0.00
Nasopharynx	2	0.96	12	1.55	7	1.21	3	0.59	24	20.69	1.16	0.01
Tonsil	3	0.67	12	0.73	19	1.56	13	1.29	47	43.20	1.09	0.02
Oropharynx	1	0.83	4	0.86	6	1.68	1	0.32	12	12.51	0.96	0.00
Hypopharynx	2	0.60	8	0.63	8	0.84	9	1.09	27	33.83	0.80	-0.03
<b>Digestive system</b>	533	0.88*	2,395	1.02	1,884	0.99	1,864	1.03	6,676	6,676.17	1.00	0.00
Esophagus	18	1.08	68	1.05	71	1.36*	86	1.71*	243	183.56	1.32*	0.25
Stomach	43	0.90	221	1.21*	151	1.05	158	1.20*	573	507.10	1.13*	0.28
Small intestine	2	0.23*	33	0.98	33	1.18	38	1.36	106	98.04	1.08	0.03
Colon	284	0.94	1,265	1.07*	1,016	1.06	918	1.01	3,483	3,351.80	1.04*	0.55
Rectum, rectosigmoid junction	77	0.79*	380	1.02	275	0.94	279	1.05	1,011	1,028.57	0.98	-0.07
Rectum	55	0.86	233	0.95	180	0.94	175	0.99	643	676.99	0.95	-0.14
Anus, anal canal	8	0.97	29	0.91	26	1.01	23	0.95	86	90.12	0.95	-0.02
Liver	9	0.70	30	0.60*	23	0.55*	36	0.85	98	147.46	0.66*	-0.21
Gallbladder	9	0.64	34	0.64*	20	0.48*	40	1.08	103	145.80	0.71*	-0.18
Bile ducts, other biliary	16	1.24	50	0.98	30	0.69*	43	0.97	139	151.85	0.92	-0.05
Pancreas	63	0.80	257	0.84*	221	0.88*	219	0.90	760	880.96	0.86*	-0.51
<b>Respiratory system</b>	281	0.82*	1,228	0.91*	1,043	0.93*	1,168	1.04	3,720	3,949.93	0.94*	-0.97
Nose, nasal cavity, ear	3	0.82	14	1.00	10	0.89	10	0.94	37	39.57	0.94	-0.01
Larynx	12	1.03	41	0.93	23	0.67	31	1.00	107	121.06	0.88	-0.06
Lung, bronchus	263	0.81*	1,171	0.91*	1,007	0.93*	1,122	1.04	3,563	3,779.40	0.94*	-0.91
<b>Female breast</b>	1,266	1.60*	5,260	1.74*	3,788	1.59*	3,114	1.42*	13,428	8,380.29	1.60*	21.24
<b>Female genital system</b>	406	1.13*	1,672	1.25*	1,322	1.31*	1,014	1.14*	4,414	3,603.65	1.22*	3.41
Cervix uteri	37	0.82	142	0.91	71	0.68*	45	0.57*	295	384.43	0.77*	-0.38
Corpus uteri	218	1.20*	934	1.37*	776	1.51*	538	1.18*	2,466	1,830.03	1.35*	2.68
Ovary	131	1.26*	499	1.27*	395	1.29*	349	1.26*	1,374	1,079.84	1.27*	1.24
Vagina	1	0.19	15	0.75	11	0.71	12	0.85	39	54.81	0.71*	-0.07
Vulva	9	0.58	50	0.83	38	0.77	40	0.84	137	172.86	0.79*	-0.15
<b>Urinary system</b>	152	1.22*	475	0.97	440	1.09	412	1.05	1,479	1,409.47	1.05	0.29
Urinary bladder	67	0.91	269	0.93	273	1.15*	266	1.15*	875	831.20	1.05	0.18
Kidney parenchyma	77	1.87*	172	1.07	132	1.00	115	0.89	496	464.18	1.07	0.13
Renal pelvis, other urinary	8	0.78	34	0.85	35	1.07	31	1.00	108	114.09	0.95	-0.03
Ureter	2	0.64	6	0.49	10	1.00	12	1.27	30	34.96	0.86	-0.02
<b>Bone, joints</b>	2	0.77	7	0.72	11	1.49	16	2.42*	36	26.32	1.37	0.04
<b>Soft tissue including heart</b>	6	0.56	51	1.23	58	1.77*	47	1.51*	162	116.16	1.39*	0.19
<b>Kaposi sarcoma</b>	0	0.00	1	0.26	1	0.31	4	1.31	6	11.16	0.54	-0.02
<b>Melanoma of skin</b>	74	1.32*	251	1.17*	196	1.16*	179	1.14	700	595.34	1.18*	0.44
<b>Eye, orbit</b>	1	0.25	20	1.30	14	1.20	12	1.14	47	41.66	1.13	0.02
<b>Brain, central nervous system</b>	21	0.74	110	1.02	68	0.81	55	0.72*	254	296.76	0.86*	-0.18
<b>Thyroid</b>	56	2.01*	127	1.25*	97	1.33*	65	1.07	345	262.84	1.31*	0.35
<b>Lymphatic, hematopoietic</b>	176	0.88	735	0.94	625	0.97	649	1.05	2,185	2,246.18	0.97	-0.26
Hodgkin lymphoma	11	1.61	14	0.57*	17	0.94	20	1.31	62	64.78	0.96	-0.01
Non-Hodgkin lymphoma	81	0.85	278	0.74*	272	0.87*	330	1.06	961	1,097.39	0.88*	-0.57
Myeloma	33	0.96	134	1.00	98	0.90	99	0.95	364	382.33	0.95	-0.08
Leukemia	51	0.80	309	1.25*	238	1.19*	200	1.05	798	701.68	1.14*	0.41
Acute lymphocytic	3	1.53	10	1.34	7	1.18	2	0.37	22	20.80	1.06	0.01
Chronic lymphocytic	11	0.45*	45	0.47*	53	0.69*	69	0.94	178	269.96	0.66*	-0.39
Acute non-lymphocytic	25	1.11	206	2.35*	127	1.79*	84	1.22	442	249.80	1.77*	0.81
Chronic myeloid	8	0.90	31	0.90	30	1.09	29	1.12	98	96.91	1.01	0.00

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.1.3:** Risk of subsequent primary cancers after cancer of the breast, females, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	25,569	1.20*	5,428	1.18*	2,463	1.12*	1,040	1.05	34,500	29,141.37	1.18*	22.54
All excluding same site	15,255	1.01	3,447	1.05*	1,627	1.02	743	1.03	21,072	20,761.09	1.01*	1.31
<b>Buccal cavity, pharynx</b>	409	1.08	75	0.96	54	1.47*	13	0.81	551	510.33	1.08	0.17
Lip	19	0.74	8	1.41	3	1.06	3	2.27	33	35.48	0.93	-0.01
Tongue	92	1.10	13	0.75	14	1.71	2	0.57	121	113.04	1.07	0.03
Salivary gland	69	1.63*	11	1.24	7	1.62	4	2.05	91	57.44	1.58*	0.14
Mouth	131	1.00	24	0.88	19	1.49	2	0.36	176	176.26	1.00	0.00
Nasopharynx	21	1.34	2	0.66	1	0.71	0	0.00	24	20.69	1.16	0.01
Tonsil	34	1.03	6	0.97	7	2.49	0	0.00	47	43.20	1.09	0.02
Oropharynx	11	1.17	1	0.54	0	0.00	0	0.00	12	12.51	0.96	0.00
Hypopharynx	18	0.70	7	1.40	1	0.44	1	1.03	27	33.83	0.80	-0.03
<b>Digestive system</b>	4,812	0.99	1,068	1.01	540	1.06	256	1.09	6,676	6,676.17	1.00	0.00
Esophagus	157	1.18*	48	1.64*	26	1.83*	12	1.80	243	183.56	1.32*	0.25
Stomach	415	1.11*	94	1.20	40	1.08	24	1.43	573	507.10	1.13*	0.28
Small intestine	68	0.97	23	1.43	14	1.73	1	0.26	106	98.04	1.08	0.03
Colon	2,565	1.05*	525	0.98	261	1.01	132	1.11	3,483	3,351.80	1.04*	0.55
Rectum, rectosigmoid junction	732	0.96	159	1.01	90	1.22	30	0.91	1,011	1,028.57	0.98	-0.07
Rectum	468	0.94	94	0.90	63	1.28	18	0.80	643	676.99	0.95	-0.14
Anus, anal canal	63	0.96	11	0.77	7	1.02	5	1.63	86	90.12	0.95	-0.02
Liver	62	0.59*	21	0.87	7	0.57	8	1.30	98	147.46	0.66*	-0.21
Gallbladder	63	0.58*	24	1.09	12	1.16	4	0.89	103	145.80	0.71*	-0.18
Bile ducts, other biliary	96	0.89	25	0.99	11	0.86	7	1.13	139	151.85	0.92	-0.05
Pancreas	541	0.85*	124	0.87	67	0.97	28	0.87	760	880.96	0.86*	-0.51
<b>Respiratory system</b>	2,552	0.90*	656	1.01	341	1.05	171	1.12	3,720	3,949.93	0.94*	-0.97
Nose, nasal cavity, ear	27	0.93	7	1.12	3	1.01	0	0.00	37	39.57	0.94	-0.01
Larynx	76	0.84	18	0.97	11	1.27	2	0.55	107	121.06	0.88	-0.06
Lung, bronchus	2,441	0.91*	629	1.01	324	1.03	169	1.14	3,563	3,779.40	0.94*	-0.91
<b>Female breast</b>	10,314	1.67*	1,981	1.52*	836	1.36*	297	1.10	13,428	8,380.29	1.60*	21.24
<b>Female genital system</b>	3,400	1.25*	660	1.23*	258	1.03	96	0.90	4,414	3,603.65	1.22*	3.41
Cervix uteri	250	0.82*	28	0.56*	16	0.76	1	0.13*	295	384.43	0.77*	-0.38
Corpus uteri	1,928	1.40*	366	1.35*	127	0.99	45	0.82	2,466	1,830.03	1.35*	2.68
Ovary	1,025	1.28*	216	1.31*	91	1.17	42	1.25	1,374	1,079.84	1.27*	1.24
Vagina	27	0.66*	7	0.83	4	1.02	1	0.57	39	54.81	0.71*	-0.07
Vulva	97	0.78*	28	1.00	9	0.66	3	0.47	137	172.86	0.79*	-0.15
<b>Urinary system</b>	1,067	1.05	238	1.05	127	1.13	47	0.90	1,479	1,409.47	1.05	0.29
Urinary bladder	609	1.01	155	1.15	77	1.17	34	1.10	875	831.20	1.05	0.18
Kidney parenchyma	381	1.14*	68	0.90	38	1.02	9	0.52*	496	464.18	1.07	0.13
Renal pelvis, other urinary	77	0.93	15	0.83	12	1.36	4	0.96	108	114.09	0.95	-0.03
Ureter	18	0.71	4	0.73	6	2.24	2	1.59	30	34.96	0.86	-0.02
<b>Bone, joints</b>	20	1.01	14	3.60*	1	0.54	1	1.19	36	26.32	1.37	0.04
<b>Soft tissue including heart</b>	115	1.35*	27	1.48	12	1.34	8	1.99	162	116.16	1.39*	0.19
<b>Kaposi sarcoma</b>	2	0.25*	3	1.63	1	1.16	0	0.00	6	11.16	0.54	-0.02
<b>Melanoma of skin</b>	521	1.19*	115	1.25*	36	0.81	28	1.37	700	595.34	1.18*	0.44
<b>Eye, orbit</b>	35	1.13	6	0.96	4	1.32	2	1.55	47	41.66	1.13	0.02
<b>Brain, central nervous system</b>	199	0.90	32	0.70*	18	0.84	5	0.53	254	296.76	0.86*	-0.18
<b>Thyroid</b>	280	1.39*	45	1.22	11	0.66	9	1.27	345	262.84	1.31*	0.35
<b>Lymphatic, hematopoietic</b>	1,536	0.94*	393	1.09	182	1.03	74	0.90	2,185	2,246.18	0.97	-0.26
Hodgkin lymphoma	42	0.85	5	0.54	13	3.04*	2	1.13	62	64.78	0.96	-0.01
Non-Hodgkin lymphoma	631	0.80*	209	1.17*	84	0.94	37	0.88	961	1,097.39	0.88*	-0.57
Myeloma	265	0.95	62	1.01	27	0.90	10	0.73	364	382.33	0.95	-0.08
Leukemia	598	1.17*	117	1.05	58	1.07	25	1.02	798	701.68	1.14*	0.41
Acute lymphocytic	20	1.30	1	0.31	1	0.66	0	0.00	22	20.80	1.06	0.01
Chronic lymphocytic	109	0.55*	42	0.97	17	0.82	10	1.09	178	269.96	0.66*	-0.39
Acute non-lymphocytic	358	1.98*	46	1.15	25	1.28	13	1.40	442	249.80	1.77*	0.81
Chronic myeloid	69	0.97	19	1.24	8	1.09	2	0.61	98	96.91	1.01	0.00

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Breast**  
**Females, <40 Years of Age**

**Table 7.1.4:** Risk of subsequent primary cancers after cancer of the breast, females, <40 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	22,902		21,399		13,131		7,773		22,902			
<b>Person-years in interval</b>	18,485		67,341		51,066		51,480		188,371			
<b>All subsequent cancers</b>	135	5.14*	674	5.43*	497	3.43*	601	2.17*	1,907	571.85	3.33*	70.88
All excluding same site	32	1.96*	139	1.92*	131	1.66*	290	1.82*	592	326.71	1.81*	14.08
<b>Buccal cavity, pharynx</b>	0	0.00	1	0.57	4	1.83	8	1.76	13	8.84	1.47	0.22
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.02
Tongue	0	0.00	1	2.62	1	2.09	1	0.91	3	2.04	1.47	0.05
Salivary gland	0	0.00	0	0.00	1	2.25	6	9.54*	7	1.70	4.11*	0.28
Mouth	0	0.00	0	0.00	2	3.62	1	0.75	3	2.32	1.29	0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.04
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.91	0.00	-0.05
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.02
<b>Digestive system</b>	3	1.82	7	0.82	7	0.60	52	1.70*	69	52.44	1.32*	0.88
Esophagus	0	0.00	0	0.00	0	0.00	3	3.23	3	1.36	2.21	0.09
Stomach	0	0.00	2	2.12	2	1.87	3	1.40	7	4.35	1.61	0.14
Small intestine	0	0.00	0	0.00	0	0.00	1	1.18	1	1.58	0.63	-0.03
Colon	1	1.41	4	1.12	0	0.00*	21	1.61	26	22.09	1.18	0.21
Rectum, rectosigmoid junction	1	3.15	0	0.00	2	0.81	10	1.59	13	10.79	1.20	0.12
Rectum	1	4.36	0	0.00	0	0.00	5	1.19	6	7.33	0.82	-0.07
Anus, anal canal	0	0.00	0	0.00	1	2.11	3	3.23	4	1.77	2.25	0.12
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.59	0.00	-0.08
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-0.05
Bile ducts, other biliary	0	0.00	1	6.10	0	0.00	0	0.00	1	1.07	0.94	0.00
Pancreas	1	7.64	0	0.00	1	0.88	8	2.22	10	5.60	1.79	0.23
<b>Respiratory system</b>	2	2.20	22	4.09*	21	2.42*	41	1.44*	86	43.46	1.98*	2.26
Nose, nasal cavity, ear	0	0.00	1	5.86	1	5.81	0	0.00	2	0.69	2.89	0.07
Larynx	0	0.00	0	0.00	1	2.20	3	2.34	4	2.10	1.91	0.10
Lung, bronchus	2	2.49	21	4.33*	18	2.25*	37	1.38	78	40.46	1.93*	1.99
<b>Female breast</b>	103	10.40*	535	10.32*	366	5.54*	311	2.65*	1,315	245.14	5.36*	56.80
<b>Female genital system</b>	10	1.90	40	1.75*	60	2.49*	107	2.50*	217	94.88	2.29*	6.48
Cervix uteri	5	1.90	3	0.30*	6	0.75	11	1.39	25	28.59	0.87	-0.19
Corpus uteri	3	3.14	7	1.37	22	3.07*	32	1.68*	64	32.25	1.98*	1.69
Ovary	2	1.45	28	4.40*	30	4.02*	59	4.44*	119	28.50	4.18*	4.80
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.05
Vulva	0	0.00	1	1.42	0	0.00	1	0.79	2	2.89	0.69	-0.05
<b>Urinary system</b>	2	4.10	3	1.19	3	0.90	12	1.36	20	15.18	1.32	0.26
Urinary bladder	0	0.00	2	2.03	2	1.51	6	1.50	10	6.49	1.54	0.19
Kidney parenchyma	2	7.29	1	0.69	1	0.53	5	1.13	9	8.03	1.12	0.05
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	2.40	1	0.65	1.53	0.02
Ureter	0	0.00	0	0.00	0	0.00	1	11.19	1	0.12	8.51	0.05
<b>Bone, joints</b>	0	0.00	2	5.81	0	0.00	1	2.67	3	1.11	2.70	0.10
<b>Soft tissue including heart</b>	0	0.00	4	3.94*	2	2.20	5	3.70*	11	3.53	3.12*	0.40
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.01
<b>Melanoma of skin</b>	1	0.41	12	1.20	12	1.33	15	1.36	40	32.45	1.23	0.40
<b>Eye, orbit</b>	0	0.00	2	9.93*	1	4.55	0	0.00	3	0.86	3.47	0.11
<b>Brain, central nervous system</b>	1	1.75	6	2.55	3	1.40	5	1.53	15	8.33	1.80*	0.35
<b>Thyroid</b>	7	3.45*	8	1.03	6	0.93	9	1.25	30	23.45	1.28	0.35
<b>Lymphatic, hematopoietic</b>	5	2.62	30	3.78*	11	1.35	28	1.78*	74	33.73	2.19*	2.14
Hodgkin lymphoma	1	1.82	1	0.57	1	0.93	2	2.03	5	4.37	1.14	0.03
Non-Hodgkin lymphoma	0	0.00	7	1.95	3	0.72	14	1.66	24	16.95	1.42	0.37
Myeloma	0	0.00	0	0.00	1	1.44	3	1.38	4	3.35	1.19	0.03
Leukemia	4	7.73*	22	10.14*	6	2.70	9	2.17	41	9.06	4.52*	1.70
Acute lymphocytic	1	16.70	1	4.05	0	0.00	0	0.00	2	0.78	2.55	0.06
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	0.88	1	1.66	0.60	-0.03
Acute non-lymphocytic	3	11.18*	19	17.39*	4	3.85*	7	4.12*	33	4.10	8.05*	1.53
Chronic myeloid	0	0.00	1	2.10	1	2.19	1	1.32	3	1.81	1.66	0.06

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.1.5:** Risk of subsequent primary cancers after cancer of the breast, females, 40-49 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	365	2.20*	1,472	1.98*	1,270	1.64*	1,675	1.26*	4,782	3,011.07	1.59*	37.79
All excluding same site	109	1.20	591	1.41*	609	1.32*	999	1.14*	2,308	1,848.91	1.25*	9.80
<b>Buccal cavity, pharynx</b>	4	1.44	19	1.46	21	1.44	26	1.07	70	54.66	1.28	0.33
Lip	0	0.00	0	0.00	0	0.00	3	2.67	3	2.29	1.31	0.02
Tongue	0	0.00	3	1.06	5	1.46	8	1.38	16	12.62	1.27	0.07
Salivary gland	2	4.46	8	4.33*	1	0.59	1	0.38	12	6.63	1.81	0.11
Mouth	2	2.57	6	1.55	5	1.11	9	1.19	22	16.74	1.31	0.11
Nasopharynx	0	0.00	2	2.10	1	1.27	0	0.00	3	3.11	0.96	0.00
Tonsil	0	0.00	0	0.00	5	2.89	1	0.39	6	6.14	0.98	0.00
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.40	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	3	2.86	3	1.56	6	3.98	1.51	0.04
<b>Digestive system</b>	16	1.04	88	1.15	113	1.20	230	1.09	447	397.15	1.13*	1.06
Esophagus	1	2.35	2	0.91	6	1.97	15	2.04*	24	13.00	1.85*	0.23
Stomach	2	1.50	9	1.50	12	1.83	21	1.53	44	27.61	1.59*	0.35
Small intestine	0	0.00	2	0.96	2	0.88	9	2.04	13	9.21	1.41	0.08
Colon	6	0.91	32	0.98	52	1.26	89	0.91	179	178.34	1.00	0.01
Rectum, rectosigmoid junction	5	1.56	19	1.18	21	1.08	50	1.33	95	76.49	1.24*	0.39
Rectum	3	1.40	11	1.03	14	1.11	29	1.16	57	50.28	1.13	0.14
Anus, anal canal	0	0.00	5	2.12	2	0.79	6	1.39	13	9.71	1.34	0.07
Liver	0	0.00	1	0.48	2	0.83	4	0.69	7	10.77	0.65	-0.08
Gallbladder	0	0.00	1	0.72	0	0.00	6	1.45	7	7.64	0.92	-0.01
Bile ducts, other biliary	0	0.00	2	1.36	2	1.10	6	1.31	10	8.16	1.22	0.04
Pancreas	1	0.64	12	1.46	13	1.18	22	0.80	48	48.31	0.99	-0.01
<b>Respiratory system</b>	13	1.05	105	1.59*	119	1.34*	262	1.25*	499	377.09	1.32*	2.60
Nose, nasal cavity, ear	0	0.00	2	2.20	1	1.06	2	1.24	5	3.66	1.36	0.03
Larynx	0	0.00	6	1.74	4	0.95	6	0.77	16	16.11	0.99	0.00
Lung, bronchus	13	1.13	97	1.58*	114	1.36*	253	1.27*	477	356.29	1.34*	2.58
<b>Female breast</b>	256	3.41*	881	2.73*	661	2.12*	676	1.49*	2,474	1,162.16	2.13*	27.99
<b>Female genital system</b>	25	0.90	198	1.60*	181	1.47*	190	1.02	594	460.96	1.29*	2.84
Cervix uteri	4	0.52	24	0.87	14	0.70	7	0.36*	49	74.94	0.65*	-0.55
Corpus uteri	5	0.50	86	1.70*	79	1.35*	96	0.96	266	218.86	1.22*	1.01
Ovary	14	1.62	80	2.08*	80	2.11*	76	1.36*	250	140.80	1.78*	2.33
Vagina	0	0.00	1	0.91	2	1.74	2	0.97	5	4.57	1.09	0.01
Vulva	0	0.00	3	0.88	0	0.00	5	0.87	8	13.21	0.61	-0.11
<b>Urinary system</b>	8	1.95	27	1.32	30	1.18	72	1.26	137	107.15	1.28*	0.64
Urinary bladder	1	0.56	15	1.61	17	1.39	47	1.58*	80	52.96	1.51*	0.58
Kidney parenchyma	6	2.79*	10	0.98	12	1.00	22	0.92	50	48.16	1.04	0.04
Renal pelvis, other urinary	1	5.55	2	2.03	1	0.73	3	0.86	7	6.03	1.16	0.02
Ureter	1	29.93	0	0.00	0	0.00	1	1.02	2	1.52	1.32	0.01
<b>Bone, joints</b>	1	3.67	0	0.00	2	2.27	6	4.98*	9	3.43	2.63*	0.12
<b>Soft tissue including heart</b>	0	0.00	5	1.36	6	1.73	6	1.14	17	13.30	1.28	0.08
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.01
<b>Melanoma of skin</b>	17	2.13*	38	1.20	32	1.18	47	1.39*	134	100.67	1.33*	0.71
<b>Eye, orbit</b>	0	0.00	1	0.88	3	2.58	3	1.55	7	4.49	1.56	0.05
<b>Brain, central nervous system</b>	3	1.39	17	1.82*	11	1.18	11	0.77	42	35.13	1.20	0.15
<b>Thyroid</b>	11	1.97	21	0.99	27	1.64*	19	1.15	78	59.77	1.31*	0.39
<b>Lymphatic, hematopoietic</b>	7	0.81	60	1.53*	54	1.25	104	1.21	225	176.95	1.27*	1.03
Hodgkin lymphoma	0	0.00	0	0.00	2	0.87	3	1.04	5	8.84	0.57	-0.08
Non-Hodgkin lymphoma	2	0.45	12	0.58	19	0.82	55	1.20	88	93.78	0.94	-0.12
Myeloma	0	0.00	2	0.41	4	0.65	19	1.34	25	26.11	0.96	-0.02
Leukemia	5	2.05	46	4.18*	29	2.45*	27	1.18	107	48.23	2.22*	1.25
Acute lymphocytic	0	0.00	3	4.17	1	1.54	0	0.00	4	2.49	1.61	0.03
Chronic lymphocytic	1	2.18	5	1.90	4	1.11	11	1.29	21	15.26	1.38	0.12
Acute non-lymphocytic	2	1.87	34	7.46*	21	4.54*	12	1.40	69	18.81	3.67*	1.07
Chronic myeloid	1	1.99	2	0.91	2	0.95	4	1.22	9	8.09	1.11	0.02

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



**Breast**  
**Females, 50-69 Years of Age**

**Table 7.1.6:** Risk of subsequent primary cancers after cancer of the breast, females, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,351	1.18*	5,947	1.24*	5,112	1.14*	5,427	1.10*	17,837	15,335.64	1.16*	21.37
All excluding same site	791	1.02	3,505	1.06*	3,194	1.01	3,655	1.02	11,145	10,816.09	1.03*	2.81
<b>Buccal cavity, pharynx</b>	20	0.85	107	1.11	93	1.12	90	1.10	310	284.82	1.09	0.22
Lip	0	0.00	5	1.10	3	0.65	6	0.98	14	16.27	0.86	-0.02
Tongue	5	0.94	28	1.30	17	0.91	16	0.89	66	63.46	1.04	0.02
Salivary gland	4	1.78	13	1.41	12	1.45	14	1.54	43	28.85	1.49*	0.12
Mouth	7	0.91	31	0.98	37	1.33	31	1.07	106	96.02	1.10	0.09
Nasopharynx	1	0.93	7	1.66	5	1.44	2	0.63	15	11.91	1.26	0.03
Tonsil	2	0.74	8	0.77	10	1.25	9	1.43	29	27.38	1.06	0.01
Oropharynx	0	0.00	3	1.09	2	0.85	1	0.49	6	7.80	0.77	-0.02
Hypopharynx	1	0.51	7	0.88	5	0.76	6	1.08	19	22.02	0.86	-0.03
<b>Digestive system</b>	208	1.04	988	1.11*	881	0.96	1,194	1.04	3,271	3,154.43	1.04*	1.00
Esophagus	8	1.14	44	1.47*	41	1.43*	53	1.62*	146	98.21	1.49*	0.41
Stomach	15	1.07	90	1.45*	58	0.91	108	1.31*	271	222.39	1.22*	0.42
Small intestine	1	0.29	20	1.33	25	1.68*	20	1.11	66	51.29	1.29	0.13
Colon	110	1.18	472	1.12*	445	1.00	593	1.02	1,620	1,538.43	1.05*	0.70
Rectum, rectosigmoid junction	36	0.98	168	1.06	141	0.93	161	0.95	506	516.27	0.98	-0.09
Rectum	25	1.05	102	1.00	89	0.91	99	0.88	315	336.35	0.94	-0.18
Anus, anal canal	4	1.12	13	0.85	16	1.13	13	0.86	46	48.07	0.96	-0.02
Liver	3	0.66	18	0.88	15	0.68	25	0.88	61	75.34	0.81	-0.12
Gallbladder	1	0.24	17	0.89	10	0.51*	25	1.06	53	66.66	0.80	-0.12
Bile ducts, other biliary	4	1.05	19	1.08	14	0.73	31	1.11	68	68.45	0.99	0.00
Pancreas	23	0.89	115	0.98	105	0.85	150	0.95	393	423.55	0.93	-0.26
<b>Respiratory system</b>	143	0.87	711	0.98	658	0.93	771	1.00	2,283	2,364.67	0.97	-0.70
Nose, nasal cavity, ear	3	1.97	7	1.14	7	1.21	5	0.74	22	20.24	1.09	0.02
Larynx	8	1.15	28	1.01	16	0.70	20	1.03	72	77.16	0.93	-0.04
Lung, bronchus	130	0.84*	675	0.98	634	0.93	743	1.00	2,182	2,261.83	0.96	-0.68
<b>Female breast</b>	560	1.53*	2,442	1.64*	1,918	1.45*	1,772	1.32*	6,692	4,519.55	1.48*	18.56
<b>Female genital system</b>	198	1.10	853	1.20*	700	1.19*	595	1.08	2,346	2,027.68	1.16*	2.72
Cervix uteri	17	0.81	68	0.90	35	0.66*	24	0.57*	144	191.62	0.75*	-0.41
Corpus uteri	102	1.03	503	1.28*	436	1.36*	339	1.17*	1,380	1,102.00	1.25*	2.38
Ovary	72	1.46*	242	1.22*	196	1.14	186	1.09	696	590.51	1.18*	0.90
Vagina	0	0.00	8	0.97	4	0.52	9	1.02	21	26.76	0.78	-0.05
Vulva	4	0.83	18	0.85	18	0.83	22	0.76	62	76.70	0.81	-0.13
<b>Urinary system</b>	70	1.48*	194	0.92	241	1.14	260	1.02	765	723.38	1.06	0.36
Urinary bladder	26	1.01	100	0.86	149	1.25*	166	1.11	441	410.31	1.07	0.26
Kidney parenchyma	40	2.19*	82	1.04	76	1.00	70	0.84	268	256.16	1.05	0.10
Renal pelvis, other urinary	4	1.16	12	0.76	16	0.95	24	1.15	56	56.90	0.98	-0.01
Ureter	0	0.00	2	0.43	4	0.78	9	1.41	15	17.20	0.87	-0.02
<b>Bone, joints</b>	1	0.95	1	0.23	7	1.84	9	2.23*	18	13.18	1.37	0.04
<b>Soft tissue including heart</b>	2	0.46	29	1.63*	29	1.79*	32	1.70*	92	57.22	1.61*	0.30
<b>Kaposi sarcoma</b>	0	0.00	1	1.57	0	0.00	2	1.20	3	3.23	0.93	0.00
<b>Melanoma of skin</b>	37	1.50*	114	1.15	97	1.13	93	1.03	341	299.79	1.14*	0.35
<b>Eye, orbit</b>	0	0.00	6	0.78	8	1.21	6	0.91	20	22.71	0.88	-0.02
<b>Brain, central nervous system</b>	10	0.77	58	1.07	38	0.77	35	0.70*	141	166.70	0.85*	-0.22
<b>Thyroid</b>	28	2.17*	62	1.29	53	1.45*	30	0.94	173	129.18	1.34*	0.37
<b>Lymphatic, hematopoietic</b>	62	0.85	319	0.99	313	0.96	411	1.03	1,105	1,118.95	0.99	-0.12
Hodgkin lymphoma	1	0.37	6	0.56	10	1.08	12	1.28	29	32.11	0.90	-0.03
Non-Hodgkin lymphoma	36	0.99	115	0.71*	125	0.75*	207	1.02	483	566.72	0.85*	-0.72
Myeloma	11	0.87	57	1.02	51	0.90	65	0.94	184	194.78	0.94	-0.09
Leukemia	14	0.67	141	1.53*	127	1.36*	127	1.07	409	325.35	1.26*	0.71
Acute lymphocytic	1	1.30	2	0.64	5	1.78	1	0.32	9	9.84	0.91	-0.01
Chronic lymphocytic	3	0.37	17	0.46*	27	0.72	46	0.99	93	129.15	0.72*	-0.31
Acute non-lymphocytic	9	1.21	107	3.24*	69	2.06*	53	1.22	238	117.49	2.03*	1.03
Chronic myeloid	1	0.33	10	0.79	14	1.14	15	0.97	40	43.33	0.92	-0.03

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.1.7:** Risk of subsequent primary cancers after cancer of the breast, females, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,203	0.88*	4,563	0.97*	2,980	1.03	1,228	0.98	9,974	10,222.81	0.98*	-4.53
All excluding same site	856	0.84*	3,161	0.89*	2,137	0.97	873	0.90*	7,027	7,769.38	0.90*	-13.50
<b>Buccal cavity, pharynx</b>	25	1.13	62	0.82	53	1.18	18	0.92	158	162.01	0.98	-0.07
Lip	2	1.00	5	0.69	4	0.82	5	2.07	16	16.55	0.97	-0.01
Tongue	9	1.89	11	0.68	12	1.24	4	0.94	36	34.93	1.03	0.02
Salivary gland	6	2.31	15	1.65	7	1.21	1	0.36	29	20.26	1.43	0.16
Mouth	4	0.49	19	0.68	18	1.05	4	0.52	45	61.17	0.74*	-0.29
Nasopharynx	1	1.38	3	1.26	1	0.75	1	1.97	6	4.94	1.21	0.02
Tonsil	1	0.71	4	0.90	4	1.78	3	4.50	12	8.77	1.37	0.06
Oropharynx	1	2.08	1	0.64	4	4.92*	0	0.00	6	3.14	1.91	0.05
Hypopharynx	1	0.82	1	0.26	0	0.00	0	0.00	2	7.41	0.27*	-0.10
<b>Digestive system</b>	306	0.79*	1,312	0.95	883	0.99	388	0.95	2,889	3,072.15	0.94*	-3.33
Esophagus	9	0.97	22	0.68	24	1.19	15	1.62	70	71.00	0.99	-0.02
Stomach	26	0.81	120	1.06	79	1.08	26	0.77	251	252.75	0.99	-0.03
Small intestine	1	0.22	11	0.68	6	0.58	8	1.67	26	35.95	0.72	-0.18
Colon	167	0.83*	757	1.05	519	1.10*	215	0.97	1,658	1,612.94	1.03	0.82
Rectum, rectosigmoid junction	35	0.61*	193	0.98	111	0.93	58	1.13	397	425.02	0.93	-0.51
Rectum	26	0.69	120	0.92	77	0.96	42	1.19	265	283.03	0.94	-0.33
Anus, anal canal	4	0.98	11	0.78	7	0.82	1	0.26	23	30.57	0.75	-0.14
Liver	6	0.77	11	0.40*	6	0.35*	7	0.95	30	59.76	0.50*	-0.54
Gallbladder	8	0.85	16	0.49*	10	0.50*	9	1.05	43	70.62	0.61*	-0.50
Bile ducts, other biliary	12	1.37	28	0.87	14	0.63	6	0.54	60	74.17	0.81	-0.26
Pancreas	38	0.75	130	0.72*	102	0.87	39	0.71*	309	403.51	0.77*	-1.72
<b>Respiratory system</b>	123	0.75*	390	0.70*	245	0.76*	94	0.77*	852	1,164.71	0.73*	-5.69
Nose, nasal cavity, ear	0	0.00	4	0.59	1	0.23	3	1.54	8	14.97	0.53	-0.13
Larynx	4	1.01	7	0.55	2	0.30	2	0.85	15	25.69	0.58*	-0.19
Lung, bronchus	118	0.75*	378	0.70*	241	0.78*	89	0.76*	826	1,120.83	0.74*	-5.36
<b>Female breast</b>	347	1.03	1,402	1.21*	843	1.24*	355	1.27*	2,947	2,453.44	1.20*	8.98
<b>Female genital system</b>	173	1.18*	581	1.19*	381	1.38*	122	1.10	1,257	1,020.13	1.23*	4.31
Cervix uteri	11	0.81	47	1.08	16	0.69	3	0.33*	77	89.28	0.86	-0.22
Corpus uteri	108	1.51*	338	1.45*	239	1.90*	71	1.54*	756	476.92	1.59*	5.08
Ovary	43	0.97	149	0.99	89	1.01	28	0.76	309	320.03	0.97	-0.20
Vagina	1	0.34	6	0.58	5	0.78	1	0.36	13	22.60	0.58*	-0.17
Vulva	5	0.52	28	0.80	20	0.85	12	1.01	65	80.05	0.81	-0.27
<b>Urinary system</b>	72	0.99	251	0.98	166	1.03	68	0.94	557	563.77	0.99	-0.12
Urinary bladder	40	0.87	152	0.93	105	1.01	47	0.97	344	361.44	0.95	-0.32
Kidney parenchyma	29	1.42	79	1.11	43	1.01	18	1.01	169	151.83	1.11	0.31
Renal pelvis, other urinary	3	0.45	20	0.86	18	1.25	3	0.49	44	50.50	0.87	-0.12
Ureter	1	0.47	4	0.54	6	1.30	1	0.51	12	16.13	0.74	-0.08
<b>Bone, joints</b>	0	0.00	4	0.99	2	0.83	0	0.00	6	8.61	0.70	-0.05
<b>Soft tissue including heart</b>	4	0.75	13	0.69	21	1.71*	4	0.70	42	42.11	1.00	0.00
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	0.43	2	1.63	3	7.42	0.40	-0.08
<b>Melanoma of skin</b>	19	0.92	87	1.19	55	1.18	24	1.08	185	162.43	1.14	0.41
<b>Eye, orbit</b>	1	0.53	11	1.74	2	0.54	3	1.81	17	13.59	1.25	0.06
<b>Brain, central nervous system</b>	7	0.56	29	0.69*	16	0.68	4	0.45	56	86.60	0.65*	-0.56
<b>Thyroid</b>	10	1.36	36	1.48*	11	0.81	7	1.33	64	50.44	1.27	0.25
<b>Lymphatic, hematopoietic</b>	102	0.87	326	0.78*	247	0.93	106	0.89	781	916.55	0.85*	-2.47
Hodgkin lymphoma	9	3.23*	7	0.75	4	0.75	3	1.51	23	19.46	1.18	0.06
Non-Hodgkin lymphoma	43	0.80	144	0.75*	125	1.03	54	1.01	366	419.95	0.87*	-0.98
Myeloma	22	1.06	75	1.03	42	0.93	12	0.63	151	158.10	0.96	-0.13
Leukemia	28	0.70	100	0.70*	76	0.82	37	0.83	241	319.04	0.76*	-1.42
Acute lymphocytic	1	1.06	4	1.17	1	0.45	1	0.92	7	7.68	0.91	-0.01
Chronic lymphocytic	7	0.44*	23	0.41*	22	0.62*	11	0.66	63	123.89	0.51*	-1.11
Acute non-lymphocytic	11	0.80	46	0.94	33	1.04	12	0.81	102	109.40	0.93	-0.13
Chronic myeloid	6	1.13	18	0.94	13	1.02	9	1.40	46	43.69	1.05	0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Breast**  
**Females, Radiotherapy**

**Table 7.1.8:** Risk of subsequent primary cancers after cancer of the breast, females, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	109,188	86,112	933	1.12*	3,971	1.32*	2,845	1.39*	2,176	1.44*	9,925	7,400.22	1.34*	38.35
All excluding same site			523	0.91*	2,217	1.06*	1,649	1.15*	1,338	1.25*	5,727	5,167.83	1.11*	8.49
<b>Buccal cavity, pharynx</b>			19	1.28	51	0.96	49	1.38*	21	0.82	140	129.15	1.08	0.16
Lip			0	0.00	4	1.23	1	0.43	1	0.56	6	8.22	0.73	-0.03
Tongue			6	1.80	11	0.92	9	1.13	5	0.88	31	28.93	1.07	0.03
Salivary gland			5	2.99	12	2.00*	7	1.75	6	2.05	30	14.61	2.05*	0.23
Mouth			7	1.42	13	0.73	18	1.50	2	0.23*	40	43.55	0.92	-0.05
Nasopharynx			0	0.00	1	0.42	1	0.66	1	0.97	3	5.61	0.53	-0.04
Tonsil			0	0.00	6	1.22	8	2.58*	2	0.96	16	11.50	1.39	0.07
Oropharynx			0	0.00	2	1.48	0	0.00	0	0.00	2	3.26	0.61	-0.02
Hypopharynx			1	0.95	1	0.27	3	1.23	3	1.77	8	8.93	0.90	-0.01
<b>Digestive system</b>			133	0.80*	652	1.06	451	1.04	352	1.06	1,588	1,549.84	1.02	0.58
Esophagus			4	0.82	20	1.12	28	2.24*	28	2.93*	80	44.83	1.78*	0.53
Stomach			13	1.04	83	1.82*	44	1.39*	30	1.26	170	113.69	1.50*	0.86
Small intestine			1	0.37	15	1.50	6	0.85	4	0.73	26	25.21	1.03	0.01
Colon			62	0.77*	310	1.03	227	1.05	167	1.01	766	764.10	1.00	0.03
Rectum, rectosigmoid junction			21	0.77	102	1.03	69	1.02	45	0.90	237	244.46	0.97	-0.11
Rectum			15	0.84	72	1.10	47	1.05	30	0.90	164	161.40	1.02	0.04
Anus, anal canal			4	1.55	11	1.17	5	0.78	7	1.48	27	23.10	1.17	0.06
Liver			3	0.76	9	0.61	6	0.58	7	0.86	25	37.18	0.67*	-0.19
Gallbladder			2	0.56	14	1.07	4	0.44	4	0.60	24	32.52	0.74	-0.13
Bile ducts, other biliary			2	0.55	14	1.02	9	0.90	10	1.25	35	35.40	0.99	-0.01
Pancreas			20	0.92	69	0.85	50	0.86	47	1.05	186	205.79	0.90	-0.30
<b>Respiratory system</b>			78	0.69*	361	0.86*	312	1.07	330	1.46*	1,081	1,049.08	1.03	0.48
Nose, nasal cavity, ear			2	1.84	6	1.52	2	0.74	5	2.46	15	9.80	1.53	0.08
Larynx			4	1.04	8	0.59	2	0.22*	4	0.63	18	32.67	0.55*	-0.22
Lung, bronchus			71	0.66*	347	0.87*	306	1.09	318	1.47*	1,042	1,004.09	1.04	0.58
<b>Female breast</b>			410	1.59*	1,754	1.90*	1,196	1.95*	838	1.90*	4,198	2,232.39	1.88*	29.86
<b>Female genital system</b>			120	1.06	526	1.33*	358	1.40*	232	1.30*	1,236	944.32	1.31*	4.43
Cervix uteri			15	1.05	51	1.10	18	0.67	11	0.68	95	103.73	0.92	-0.13
Corpus uteri			63	1.09	300	1.48*	221	1.68*	122	1.32*	706	483.77	1.46*	3.38
Ovary			34	1.03	149	1.27*	98	1.27*	79	1.44*	360	282.76	1.27*	1.17
Vagina			0	0.00	5	0.93	2	0.55	7	2.61*	14	13.19	1.06	0.01
Vulva			5	1.15	13	0.80	10	0.88	7	0.80	35	40.72	0.86	-0.09
<b>Urinary system</b>			46	1.24	150	1.09	110	1.13	81	1.09	387	346.43	1.12*	0.62
Urinary bladder			18	0.86	77	0.98	65	1.17	49	1.14	209	197.94	1.06	0.17
Kidney parenchyma			24	1.80*	64	1.31*	39	1.16	25	0.97	152	121.61	1.25*	0.46
Renal pelvis, other urinary			4	1.39	9	0.84	6	0.79	7	1.21	26	26.88	0.97	-0.01
Ureter			2	2.34	2	0.63	0	0.00	4	2.30	8	8.07	0.99	0.00
<b>Bone, joints</b>			0	0.00	2	0.69	3	1.60	8	6.11*	13	6.89	1.89*	0.09
<b>Soft tissue including heart</b>			2	0.59	19	1.56	28	3.42*	18	2.99*	67	29.72	2.25*	0.57
<b>Kaposi sarcoma</b>			0	0.00	1	1.19	0	0.00	1	2.00	2	2.19	0.91	0.00
<b>Melanoma of skin</b>			33	1.70*	93	1.35*	63	1.39*	53	1.66*	242	165.36	1.46*	1.16
<b>Eye, orbit</b>			0	0.00	4	0.91	3	1.04	5	2.43	12	10.55	1.14	0.02
<b>Brain, central nervous system</b>			8	0.89	28	0.87	22	1.03	15	0.98	73	77.83	0.94	-0.07
<b>Thyroid</b>			20	1.98*	36	1.06	25	1.22	18	1.38	99	77.61	1.28*	0.32
<b>Lymphatic, hematopoietic</b>			49	0.82	255	1.16*	194	1.26*	165	1.41*	663	550.35	1.20*	1.71
Hodgkin lymphoma			5	2.30	6	0.82	11	2.41*	7	2.30	29	17.13	1.69*	0.18
Non-Hodgkin lymphoma			21	0.71	75	0.68*	75	0.97	82	1.38*	253	276.32	0.92	-0.35
Myeloma			10	1.00	37	1.00	26	1.00	21	1.06	94	92.91	1.01	0.02
Leukemia			13	0.74	137	2.10*	82	1.78*	55	1.57*	287	164.00	1.75*	1.87
Acute lymphocytic			3	4.98*	4	1.86	4	2.78	0	0.00	11	5.23	2.10*	0.09
Chronic lymphocytic			1	0.15*	15	0.61	17	0.97	25	1.87*	58	61.99	0.94	-0.06
Acute non-lymphocytic			6	0.93	95	3.96*	44	2.62*	23	1.79*	168	60.06	2.80*	1.64
Chronic myeloid			3	1.20	15	1.65	9	1.42	6	1.26	33	22.68	1.45*	0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.1.9:** Risk of subsequent primary cancers after cancer of the breast, females, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,121	1.14*	8,685	1.18*	7,014	1.12*	6,755	1.08*	24,575	21,741.16	1.13*	16.49
All excluding same site	1,265	0.95	5,179	0.98	4,422	0.99	4,479	0.99	15,345	15,593.26	0.98*	-1.44
<b>Buccal cavity, pharynx</b>	30	0.88	138	1.04	122	1.12	121	1.15	411	381.18	1.08	0.17
Lip	2	0.88	6	0.66	6	0.77	13	1.62	27	27.25	0.99	0.00
Tongue	8	1.08	32	1.10	26	1.07	24	1.03	90	84.11	1.07	0.03
Salivary gland	7	1.87	24	1.63*	14	1.15	16	1.31	61	42.83	1.42*	0.11
Mouth	6	0.51	43	0.93	44	1.16	43	1.17	136	132.71	1.02	0.02
Nasopharynx	2	1.43	11	2.05*	6	1.40	2	0.50	21	15.08	1.39	0.03
Tonsil	3	0.99	6	0.52	11	1.21	11	1.38	31	31.69	0.98	0.00
Oropharynx	1	1.20	2	0.61	6	2.25	1	0.41	10	9.24	1.08	0.00
Hypopharynx	1	0.44	7	0.79	5	0.70	6	0.91	19	24.90	0.76	-0.03
<b>Digestive system</b>	400	0.91	1,743	1.00	1,433	0.97	1,512	1.03	5,088	5,126.33	0.99	-0.22
Esophagus	14	1.19	48	1.03	43	1.08	58	1.43*	163	138.73	1.17*	0.14
Stomach	30	0.85	138	1.01	107	0.95	128	1.18	403	393.41	1.02	0.06
Small intestine	1	0.17*	18	0.77	27	1.29	34	1.51*	80	72.82	1.10	0.04
Colon	222	1.01	955	1.09*	789	1.06	751	1.01	2,717	2,587.70	1.05*	0.75
Rectum, rectosigmoid junction	56	0.80	278	1.01	206	0.92	234	1.09	774	784.11	0.99	-0.06
Rectum	40	0.87	161	0.90	133	0.90	145	1.01	479	515.59	0.93	-0.21
Anus, anal canal	4	0.71	18	0.80	21	1.09	16	0.82	59	67.03	0.88	-0.05
Liver	6	0.68	21	0.59*	17	0.54*	29	0.85	73	110.28	0.66*	-0.22
Gallbladder	7	0.68	20	0.50*	16	0.49*	36	1.19	79	113.28	0.70*	-0.20
Bile ducts, other biliary	14	1.51	36	0.96	21	0.63*	33	0.91	104	116.45	0.89	-0.07
Pancreas	43	0.76	188	0.83*	171	0.88	172	0.87	574	675.17	0.85*	-0.59
<b>Respiratory system</b>	203	0.89	867	0.93*	731	0.88*	838	0.93*	2,639	2,900.86	0.91*	-1.52
Nose, nasal cavity, ear	1	0.39	8	0.80	8	0.94	5	0.58	22	29.77	0.74	-0.05
Larynx	8	1.02	33	1.07	21	0.83	27	1.10	89	88.39	1.01	0.00
Lung, bronchus	192	0.88	824	0.92*	701	0.88*	804	0.93*	2,521	2,775.31	0.91*	-1.48
<b>Female breast</b>	856	1.61*	3,506	1.67*	2,592	1.47*	2,276	1.30*	9,230	6,147.90	1.50*	17.93
<b>Female genital system</b>	286	1.16*	1,146	1.21*	964	1.28*	782	1.10*	3,178	2,659.33	1.20*	3.02
Cervix uteri	22	0.72	91	0.83	53	0.68*	34	0.54*	200	280.69	0.71*	-0.47
Corpus uteri	155	1.25*	634	1.33*	555	1.46*	416	1.15*	1,760	1,346.26	1.31*	2.41
Ovary	97	1.37*	350	1.26*	297	1.30*	270	1.22*	1,014	797.08	1.27*	1.26
Vagina	1	0.27	10	0.69	9	0.76	5	0.44	25	41.62	0.60*	-0.10
Vulva	4	0.36*	37	0.84	28	0.74	33	0.84	102	132.13	0.77*	-0.18
<b>Urinary system</b>	106	1.21	325	0.92	330	1.08	331	1.04	1,092	1,063.05	1.03	0.17
Urinary bladder	49	0.93	192	0.91	208	1.14	217	1.15*	666	633.26	1.05	0.19
Kidney parenchyma	53	1.91*	108	0.96	93	0.94	90	0.86	344	342.57	1.00	0.01
Renal pelvis, other urinary	4	0.54	25	0.85	29	1.16	24	0.95	82	87.21	0.94	-0.03
Ureter	0	0.00	4	0.44	10	1.29	8	1.04	22	26.89	0.82	-0.03
<b>Bone, joints</b>	2	1.13	5	0.73	8	1.45	8	1.51	23	19.43	1.18	0.02
<b>Soft tissue including heart</b>	4	0.54	32	1.10	30	1.22	29	1.15	95	86.44	1.10	0.05
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	0.38	3	1.17	4	8.96	0.45	-0.03
<b>Melanoma of skin</b>	41	1.13	158	1.09	133	1.08	126	1.01	458	429.98	1.07	0.16
<b>Eye, orbit</b>	1	0.35	16	1.46	11	1.25	7	0.82	35	31.12	1.12	0.02
<b>Brain, central nervous system</b>	13	0.68	82	1.08	46	0.73*	40	0.65*	181	218.93	0.83*	-0.22
<b>Thyroid</b>	36	2.03*	91	1.36*	72	1.37*	47	0.98	246	185.23	1.33*	0.35
<b>Lymphatic, hematopoietic</b>	127	0.90	480	0.85*	431	0.88*	484	0.96	1,522	1,695.83	0.90*	-1.01
Hodgkin lymphoma	6	1.29	8	0.46*	6	0.45*	13	1.07	33	47.65	0.69*	-0.09
Non-Hodgkin lymphoma	60	0.91	203	0.76*	197	0.83*	248	0.99	708	821.08	0.86*	-0.66
Myeloma	23	0.94	97	1.00	72	0.87	78	0.92	270	289.42	0.93	-0.11
Leukemia	38	0.83	172	0.94	156	1.01	145	0.93	511	537.69	0.95	-0.16
Acute lymphocytic	0	0.00	6	1.13	3	0.67	2	0.45	11	15.57	0.71	-0.03
Chronic lymphocytic	10	0.56	30	0.42*	36	0.60*	44	0.74*	120	207.97	0.58*	-0.51
Acute non-lymphocytic	19	1.19	111	1.74*	83	1.53*	61	1.09	274	189.74	1.44*	0.49
Chronic myeloid	5	0.78	16	0.63	21	0.99	23	1.08	65	74.23	0.88	-0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Breast**  
**Females, Long-term Follow-up, Radiotherapy**

**Table 7.1.10:** Risk of subsequent primary cancers after cancer of the breast, females, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	109,188		21,912		8,686		3,168		109,188			
<b>Person-years in interval</b>	547,798		72,946		26,986		10,566		658,296			
<b>All subsequent cancers</b>	7,749	1.32*	1,433	1.50*	520	1.34*	223	1.32*	9,925	7,400.22	1.34*	38.35
All excluding same site	4,389	1.07*	855	1.27*	323	1.17*	160	1.31*	5,727	5,167.83	1.11*	8.49
<b>Buccal cavity, pharynx</b>	119	1.15	13	0.80	5	0.77	3	1.10	140	129.15	1.08	0.16
Lip	5	0.78	0	0.00	0	0.00	1	4.70	6	8.22	0.73	-0.03
Tongue	26	1.12	1	0.27	3	2.07	1	1.66	31	28.93	1.07	0.03
Salivary gland	24	2.06*	5	2.70	0	0.00	1	3.05	30	14.61	2.05*	0.23
Mouth	38	1.09	2	0.36	0	0.00	0	0.00	40	43.55	0.92	-0.05
Nasopharynx	2	0.44	0	0.00	1	3.84	0	0.00	3	5.61	0.53	-0.04
Tonsil	14	1.48	1	0.74	1	1.89	0	0.00	16	11.50	1.39	0.07
Oropharynx	2	0.76	0	0.00	0	0.00	0	0.00	2	3.26	0.61	-0.02
Hypopharynx	5	0.69	3	2.75	0	0.00	0	0.00	8	8.93	0.90	-0.01
<b>Digestive system</b>	1,236	1.02	224	1.08	83	0.97	45	1.16	1,588	1,549.84	1.02	0.58
Esophagus	52	1.47*	16	2.68*	10	4.06*	2	1.78	80	44.83	1.78*	0.53
Stomach	140	1.56*	23	1.54	2	0.32	5	1.82	170	113.69	1.50*	0.86
Small intestine	22	1.11	2	0.59	2	1.41	0	0.00	26	25.21	1.03	0.01
Colon	599	1.00	108	1.04	39	0.91	20	1.03	766	764.10	1.00	0.03
Rectum, rectosigmoid junction	192	0.99	27	0.85	12	0.95	6	1.09	237	244.46	0.97	-0.11
Rectum	134	1.05	17	0.81	8	0.95	5	1.33	164	161.40	1.02	0.04
Anus, anal canal	20	1.09	6	2.01	1	0.82	0	0.00	27	23.10	1.17	0.06
Liver	18	0.62*	4	0.81	1	0.47	2	1.91	25	37.18	0.67*	-0.19
Gallbladder	20	0.77	2	0.47	1	0.58	1	1.36	24	32.52	0.74	-0.13
Bile ducts, other biliary	25	0.91	6	1.22	3	1.42	1	1.00	35	35.40	0.99	-0.01
Pancreas	139	0.86	29	1.04	10	0.86	8	1.50	186	205.79	0.90	-0.30
<b>Respiratory system</b>	751	0.91*	192	1.37*	90	1.53*	48	1.79*	1,081	1,049.08	1.03	0.48
Nose, nasal cavity, ear	10	1.29	5	3.90*	0	0.00	0	0.00	15	9.80	1.53	0.08
Larynx	14	0.53*	2	0.49	2	1.24	0	0.00	18	32.67	0.55*	-0.22
Lung, bronchus	724	0.92*	184	1.37*	86	1.52*	48	1.86*	1,042	1,004.09	1.04	0.58
<b>Female breast</b>	3,360	1.87*	578	2.05*	197	1.77*	63	1.34*	4,198	2,232.39	1.88*	29.86
<b>Female genital system</b>	1,004	1.31*	160	1.39*	49	1.08	23	1.24	1,236	944.32	1.31*	4.43
Cervix uteri	84	0.96	7	0.64	4	1.01	0	0.00	95	103.73	0.92	-0.13
Corpus uteri	584	1.49*	88	1.49*	24	1.03	10	1.03	706	483.77	1.46*	3.38
Ovary	281	1.23*	53	1.51*	15	1.08	11	1.90	360	282.76	1.27*	1.17
Vagina	7	0.67	4	2.35	3	4.41	0	0.00	14	13.19	1.06	0.01
Vulva	28	0.88	4	0.73	2	0.89	1	0.98	35	40.72	0.86	-0.09
<b>Urinary system</b>	306	1.13*	53	1.14	22	1.14	6	0.68	387	346.43	1.12*	0.62
Urinary bladder	160	1.03	33	1.23	11	0.98	5	0.98	209	197.94	1.06	0.17
Kidney parenchyma	127	1.32*	17	1.06	7	1.05	1	0.34	152	121.61	1.25*	0.46
Renal pelvis, other urinary	19	0.90	3	0.84	4	2.68	0	0.00	26	26.88	0.97	-0.01
Ureter	4	0.63	1	0.93	3	6.66*	0	0.00	8	8.07	0.99	0.00
<b>Bone, joints</b>	5	0.90	7	8.36*	1	3.04	0	0.00	13	6.89	1.89*	0.09
<b>Soft tissue including heart</b>	49	2.07*	11	2.90*	4	2.57	3	4.44	67	29.72	2.25*	0.57
<b>Kaposi sarcoma</b>	1	0.59	1	3.18	0	0.00	0	0.00	2	2.19	0.91	0.00
<b>Melanoma of skin</b>	189	1.42*	35	1.72*	9	1.13	9	2.57*	242	165.36	1.46*	1.16
<b>Eye, orbit</b>	7	0.82	4	3.06	1	1.89	0	0.00	12	10.55	1.14	0.02
<b>Brain, central nervous system</b>	58	0.93	6	0.61	8	2.07	1	0.61	73	77.83	0.94	-0.07
<b>Thyroid</b>	81	1.25	15	1.75	2	0.63	1	0.79	99	77.61	1.28*	0.32
<b>Lymphatic, hematopoietic</b>	498	1.15*	106	1.44*	42	1.38	17	1.24	663	550.35	1.20*	1.71
Hodgkin lymphoma	22	1.56	1	0.51	4	5.22*	2	6.55	29	17.13	1.69*	0.18
Non-Hodgkin lymphoma	171	0.79*	56	1.51*	15	0.98	11	1.57	253	276.32	0.92	-0.35
Myeloma	73	1.00	14	1.13	7	1.35	0	0.00	94	92.91	1.01	0.02
Leukemia	232	1.80*	35	1.59*	16	1.77*	4	1.00	287	164.00	1.75*	1.87
Acute lymphocytic	11	2.63*	0	0.00	0	0.00	0	0.00	11	5.23	2.10*	0.09
Chronic lymphocytic	33	0.68*	18	2.15*	6	1.73	1	0.67	58	61.99	0.94	-0.06
Acute non-lymphocytic	145	3.07*	13	1.62	9	2.73*	1	0.65	168	60.06	2.80*	1.64
Chronic myeloid	27	1.51	3	1.00	1	0.82	2	3.81	33	22.68	1.45*	0.16

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.1.11:** Risk of subsequent primary cancers after cancer of the breast, females, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	17,820	1.15*	3,995	1.10*	1,943	1.07*	817	0.99	24,575	21,741.16	1.13*	16.49
All excluding same site	10,866	0.98*	2,592	1.00	1,304	0.99	583	0.97	15,345	15,593.26	0.98*	-1.44
<b>Buccal cavity, pharynx</b>	290	1.05	62	1.01	49	1.62*	10	0.76	411	381.18	1.08	0.17
Lip	14	0.73	8	1.75	3	1.27	2	1.81	27	27.25	0.99	0.00
Tongue	66	1.09	12	0.87	11	1.64	1	0.34	90	84.11	1.07	0.03
Salivary gland	45	1.47*	6	0.86	7	1.96	3	1.84	61	42.83	1.42*	0.11
Mouth	93	0.97	22	1.02	19	1.80*	2	0.43	136	132.71	1.02	0.02
Nasopharynx	19	1.72*	2	0.85	0	0.00	0	0.00	21	15.08	1.39	0.03
Tonsil	20	0.84	5	1.03	6	2.63	0	0.00	31	31.69	0.98	0.00
Oropharynx	9	1.33	1	0.69	0	0.00	0	0.00	10	9.24	1.08	0.00
Hypopharynx	13	0.71	4	1.02	1	0.54	1	1.25	19	24.90	0.76	-0.03
<b>Digestive system</b>	3,576	0.98	844	0.99	457	1.08	211	1.07	5,088	5,126.33	0.99	-0.22
Esophagus	105	1.07	32	1.37	16	1.36	10	1.80	163	138.73	1.17*	0.14
Stomach	275	0.96	71	1.12	38	1.23	19	1.35	403	393.41	1.02	0.06
Small intestine	46	0.92	21	1.66*	12	1.80	1	0.31	80	72.82	1.10	0.04
Colon	1,966	1.07*	417	0.97	222	1.03	112	1.12	2,717	2,587.70	1.05*	0.75
Rectum, rectosigmoid junction	540	0.95	132	1.05	78	1.28*	24	0.87	774	784.11	0.99	-0.06
Rectum	334	0.90*	77	0.92	55	1.34*	13	0.69	479	515.59	0.93	-0.21
Anus, anal canal	43	0.90	5	0.45	6	1.06	5	1.96	59	67.03	0.88	-0.05
Liver	44	0.58*	17	0.89	6	0.60	6	1.17	73	110.28	0.66*	-0.22
Gallbladder	43	0.52*	22	1.23	11	1.28	3	0.80	79	113.28	0.70*	-0.20
Bile ducts, other biliary	71	0.88	19	0.94	8	0.75	6	1.16	104	116.45	0.89	-0.07
Pancreas	402	0.84*	95	0.83	57	0.99	20	0.74	574	675.17	0.85*	-0.59
<b>Respiratory system</b>	1,801	0.90*	464	0.91	251	0.94	123	0.97	2,639	2,900.86	0.91*	-1.52
Nose, nasal cavity, ear	17	0.80	2	0.40	3	1.22	0	0.00	22	29.77	0.74	-0.05
Larynx	62	0.97	16	1.11	9	1.28	2	0.67	89	88.39	1.01	0.00
Lung, bronchus	1,717	0.90*	445	0.91	238	0.93	121	0.99	2,521	2,775.31	0.91*	-1.48
<b>Female breast</b>	6,954	1.58*	1,403	1.37*	639	1.26*	234	1.05	9,230	6,147.90	1.50*	17.93
<b>Female genital system</b>	2,396	1.23*	500	1.19*	209	1.02	73	0.83	3,178	2,659.33	1.20*	3.02
Cervix uteri	166	0.76*	21	0.54*	12	0.70	1	0.15*	200	280.69	0.71*	-0.47
Corpus uteri	1,344	1.37*	278	1.31*	103	0.98	35	0.77	1,760	1,346.26	1.31*	2.41
Ovary	744	1.29*	163	1.26*	76	1.19	31	1.12	1,014	797.08	1.27*	1.26
Vagina	20	0.66	3	0.45	1	0.31	1	0.69	25	41.62	0.60*	-0.10
Vulva	69	0.74*	24	1.07	7	0.61	2	0.38	102	132.13	0.77*	-0.18
<b>Urinary system</b>	761	1.02	185	1.02	105	1.13	41	0.94	1,092	1,063.05	1.03	0.17
Urinary bladder	449	1.01	122	1.14	66	1.20	29	1.13	666	633.26	1.05	0.19
Kidney parenchyma	254	1.07	51	0.86	31	1.01	8	0.56	344	342.57	1.00	0.01
Renal pelvis, other urinary	58	0.94	12	0.83	8	1.10	4	1.15	82	87.21	0.94	-0.03
Ureter	14	0.73	3	0.68	3	1.35	2	1.90	22	26.89	0.82	-0.03
<b>Bone, joints</b>	15	1.06	7	2.29	0	0.00	1	1.43	23	19.43	1.18	0.02
<b>Soft tissue including heart</b>	66	1.08	16	1.11	8	1.08	5	1.50	95	86.44	1.10	0.05
<b>Kaposi sarcoma</b>	1	0.16*	2	1.31	1	1.37	0	0.00	4	8.96	0.45	-0.03
<b>Melanoma of skin</b>	332	1.09	80	1.12	27	0.74	19	1.12	458	429.98	1.07	0.16
<b>Eye, orbit</b>	28	1.24	2	0.40	3	1.20	2	1.86	35	31.12	1.12	0.02
<b>Brain, central nervous system</b>	141	0.89	26	0.73	10	0.57	4	0.51	181	218.93	0.83*	-0.22
<b>Thyroid</b>	199	1.45*	30	1.06	9	0.66	8	1.37	246	185.23	1.33*	0.35
<b>Lymphatic, hematopoietic</b>	1,038	0.87*	287	1.00	140	0.95	57	0.84	1,522	1,695.83	0.90*	-1.01
Hodgkin lymphoma	20	0.56*	4	0.55	9	2.56*	0	0.00	33	47.65	0.69*	-0.09
Non-Hodgkin lymphoma	460	0.81*	153	1.08	69	0.94	26	0.75	708	821.08	0.86*	-0.66
Myeloma	192	0.94	48	0.98	20	0.81	10	0.88	270	289.42	0.93	-0.11
Leukemia	366	0.96	82	0.91	42	0.93	21	1.02	511	537.69	0.95	-0.16
Acute lymphocytic	9	0.81	1	0.39	1	0.80	0	0.00	11	15.57	0.71	-0.03
Chronic lymphocytic	76	0.51*	24	0.69	11	0.64	9	1.18	120	207.97	0.58*	-0.51
Acute non-lymphocytic	213	1.59*	33	1.04	16	0.98	12	1.55	274	189.74	1.44*	0.49
Chronic myeloid	42	0.79	16	1.30	7	1.14	0	0.00	65	74.23	0.88	-0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Breast Infiltrating Ductal Carcinoma NOS, Females

**Table 7.1.12:** Risk of subsequent primary cancers after infiltrating ductal carcinoma of the breast, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	225,778		207,743		124,981		64,754		225,778			
<b>Person-years in interval</b>	180,326		651,897		459,611		358,272		1,650,107			
<b>All subsequent cancers</b>	2,054	1.10*	8,795	1.21*	6,831	1.18*	5,972	1.15*	23,652	20,131.63	1.17*	21.33
All excluding same site	1,253	0.95	5,158	1.00	4,248	1.03	3,901	1.04*	14,560	14,315.82	1.02*	1.48
<b>Buccal cavity, pharynx</b>	33	0.97	134	1.03	120	1.19	96	1.10	383	352.06	1.09	0.19
Lip	2	0.93	7	0.82	6	0.85	11	1.68	26	24.33	1.07	0.01
Tongue	9	1.20	35	1.22	23	1.02	18	0.93	85	78.13	1.09	0.04
Salivary gland	8	2.13	23	1.59*	16	1.41	18	1.78*	65	39.64	1.64*	0.15
Mouth	8	0.69	36	0.81	45	1.29	30	0.99	119	121.30	0.98	-0.01
Nasopharynx	1	0.68	8	1.45	4	0.97	1	0.29	14	14.53	0.96	0.00
Tonsil	3	0.97	9	0.78	13	1.54	9	1.35	34	29.81	1.14	0.03
Oropharynx	1	1.18	3	0.92	4	1.61	0	0.00	8	8.64	0.93	0.00
Hypopharynx	1	0.43	5	0.56	4	0.60	7	1.27	17	23.34	0.73	-0.04
<b>Digestive system</b>	375	0.91	1,605	0.98	1,282	0.97	1,215	1.01	4,477	4,572.17	0.98	-0.58
Esophagus	10	0.87	48	1.07	50	1.38*	57	1.71*	165	125.96	1.31*	0.24
Stomach	26	0.80	132	1.05	94	0.94	97	1.10	349	345.95	1.01	0.02
Small intestine	1	0.17*	22	0.93	25	1.28	18	0.96	66	67.84	0.97	-0.01
Colon	201	0.98	861	1.06	701	1.05	593	0.98	2,356	2,291.94	1.03	0.39
Rectum, rectosigmoid junction	60	0.90	250	0.97	186	0.92	200	1.13	696	704.84	0.99	-0.05
Rectum	43	0.99	151	0.89	120	0.90	126	1.07	440	464.13	0.95	-0.15
Anus, anal canal	7	1.22	19	0.85	16	0.89	15	0.93	57	62.28	0.92	-0.03
Liver	7	0.78	19	0.54*	18	0.61*	20	0.70	64	102.54	0.62*	-0.23
Gallbladder	7	0.74	21	0.57*	11	0.38*	25	1.02	64	99.31	0.64*	-0.21
Bile ducts, other biliary	11	1.25	33	0.92	19	0.62*	28	0.94	91	104.65	0.87	-0.08
Pancreas	42	0.78	181	0.85*	148	0.84*	149	0.92	520	603.87	0.86*	-0.51
<b>Respiratory system</b>	202	0.84*	889	0.93*	770	0.97	843	1.11*	2,704	2,749.05	0.98	-0.27
Nose, nasal cavity, ear	3	1.19	9	0.92	8	1.02	7	0.98	27	27.29	0.99	0.00
Larynx	7	0.86	27	0.87	19	0.79	19	0.93	72	83.85	0.86	-0.07
Lung, bronchus	191	0.84*	851	0.93*	740	0.97	813	1.12*	2,595	2,631.06	0.99	-0.22
<b>Female breast</b>	801	1.45*	3,637	1.71*	2,583	1.55*	2,071	1.41*	9,092	5,815.81	1.56*	19.85
<b>Female genital system</b>	302	1.21*	1,190	1.27*	927	1.31*	644	1.08	3,063	2,489.76	1.23*	3.47
Cervix uteri	28	0.90	100	0.92	44	0.61*	31	0.60*	203	264.21	0.77*	-0.37
Corpus uteri	163	1.29*	665	1.39*	561	1.57*	350	1.15*	1,739	1,265.74	1.37*	2.87
Ovary	95	1.31*	355	1.28*	260	1.22*	208	1.13	918	747.71	1.23*	1.03
Vagina	1	0.28	12	0.87	10	0.93	9	0.96	32	37.48	0.85	-0.03
Vulva	5	0.47	36	0.86	31	0.90	27	0.85	99	118.63	0.83	-0.12
<b>Urinary system</b>	100	1.16	340	0.99	306	1.09	279	1.06	1,025	971.47	1.06	0.32
Urinary bladder	44	0.87	201	1.00	193	1.17*	183	1.18*	621	570.99	1.09*	0.30
Kidney parenchyma	49	1.71*	114	1.00	87	0.94	76	0.87	326	322.13	1.01	0.02
Renal pelvis, other urinary	7	0.99	25	0.90	26	1.15	20	0.97	78	78.35	1.00	0.00
Ureter	1	0.46	6	0.70	8	1.14	5	0.79	20	24.02	0.83	-0.02
<b>Bone, joints</b>	2	1.11	4	0.59	8	1.55	12	2.71*	26	18.18	1.43	0.05
<b>Soft tissue including heart</b>	5	0.67	37	1.28	45	1.96*	32	1.54*	119	80.27	1.48*	0.23
<b>Kaposi sarcoma</b>	0	0.00	1	0.38	1	0.45	1	0.50	3	7.54	0.40	-0.03
<b>Melanoma of skin</b>	48	1.22	171	1.13	149	1.25*	117	1.11	485	415.17	1.17*	0.42
<b>Eye, orbit</b>	0	0.00	19	1.78*	10	1.23	10	1.41	39	28.72	1.36	0.06
<b>Brain, central nervous system</b>	19	0.96	69	0.91	49	0.83	43	0.84	180	205.88	0.87	-0.16
<b>Thyroid</b>	35	1.77*	81	1.12	71	1.38*	41	1.00	228	184.37	1.24*	0.26
<b>Lymphatic, hematopoietic</b>	110	0.79*	520	0.95	422	0.94	440	1.06	1,492	1,548.36	0.96	-0.34
Hodgkin lymphoma	7	1.47	11	0.64	14	1.12	17	1.67	49	44.78	1.09	0.03
Non-Hodgkin lymphoma	55	0.83	197	0.74*	187	0.85*	228	1.10	667	760.33	0.88*	-0.57
Myeloma	17	0.72	98	1.05	55	0.73*	62	0.89	232	262.53	0.88	-0.19
Leukemia	31	0.71	214	1.25*	166	1.20*	133	1.05	544	480.71	1.13*	0.38
Acute lymphocytic	2	1.47	7	1.33	5	1.21	1	0.28	15	14.37	1.04	0.00
Chronic lymphocytic	7	0.42*	32	0.49*	36	0.67*	46	0.95	121	184.62	0.66*	-0.39
Acute non-lymphocytic	16	1.04	145	2.38*	90	1.82*	54	1.18	305	171.75	1.78*	0.81
Chronic myeloid	4	0.65	17	0.71	19	0.99	19	1.10	59	66.38	0.89	-0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.1.13:** Risk of subsequent primary cancers after lobular carcinoma of the breast, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	248	1.22*	890	1.15*	716	1.24*	561	1.14*	2,415	2,045.17	1.18*	23.45
All excluding same site	127	0.89	526	0.96	474	1.15*	374	1.05	1,501	1,458.28	1.03	2.71
<b>Buccal cavity, pharynx</b>	3	0.83	16	1.17	16	1.60	6	0.72	41	35.65	1.15	0.34
Lip	0	0.00	1	1.05	1	1.38	0	0.00	2	2.56	0.78	-0.04
Tongue	0	0.00	2	0.66	3	1.35	1	0.54	6	7.90	0.76	-0.12
Salivary gland	1	2.48	4	2.61	1	0.89	2	2.07	8	4.03	1.99	0.25
Mouth	1	0.80	8	1.69	7	2.01	2	0.69	18	12.38	1.45	0.36
Nasopharynx	1	7.11	1	1.92	1	2.68	0	0.00	3	1.34	2.23	0.11
Tonsil	0	0.00	0	0.00	2	2.42	0	0.00	2	2.96	0.68	-0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	1	1.52	1	1.89	2	2.36	0.85	-0.02
<b>Digestive system</b>	39	0.87	183	1.05	152	1.15	139	1.22*	513	465.20	1.10*	3.03
Esophagus	2	1.62	3	0.63	8	2.22	4	1.27	17	12.76	1.33	0.27
Stomach	7	2.09	28	2.18*	25	2.60*	20	2.47*	80	33.91	2.36*	2.92
Small intestine	0	0.00	2	0.78	1	0.51	3	1.70	6	6.93	0.87	-0.06
Colon	20	0.89	94	1.07	68	1.02	59	1.02	241	234.95	1.03	0.38
Rectum, rectosigmoid junction	5	0.70	32	1.17	24	1.19	23	1.38	84	71.42	1.18	0.80
Rectum	4	0.85	18	1.00	15	1.13	17	1.52	54	47.13	1.15	0.44
Anus, anal canal	0	0.00	1	0.42	1	0.56	2	1.30	4	6.35	0.63	-0.15
Liver	0	0.00	4	1.09	0	0.00	2	0.77	6	10.04	0.60	-0.26
Gallbladder	0	0.00	2	0.52	1	0.35	2	0.86	5	9.98	0.50	-0.32
Bile ducts, other biliary	1	1.01	3	0.77	1	0.33	4	1.42	9	10.74	0.84	-0.11
Pancreas	4	0.68	12	0.52*	21	1.20	15	0.98	52	61.56	0.84	-0.61
<b>Respiratory system</b>	25	0.93	68	0.65*	88	1.10	65	0.90	246	283.73	0.87*	-2.39
Nose, nasal cavity, ear	0	0.00	1	0.96	1	1.28	1	1.48	3	2.77	1.08	0.01
Larynx	2	2.31	3	0.92	0	0.00	4	2.03	9	8.43	1.07	0.04
Lung, bronchus	23	0.89	64	0.64*	87	1.14	60	0.86	234	271.84	0.86*	-2.40
<b>Female breast</b>	121	2.04*	364	1.62*	242	1.47*	187	1.35*	914	586.89	1.56*	20.74
<b>Female genital system</b>	19	0.73	121	1.24*	88	1.27*	52	0.92	280	249.36	1.12	1.94
Cervix uteri	1	0.35	8	0.79	4	0.61	3	0.64	16	24.31	0.66	-0.53
Corpus uteri	11	0.82	76	1.52*	54	1.53*	34	1.17	175	127.95	1.37*	2.98
Ovary	5	0.65	33	1.13	23	1.09	13	0.74	74	75.50	0.98	-0.09
Vagina	0	0.00	1	0.70	0	0.00	0	0.00	1	3.74	0.27	-0.17
Vulva	2	1.70	2	0.44	4	1.15	2	0.65	10	12.26	0.82	-0.14
<b>Urinary system</b>	11	1.14	34	0.91	29	1.03	31	1.24	105	100.21	1.05	0.30
Urinary bladder	6	1.06	19	0.86	18	1.07	19	1.28	62	59.25	1.05	0.17
Kidney parenchyma	5	1.57	13	1.06	9	0.97	8	0.97	35	32.92	1.06	0.13
Renal pelvis, other urinary	0	0.00	2	0.66	2	0.88	4	2.03	8	8.05	0.99	0.00
Ureter	0	0.00	0	0.00	1	1.43	2	3.32	3	2.46	1.22	0.03
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	2.37	1	1.82	0.55	-0.05
<b>Soft tissue including heart</b>	0	0.00	3	0.99	4	1.76	3	1.53	10	8.08	1.24	0.12
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.05
<b>Melanoma of skin</b>	5	1.17	22	1.36	16	1.35	10	0.99	53	42.47	1.25	0.67
<b>Eye, orbit</b>	1	3.28	0	0.00	0	0.00	1	1.46	2	2.96	0.68	-0.06
<b>Brain, central nervous system</b>	0	0.00	10	1.24	2	0.34	0	0.00*	12	20.94	0.57	-0.57
<b>Thyroid</b>	4	2.09	11	1.59	8	1.69	5	1.34	28	17.31	1.62*	0.68
<b>Lymphatic, hematopoietic</b>	18	1.18	49	0.83	54	1.20	45	1.14	166	158.94	1.04	0.45
Hodgkin lymphoma	2	4.21	1	0.58	0	0.00	0	0.00	3	4.38	0.68	-0.09
Non-Hodgkin lymphoma	9	1.20	16	0.55*	24	1.08	22	1.11	71	78.63	0.90	-0.48
Myeloma	3	1.17	8	0.81	12	1.61	8	1.23	31	26.43	1.17	0.29
Leukemia	4	0.83	24	1.29	18	1.28	15	1.24	61	49.49	1.23	0.73
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.44	0.00	-0.09
Chronic lymphocytic	1	0.54	5	0.70	5	0.92	7	1.50	18	19.16	0.94	-0.07
Acute non-lymphocytic	1	0.59	12	1.83	9	1.81	5	1.14	27	17.63	1.53*	0.59
Chronic myeloid	2	3.02	5	1.96	2	1.04	3	1.83	12	6.77	1.77	0.33

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.2.1:** Characteristics of patients with an initial cancer of the breast, males, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	2,158	100.0	—	—	2,158	100.0
<b>Initial treatment</b>						
Any radiation	543	25.2	—	—	543	25.2
With surgery	487	22.6	—	—	487	22.6
Without surgery	56	2.6	—	—	56	2.6
No radiation	1,615	74.8	—	—	1,615	74.8
With surgery	1,524	70.6	—	—	1,524	70.6
Without surgery	91	4.2	—	—	91	4.2
<b>Race</b>						
White	1,835	85.0	—	—	1,835	85.0
Black	235	10.9	—	—	235	10.9
Other	79	3.7	—	—	79	3.7
Unknown	9	0.4	—	—	9	0.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	6	0.3	—	—	6	0.3
30–49	255	11.8	—	—	255	11.8
50–69	1,059	49.1	—	—	1,059	49.1
70–79	548	25.4	—	—	548	25.4
≥ 80	290	13.4	—	—	290	13.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	1,843	85.4	—	—	1,843	85.4
1st and 2nd cancers	280	13.0	—	—	280	13.0
1st, 2nd, and 3rd cancers	31	1.4	—	—	31	1.4
1st, 2nd, 3rd, and additional cancers	4	0.2	—	—	4	0.2
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	66.0	—	—	—	66.0	—
Median year of 1st cancer diagnosis	1989.0	—	—	—	1989.0	—
Median person-years at risk	4.9	—	—	—	4.9	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	97.5	—	—	—	97.5
1st, 2nd, and additional cancers	—	96.5	—	—	—	96.5
1st cancer only	—	1.9	—	—	—	1.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 7.2.2:** Risk of subsequent primary cancers after cancer of the breast, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	2,158	1,686	1,917	5,919	1,087	3,895	519	2,633	2,158	14,133		
<b>All subsequent cancers</b>	38	1.14	133	1.07	114	1.24*	70	0.99	355	320.94	1.11	24.10
All excluding same site	36	1.08	123	0.99	110	1.20	68	0.96	337	320.33	1.05	11.80
<b>Buccal cavity, pharynx</b>	1	0.99	2	0.55	3	1.21	3	1.76	9	8.81	1.02	0.13
Lip	1	5.26	0	0.00	0	0.00	1	3.21	2	1.65	1.22	0.25
Tongue	0	0.00	0	0.00	0	0.00	1	3.05	1	1.66	0.60	-0.47
Salivary gland	0	0.00	1	3.32	0	0.00	0	0.00	1	0.78	1.28	0.15
Mouth	0	0.00	1	1.17	2	3.46	0	0.00	3	2.07	1.45	0.66
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.22
Tonsil	0	0.00	0	0.00	1	4.50	0	0.00	1	0.80	1.25	0.14
Oropharynx	0	0.00	0	0.00	0	0.00	1	20.31	1	0.25	3.97	0.53
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.97	0.00	-0.69
<b>Digestive system</b>	9	1.22	24	0.88	23	1.15	12	0.80	68	69.79	0.97	-1.27
Esophagus	0	0.00	1	0.59	2	1.66	0	0.00	3	4.26	0.70	-0.89
Stomach	1	1.12	5	1.54	4	1.72	1	0.59	11	8.16	1.35	2.01
Small intestine	0	0.00	0	0.00	1	3.67	0	0.00	1	0.95	1.05	0.04
Colon	5	1.58	10	0.84	10	1.13	8	1.20	33	30.51	1.08	1.76
Rectum, rectosigmoid junction	1	0.76	5	1.03	4	1.16	1	0.40	11	12.11	0.91	-0.78
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.31
Liver	1	3.56	1	0.95	1	1.28	0	0.00	3	2.73	1.10	0.19
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.43
Bile ducts, other biliary	1	6.51	1	1.71	0	0.00	0	0.00	2	1.55	1.29	0.32
Pancreas	0	0.00	1	0.32	1	0.44	2	1.19	4	7.93	0.50	-2.78
<b>Respiratory system</b>	1	0.15*	23	0.96	14	0.81	14	1.11	52	60.19	0.86	-5.79
Nose, nasal cavity, ear	0	0.00	1	5.38	0	0.00	0	0.00	1	0.47	2.15	0.38
Larynx	0	0.00	0	0.00	0	0.00	1	1.14	1	4.52	0.22	-2.49
Lung, bronchus	1	0.17*	22	1.01	14	0.89	13	1.12	50	55.05	0.91	-3.57
<b>Male breast</b>	2	29.48*	10	42.19*	4	23.17*	2	14.77*	18	0.61	29.36*	12.30
<b>Male genital system</b>	13	1.26	45	1.15	41	1.37	27	1.12	126	103.62	1.22*	15.84
Prostate	13	1.27	44	1.13	41	1.38	27	1.13	125	102.69	1.22*	15.79
Testis	0	0.00	1	8.08	0	0.00	0	0.00	1	0.27	3.76	0.52
<b>Urinary system</b>	4	1.25	11	0.91	14	1.56	4	0.57	33	31.24	1.06	1.25
Urinary bladder	3	1.29	8	0.91	13	1.97*	3	0.58	27	22.86	1.18	2.93
Kidney parenchyma	1	1.45	3	1.17	1	0.53	0	0.00	5	6.61	0.76	-1.14
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	2.68	1	1.77	0.57	-0.54
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.42
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.17
<b>Soft tissue including heart</b>	1	7.94	0	0.00	0	0.00	0	0.00	1	1.20	0.83	-0.14
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.32
<b>Melanoma of skin</b>	4	5.75*	3	1.13	2	0.99	3	1.74	12	7.10	1.69	3.47
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	11.23	1	0.42	2.37	0.41
<b>Brain, central nervous system</b>	0	0.00	1	0.87	1	1.23	0	0.00	2	2.87	0.70	-0.62
<b>Thyroid</b>	0	0.00	1	2.65	0	0.00	0	0.00	1	0.93	1.07	0.05
<b>Lymphatic, hematopoietic</b>	2	0.82	8	0.88	8	1.19	3	0.57	21	23.42	0.90	-1.71
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.46
Non-Hodgkin lymphoma	0	0.00	4	1.07	2	0.71	2	0.87	8	9.87	0.81	-1.32
Myeloma	2	4.64	1	0.63	3	2.55	0	0.00	6	4.11	1.46	1.33
Leukemia	0	0.00	3	0.88	3	1.19	1	0.52	7	8.79	0.80	-1.26
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.16
Chronic lymphocytic	0	0.00	1	0.72	2	1.95	0	0.00	3	3.56	0.84	-0.39
Acute non-lymphocytic	0	0.00	2	1.78	1	1.20	0	0.00	3	2.90	1.03	0.07
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	3.75	1	1.19	0.84	-0.13

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Breast**  
**Males, <65 Years of Age**

**Table 7.2.3:** Risk of subsequent primary cancers after cancer of the breast, males, <65 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	1,007 793		912 2,927		568 2,154		312 1,873		1,007 7,748			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	10	1.47	43	1.37	51	1.53*	47	1.07	151	115.28	1.31*	46.10
All excluding same site	10	1.47	37	1.18	48	1.44*	46	1.05	141	115.06	1.23*	33.48
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	1	0.84	1	0.86	2	4.08	0.49	-2.69
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.73
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-1.09
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.35
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-1.29
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.21
Tonsil	0	0.00	0	0.00	1	7.50	0	0.00	1	0.45	2.20	0.70
Oropharynx	0	0.00	0	0.00	0	0.00	1	26.83	1	0.14	7.38	1.12
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.64
<b>Digestive system</b>	4	2.79	7	1.08	10	1.51	6	0.70	27	23.05	1.17	5.10
Esophagus	0	0.00	1	1.80	1	1.90	0	0.00	2	1.81	1.10	0.24
Stomach	0	0.00	1	1.37	2	2.76	0	0.00	3	2.52	1.19	0.62
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.48
Colon	3	5.75*	2	0.82	6	2.28	5	1.38	16	9.21	1.74	8.77
Rectum, rectosigmoid junction	0	0.00	1	0.77	1	0.78	0	0.00	2	4.39	0.46	-3.08
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.26
Liver	1	14.02	1	3.17	0	0.00	0	0.00	2	1.09	1.83	1.17
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.20
Bile ducts, other biliary	0	0.00	1	8.60	0	0.00	0	0.00	1	0.46	2.17	0.70
Pancreas	0	0.00	0	0.00	0	0.00	1	1.03	1	2.68	0.37	-2.16
<b>Respiratory system</b>	0	0.00	8	1.12	6	0.85	14	1.70	28	24.03	1.17	5.12
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.24
Larynx	0	0.00	0	0.00	0	0.00	1	1.58	1	2.18	0.46	-1.52
Lung, bronchus	0	0.00	8	1.26	6	0.94	13	1.73	27	21.62	1.25	6.95
<b>Male breast</b>	0	0.00	6	93.03*	3	47.12*	1	12.37	10	0.22	44.51*	12.62
<b>Male genital system</b>	3	1.86	11	1.32	17	1.63	16	1.04	47	35.74	1.32	14.54
Prostate	3	1.91	10	1.22	17	1.65	16	1.05	46	35.33	1.30	13.78
Testis	0	0.00	1	11.27	0	0.00	0	0.00	1	0.20	5.09	1.04
<b>Urinary system</b>	0	0.00	3	1.03	9	2.93*	4	0.96	16	10.77	1.49	6.75
Urinary bladder	0	0.00	2	1.05	8	3.84*	3	1.01	13	7.35	1.77	7.29
Kidney parenchyma	0	0.00	1	1.17	1	1.21	0	0.00	2	2.86	0.70	-1.11
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	4.68	1	0.56	1.78	0.57
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.24
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.14
<b>Soft tissue including heart</b>	1	30.24	0	0.00	0	0.00	0	0.00	1	0.45	2.23	0.71
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.32
<b>Melanoma of skin</b>	2	8.84	2	2.11	0	0.00	2	1.75	6	3.21	1.87	3.60
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	17.27	1	0.17	5.78	1.07
<b>Brain, central nervous system</b>	0	0.00	1	2.31	0	0.00	0	0.00	1	1.34	0.75	-0.44
<b>Thyroid</b>	0	0.00	1	5.83	0	0.00	0	0.00	1	0.49	2.02	0.65
<b>Lymphatic, hematopoietic</b>	0	0.00	3	1.29	3	1.29	1	0.32	7	8.27	0.85	-1.64
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.41
Non-Hodgkin lymphoma	0	0.00	2	1.88	1	0.95	0	0.00	3	3.77	0.80	-1.00
Myeloma	0	0.00	1	2.58	1	2.52	0	0.00	2	1.40	1.43	0.78
Leukemia	0	0.00	0	0.00	1	1.26	1	0.94	2	2.79	0.72	-1.02
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.17	0.00	-1.51
Acute non-lymphocytic	0	0.00	0	0.00	1	3.99	0	0.00	1	0.89	1.12	0.14
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	6.92	1	0.37	2.68	0.81

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 7.2.4:** Risk of subsequent primary cancers after cancer of the breast, males, ≥65 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	28	1.06	90	0.97	63	1.07	23	0.85	204	205.66	0.99	-2.59
All excluding same site	26	0.98	86	0.93	62	1.06	22	0.81	196	205.27	0.95	-14.51
<b>Buccal cavity, pharynx</b>	1	1.49	2	0.90	2	1.56	2	3.65	7	4.73	1.48	3.55
Lip	1	6.73	0	0.00	0	0.00	1	7.64	2	1.08	1.85	1.44
Tongue	0	0.00	0	0.00	0	0.00	1	11.38	1	0.82	1.22	0.29
Salivary gland	0	0.00	1	4.49	0	0.00	0	0.00	1	0.51	1.95	0.76
Mouth	0	0.00	1	1.97	2	6.98	0	0.00	3	1.07	2.81	3.03
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.22
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.54
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.18
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.75
<b>Digestive system</b>	5	0.84	17	0.81	13	0.97	6	0.93	41	46.74	0.88	-8.98
Esophagus	0	0.00	0	0.00	1	1.48	0	0.00	1	2.45	0.41	-2.26
Stomach	1	1.37	4	1.58	2	1.25	1	1.28	8	5.64	1.42	3.70
Small intestine	0	0.00	0	0.00	1	5.98	0	0.00	1	0.58	1.72	0.66
Colon	2	0.76	8	0.85	4	0.65	3	0.98	17	21.30	0.80	-6.74
Rectum, rectosigmoid junction	1	0.97	4	1.13	3	1.38	1	1.03	9	7.72	1.17	2.01
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.38
Liver	0	0.00	0	0.00	1	2.11	0	0.00	1	1.64	0.61	-1.01
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.71
Bile ducts, other biliary	1	7.81	0	0.00	0	0.00	0	0.00	1	1.09	0.91	-0.15
Pancreas	0	0.00	1	0.42	1	0.67	1	1.40	3	5.26	0.57	-3.54
<b>Respiratory system</b>	1	0.20	15	0.89	8	0.79	0	0.00*	24	36.15	0.66*	-19.03
Nose, nasal cavity, ear	0	0.00	1	7.84	0	0.00	0	0.00	1	0.28	3.53	1.12
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.34	0.00	-3.67
Lung, bronchus	1	0.22	14	0.90	8	0.85	0	0.00*	23	33.43	0.69	-16.34
<b>Male breast</b>	2	38.35*	4	23.18*	1	9.17	1	18.32	8	0.39	20.60*	11.92
<b>Male genital system</b>	10	1.15	34	1.10	24	1.23	11	1.26	79	67.88	1.16	17.41
Prostate	10	1.16	34	1.11	24	1.24	11	1.27	79	67.37	1.17	18.22
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.11
<b>Urinary system</b>	4	1.56	8	0.88	5	0.85	0	0.00	17	20.47	0.83	-5.43
Urinary bladder	3	1.56	6	0.87	5	1.11	0	0.00	14	15.51	0.90	-2.36
Kidney parenchyma	1	2.03	2	1.17	0	0.00	0	0.00	3	3.75	0.80	-1.18
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.20	0.00	-1.89
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.64
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.20
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-1.18
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.32
<b>Melanoma of skin</b>	2	4.26	1	0.59	2	1.77	1	1.72	6	3.89	1.54	3.31
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.39
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	2.31	0	0.00	1	1.54	0.65	-0.84
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.68
<b>Lymphatic, hematopoietic</b>	2	1.06	5	0.74	5	1.14	2	0.93	14	15.15	0.92	-1.80
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.53
Non-Hodgkin lymphoma	0	0.00	2	0.75	1	0.56	2	2.25	5	6.10	0.82	-1.72
Myeloma	2	5.78	0	0.00	2	2.57	0	0.00	4	2.72	1.47	2.01
Leukemia	0	0.00	3	1.12	2	1.16	0	0.00	5	6.00	0.83	-1.57
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.22
Chronic lymphocytic	0	0.00	1	0.94	2	2.92	0	0.00	3	2.39	1.26	0.96
Acute non-lymphocytic	0	0.00	2	2.25	0	0.00	0	0.00	2	2.01	1.00	-0.01
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.81	0.00	-1.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.





# Chapter 8

## New Malignancies Following Cancer of the Cervix Uteri, Vagina, and Vulva

Ruth A. Kleinerman, Carol Kosary, Allan Hildesheim

### Synopsis

Subsequent primary cancer risk was evaluated in 37,757 women diagnosed with cancers of the cervix uteri, vagina, or vulva between 1973 and 2000. The overall risk of new malignancies was significantly increased among survivors of cervical cancer (O/E=1.32,<sup>1</sup> O=2,451, EAR=24 per 10,000 person-years) and vulvar cancer (O/E=1.12,<sup>1</sup> O=540, EAR=16) but not vaginal cancer (O/E=1.06,<sup>1</sup> O=109, EAR=7). Cancers of the lung and bronchus accounted for 24% of all new malignancies after cervical cancer, resulting in a 2.6-fold significant risk, likely due to cigarette smoking, which has been related to both of these malignancies. In addition, smoking and possibly human papillomavirus (HPV) infection may have contributed to the increased risks for certain cancers of the buccal cavity and pharynx after cervical and vulvar cancer and to the elevated risk for cancer of the esophagus after vaginal cancer. The excess of anal and vaginal cancer after cervical and vulvar cancer, as well as the excess of vulvar cancer following vaginal and cervical cancer, suggests a shared etiology involving HPV infection. Consistent with previous studies, radiotherapy for cervical cancer appeared to contribute to the increased risk among long-term survivors for subsequent primary cancers of the stomach, rectum, urinary bladder, and bone and joints.

### Cervical Cancer

Cervical cancer ranks as the 12th most common cancer among women in the U.S., constituting 1.6% of incident cancers and 1.3% of cancer deaths among females (Jemal et al, 2005). The median age at diagnosis of cervical cancer is 47 years, and it is the fourth most common cancer among women under 40 years of age. Squamous cell carcinomas accounted for 74% of cervical cancers in the current analyses, and adenocarcinoma and other histologies for the remaining 26% of cervical cancers. Patients with an initial *in situ* cervical cancer were excluded from the current analyses. Slightly more than half of cervical cancer patients received initial radiotherapy, either alone or

in combination with surgery. Surgery alone, usually involving removal of the uterus, fallopian tubes, and ovaries, accounted for the majority of other treatments. The relative survival rate was 72.9% at 5 years and 67.2% at 10 years. White females had better survival rates than black females.

Oncogenic types of human papillomavirus (HPV) account for 95% or more of all cervical cancer (Walboomers et al, 1999; Munoz et al, 2003). Risk factors associated with the progression of HPV infection to high-grade cervical disease and cancer include cigarette smoking (Hildesheim et al, 2001; Plummer et al, 2003), multiparity and long-term oral contraceptive use (Hildesheim et al, 2001), and impaired host immunity (Tsukui et al, 1996; Hildesheim and Wang, 2002).

### Results and Discussion

Overall, we observed a significant 32% increase in subsequent primary cancers excluding cancer of the cervix uteri among the 30,563 women who survived 2 or more months following cervical cancer (O/E=1.32, O=2,451, 95% CI=1.26-1.37, EAR=24 per 10,000 person-years). The cumulative incidence of developing any second cancer after cervical cancer, adjusted for the competing causes of death due to other causes, was 13.2% at 25 years (95% CI=12.5%-13.8%). Risk remained elevated over all time periods and did not vary substantially by histology of cervical cancer (O/E=1.34 for squamous cell carcinoma and O/E=1.23 for adenocarcinoma). The relative risk of subsequent cancer was somewhat higher among younger women, with 30% to 35% increases in risk seen among women diagnosed under age 70 years and 20% excesses among those ages 70 years and older at diagnosis. Women who received radiotherapy had higher risks for a new malignancy than women who did not receive radiotherapy (O/E=1.46, EAR=44 versus O/E=1.13, EAR=8). Risks also varied by racial group, with higher risks observed for black compared with white females (O/E=1.53, EAR=40 versus O/E=1.27, EAR=21). Significantly increased risks were noted for cancers of the following sites: buccal cavity and pharynx, especially the tonsil, mouth, and hypopharynx; digestive system, including the stomach, colon, rectum, anus, and pancreas; respiratory system, including the larynx, lung, and bronchus; vulva and vagina; and urinary bladder and

<sup>1</sup>Observed-to-expected ratios of subsequent primary cancers following cancers of the cervix, vagina, and vulva exclude new cancers of the cervix, vagina, and vulva, respectively.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000).

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**Table 8.A:** Ratio of observed to expected number of subsequent primary cancers related to tobacco or human papillomavirus (HPV) following cancer of the cervix uteri, vagina, or vulva.

Subsequent primary cancer site	First cancer site					
	Cervix uteri		Vagina		Vulva	
Tobacco-related cancer sites	O	O/E	O	O/E	O	O/E
Buccal cavity, pharynx	65	1.91 *	0	0.00	21	2.52 *
Esophagus	19	1.60	4	5.54 *	6	1.87
Pancreas	67	1.31 *	2	0.57	17	1.05
Larynx	28	3.17 *	1	2.42	6	3.42 *
Lung, bronchus	593	2.57 *	17	1.35	87	1.50 *
Cervix uteri	†	†	4	2.52	9	1.52
Urinary bladder	116	2.55 *	7	2.30	6	0.40 *
Kidney parenchyma	33	1.11	1	0.62	5	0.67
<b>Total</b>	<b>921</b>	<b>2.23 *</b>	<b>36</b>	<b>1.43</b>	<b>157</b>	<b>1.36 *</b>
<b>HPV-related cancer sites</b>						
Tonsil	13	3.92 *	0	0.00	1	1.59
Oropharynx	1	1.17	0	0.00	0	0.00
Esophagus	19	1.60	4	5.54 *	6	1.87
Anus, anal canal	19	3.24 *	1	3.18	12	8.04 *
Cervix uteri	†	†	4	2.52	9	1.52
Vagina	63	16.87 *	†	†	6	6.12 *
Vulva	51	5.12 *	5	8.06 *	†	†
<b>Total</b>	<b>166</b>	<b>4.66 *</b>	<b>14</b>	<b>4.08 *</b>	<b>34</b>	<b>2.74 *</b>

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers.

\*P <0.05.

†Risks for cancers of the same site as the first cancer were excluded from the analysis.

ureter. Significant deficits were seen for cancers of the breast and corpus uteri and melanoma of the skin. Our findings are consistent with previous large-scale studies of cervical cancer reporting increased risks for a similar array of subsequent primary cancers (Boice et al, 1988; Kleinerman et al, 1995; Hemminki et al, 2000).

Tobacco-related cancers accounted for the majority of excess subsequent cancers occurring after cervical cancer. Cancers of the lung and bronchus (O/E=2.57) constituted 24% of all subsequent malignancies, consistent with previous studies (Frisch and Melbye, 1995; Kleinerman et al, 1995). We also observed increased risks for cancers of the buccal cavity and pharynx (O/E=1.91), notably of the tonsil and hypopharynx, which have also been linked to tobacco smoking. The 2-fold risk for cancers of the lung and bronchus, and of the buccal cavity and pharynx, remained relatively constant across all age groups and time periods. Smoking may also have contributed to the excess risk for urinary bladder cancer, although radiotherapy probably contributed to the late-occurring cases among survivors of 10 years or more (Boice et al, 1988). We estimated that tobacco increased the risk of these subsequent cancers about 2-fold (Table 8.A), and the

effect was more pronounced following squamous cell carcinoma compared with adenocarcinoma of the cervix uteri (O/E=2.36 versus O/E=1.49), consistent with other studies (Berrington de Gonzalez et al, 2004).

Similar to cervical cancer, cancers of the vagina, vulva, and anus have a causal relation to HPV (Melbye and Sprogel, 1991; Rabkin et al, 1992; Hemminki et al, 2000; Daling et al, 2002, 2004). Thus, risks for these cancers were elevated following cervical cancer in all age and treatment groups, although radiotherapy probably contributed to the excess of vaginal cancer (Boice et al, 1988; Kleinerman et al, 1995). In our study, the risks for vaginal cancer, but not for vulvar cancer, increased with time since radiotherapy for cervical cancer, reaching 24-fold among those surviving 10 or more years after cervical cancer. The occurrence of squamous cell cancer of the vagina within 5 years of cervical cancer, however, may reflect recurrent cancer of the cervix uteri rather than a new primary cancer (Zaino et al, 2002).

It seems likely that HPV infection plays a role in certain cancers of the buccal cavity and pharynx, especially cancers of the tonsil and oropharynx (Herrero, 2003; Herrero et al, 2003). In our series, a significant

4-fold risk for subsequent tonsillar cancer was noted, and the risk was slightly higher for women under age 50 years. Overall, there was close to a 5-fold significant excess risk of all subsequent genital and extragenital cancers likely to be HPV-related (Table 8.A).

High-dose radiotherapy for cervical cancer has been linked to cancers arising in a variety of subsequent primary cancer sites, including the stomach, rectum, bone, vagina, vulva, ovary, and urinary bladder (Boice et al, 1988). In our study, risks for each of these cancers, except bone and ovary, were significantly increased among those surviving 10 years or more who had received radiotherapy, consistent with previous large-scale studies following radiotherapy for cervical cancer (Boice et al, 1988; Kleinerman et al, 1995). Increased medical surveillance or possibly misclassification may have contributed to the early excesses of some cancers, such as cancers of the vagina and urinary bladder. The risk of stomach cancer was significantly increased following radiotherapy (O/E=2.19) but not other treatments (O/E=0.93). We also noted a significantly increased risk of rectal cancer following radiotherapy (O/E=1.68), with a significant 3-fold risk among those surviving 10 years or more. Colon cancer was significantly increased among survivors of 10 years or more following radiotherapy (O/E=1.43) but not other treatments (O/E=0.98). This finding contrasts with earlier studies reporting no increased risk of colon cancer following radiotherapy for cervical cancer (Boice et al, 1988; Kleinerman et al, 1995), although colon cancer was noted to be excessive following radiotherapy for benign gynecologic disease (Inskip et al, 1990). Peutz-Jeghers syndrome is a rare hereditary disorder that predisposes to intestinal tumors and cervical adenocarcinoma and should be considered when these tumor types are noted, especially in younger women (Hemminki, 1999).

Subsequent primary cancer of the urinary bladder has been attributed to high-dose radiotherapy and to cigarette smoking in previous surveys of cervical cancer (Boice et al, 1988; Kleinerman et al, 1995). An overall 3-fold risk for urinary bladder cancer was seen in the radiotherapy group, with that risk reaching 7-fold among 20-year survivors. Among women who did not receive radiotherapy for cervical cancer, urinary bladder cancer was significantly increased (O/E=1.87), due at least partly to cigarette smoking, although heightened surveillance may have played a role.

Bone sarcomas have been linked to high-dose radiotherapy (Boice et al, 1988). In our study, the risk of subsequent bone and joint cancers was significantly increased (O/E=3.96) after radiotherapy, based on 4 cases, 3 of which had tumors arising in the pelvic bones.

Radiotherapy also has been linked to ovarian cancer in previous studies of women irradiated for benign menstrual conditions (Inskip et al, 1990) and in long-term survivors of cervical cancer (Boice et al, 1988). Our study revealed an overall nonsignificant increase in subsequent ovarian cancer that was limited to irradiated women

(O/E=1.30). A slight deficit of ovarian cancer (O/E=0.89) among nonirradiated women was probably related to surgical removal of the ovaries at the time of cervical cancer treatment.

Various forms of leukemia, with the exception of chronic lymphocytic leukemia, have been associated with moderate doses of radiation for cervical cancer (Boice et al, 1987), primarily within 10 years of radiotherapy. In our series, a significant 2-fold risk for acute non-lymphocytic leukemia was noted during the first 10 years after radiotherapy, as compared with a nonsignificant 12% excess risk among nonirradiated women.

Our study revealed significant deficits for subsequent melanoma of the skin (O/E=0.69), and cancers of the breast (O/E=0.77) and corpus uteri (O/E=0.57), following cervical cancer. It seems likely that some of the deficit of breast cancer was related to ovarian ablation by radiotherapy (Boice et al, 1989), whereas the deficit of corpus uteri cancer may have resulted from surgical removal of the uterus.

## Vaginal Cancer

Cancer of the vagina is an uncommon tumor, constituting 0.3% of incident cancers and 0.3% of cancer deaths among U.S. women (Jemal et al, 2005). It occurs primarily in older women (median age, 69 years). Radiotherapy is the main treatment (65%), and the 5-year relative survival rate is 43.8%. Women undergoing surgery for vaginal cancer often have their ovaries and uterus removed as well.

Similar to cervical cancer, vaginal cancer has been linked to HPV infection and cigarette smoking (Daling et al, 2002). Additional risk factors include low socioeconomic status, history of genital warts or inflammation, and previous abnormal pap smears (Daling et al, 2002). A rare form of vaginal cancer (clear cell carcinoma) in young women has been traced to *in utero* exposure to diethylstilbestrol, used from the 1950s through the 1970s to prevent miscarriage (Herbst et al, 1986).

## Results and Discussion

Among the 1,623 women with vaginal cancer surviving 2 or more months, the risk of all subsequent primary cancers, excluding new cancers of the vagina, was close to expectation (O/E=1.06, O=109, 95% CI=0.87-1.28, EAR=7). The cumulative incidence of a second cancer was 9.1% at 20 years after vaginal cancer diagnosis (95% CI=7.4%-10.9%). Based on small numbers, significantly increased risks were seen for cancers of the vulva, esophagus, and ureter. One prior survey of second cancers following vaginal cancer that used the SEER database revealed increased risks for tobacco-related cancers, primarily cancers of the lung and esophagus (Sturgeon et al, 1996).

HPV has been linked mainly to a subtype of vulvar cancer, especially in young women (Trimble et al, 1996; Hildesheim et al, 1997), and probably contributed to the elevated risk of subsequent vulvar cancer. However,

the risk of vulvar cancer was also elevated in older women whose tumors are less likely to be associated with HPV. HPV also may have contributed to the excess of esophageal cancer, because a causal relation has been suggested in some but not all studies (Gillison and Shah, 2003). While the overall risk for subsequent HPV-related cancers following vaginal cancer was significantly increased (O/E=4.08), it was based on only 14 cancers, 5 of which were vulvar cancer (Table 8.A).

Tobacco may have contributed to the increased risk of subsequent esophageal, ureter, and possibly vulvar cancers, although no significant excess of lung cancer was seen. For esophageal cancer, other important risk factors (alcohol intake, dietary deficiency, low socioeconomic status) may have played a role. Overall, the risk for tobacco-related cancers following vaginal cancer was only slightly increased (O/E=1.43) (Table 8.A).

In previous surveys, an excess of urinary bladder cancer was linked to high-dose pelvic irradiation, as well as tobacco smoking (Boice et al, 1988). In our study, the risk of urinary bladder cancer was significantly increased among 10-year survivors (O/E=5.04) based on 4 cases, with higher risks among women who had received radiotherapy (O/E=6.15).

## Vulvar Cancer

Cancer of the vulva is another uncommon cancer in women, accounting for 0.6% of incident cancers and 0.3% of cancer deaths (Jemal et al, 2005). Patients tend to be older at diagnosis (median age, 71 years). Most are treated with surgery (88%), which ranges from local excision of the tumor and surrounding tissue to radical vulvectomy, including resection of pelvic lymph nodes. Few patients (16%) receive radiotherapy. The 5-year relative survival rate is somewhat lower for black women compared with white women (65.3% versus 77.1%).

HPV is a risk factor for the basaloid/warty form of squamous cell vulvar cancer, particularly among younger women (Trimble et al, 1996; Hildesheim et al, 1997); however, the more common keratinizing tumor types may not be HPV-related (Trimble et al, 1996; Sturgeon and Sherman, 2000). Because basaloid/warty tumors of the vulva typically occur at a younger age than the more common keratinizing tumors, age is often used as a proxy to distinguish HPV-related and -unrelated tumors. Other risk factors may include cigarette smoking and impaired immune mechanisms (Brinton et al, 1990; Trimble et al, 1996; Madeleine et al, 1997; Sturgeon and Sherman, 2000).

## Results and Discussion

Among 5,571 women with vulvar cancer, we observed a significant increase of 12% in the risk of all subsequent primary cancers excluding the vulva (O/E=1.12, O=540, 95% CI=1.03-1.22, EAR=16). The cumulative incidence of second cancer reached 15.4% (95% CI=14.0%-16.8%) within 25 years of vulvar cancer diagnosis. The excess

risk was confined to women diagnosed younger than age 55 years (O/E=1.75, 95% CI=1.46-2.09, EAR=45) and included cancers of the anus and anal canal, vulva, vagina, buccal cavity and pharynx, larynx, lung and bronchus, and brain and central nervous system. Significant excess risks for some of these cancers (anus, lung and bronchus, vulva, and vagina) were also noted for older women. In an earlier SEER analysis of vulvar cancer, significantly increased risks were reported for cancers of the lung and bronchus, anus, brain and central nervous system, and melanoma of the skin, as well as non-Hodgkin lymphoma (Sturgeon et al, 1996).

Our survey revealed 31 newly detected vulvar cancers, with a significant 7-fold risk among 10-year survivors. The tendency for multiple tumors of the vulva was detected in both younger (O/E=18.93, O=6) and older women (O/E=8.53, O=25). While some subsequent vulvar cancers could have been influenced by increased medical surveillance, especially in older women, they could have arisen from persistent HPV infection and untreated vulvar intraepithelial neoplasia.

There is evidence that cancers of the vagina, vulva, and anus tend to arise as multiple foci in a field cancerization process triggered by HPV infection and possibly immunologic defects (Brinton et al, 2005). Although HPV appears to be related to basaloid/warty vulvar cancer, arising at younger ages, the risk of subsequent vaginal cancer was significantly increased for both younger (O/E=17.20) and older women (O/E=4.63), based on small numbers of cases. The risk for anal and anal canal cancer also was increased in both younger (O/E=22.02, O=5) and older women (O/E=5.53, O=7), suggesting the possible role of HPV and other factors, such as impaired immunity (Williams et al, 1994). Reciprocal significant increases of vulvar cancer were seen after vaginal and anal cancer. It is interesting that the risk of cervical cancer, which is strongly associated with HPV, was not significantly elevated among younger or older vulvar cancer patients, possibly due to effective screening. The overall risk for all HPV-related cancers (including genital, anal, and some buccal cavity, pharyngeal, and esophageal cancers) was significantly increased after vulvar cancer for all age groups combined (O/E=2.74) (Table 8.A), with the risk being higher for younger compared with older women (O/E=4.00 versus O/E=2.38).

Cigarette smoking, a likely cofactor for vulvar cancer (Trimble et al, 1996; Madeleine et al, 1997), probably accounts for the significantly elevated risks for subsequent lung and bronchus cancer in both age groups in our study, and may have contributed to some of the excess risk of buccal cavity and pharyngeal cancer in younger women. The risk for all tobacco-related subsequent primary cancers was significantly increased after vulvar cancer (O/E=1.36, O=157) (Table 8.A), with a significantly higher risk for younger compared with older women (O/E=2.70 versus O/E=1.13).



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## Cervix Uteri Females

**Table 8.1.1:** Characteristics of patients with an initial cancer of the cervix uteri, females, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	—	—	30,563	100.0	30,563	100.0
<b>Initial treatment</b>						
Any radiation	—	—	16,404	53.7	16,404	53.7
With surgery	—	—	4,980	16.3	4,980	16.3
Without surgery	—	—	11,424	37.4	11,424	37.4
No radiation	—	—	14,159	46.3	14,159	46.3
With surgery	—	—	12,039	39.4	12,039	39.4
Without surgery	—	—	2,120	6.9	2,120	6.9
<b>Race</b>						
White	—	—	23,175	75.8	23,175	75.8
Black	—	—	4,626	15.1	4,626	15.1
Other	—	—	2,525	8.3	2,525	8.3
Unknown	—	—	237	0.8	237	0.8
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	—	—	2,694	8.8	2,694	8.8
30–49	—	—	13,411	43.9	13,411	43.9
50–69	—	—	9,922	32.5	9,922	32.5
70–79	—	—	2,930	9.6	2,930	9.6
≥ 80	—	—	1,606	5.3	1,606	5.3
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	—	—	28,309	92.6	28,309	92.6
1st and 2nd cancers	—	—	2,060	6.7	2,060	6.7
1st, 2nd, and 3rd cancers	—	—	174	0.6	174	0.6
1st, 2nd, 3rd, and additional cancers	—	—	20	0.1	20	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	—	—	48.6	—	48.6	—
Median year of 1st cancer diagnosis	—	—	1986.5	—	1986.5	—
Median person-years at risk	—	—	5.5	—	5.5	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	—	—	95.3	—	95.3
1st, 2nd, and additional cancers	—	—	—	94.8	—	94.8
1st cancer only	—	—	—	4.1	—	4.1

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 8.1.2:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	255	1.74*	674	1.32*	639	1.32*	906	1.19*	2,474	1,905.05	1.30*	23.12
All excluding same site	249	1.76*	671	1.35*	635	1.34*	896	1.20*	2,451	1,862.45	1.32*	23.92
<b>Buccal cavity, pharynx</b>	7	2.53*	23	2.40*	11	1.25	24	1.86*	65	34.05	1.91*	1.26
Lip	0	0.00	0	0.00	0	0.00	2	2.68	2	1.83	1.09	0.01
Tongue	0	0.00	3	1.44	2	1.02	5	1.71	10	7.57	1.32	0.10
Salivary gland	3	9.21*	2	1.77	0	0.00	0	0.00	5	3.97	1.26	0.04
Mouth	2	2.21	8	2.56*	1	0.35	9	2.12	20	11.14	1.80*	0.36
Nasopharynx	0	0.00	1	1.80	1	2.11	1	1.58	3	1.82	1.65	0.05
Tonsil	1	3.53	6	6.17*	3	3.43	3	2.53	13	3.32	3.92*	0.39
Oropharynx	0	0.00	0	0.00	0	0.00	1	3.11	1	0.86	1.17	0.01
Hypopharynx	1	5.09	3	4.33	3	4.79	1	1.14	8	2.39	3.35*	0.23
<b>Digestive system</b>	41	1.34	140	1.34*	124	1.27*	217	1.40*	522	387.71	1.35*	5.46
Esophagus	3	3.20	6	1.88	2	0.67	8	1.69	19	11.87	1.60	0.29
Stomach	7	2.51*	18	1.96*	10	1.22	21	1.71*	56	32.45	1.73*	0.96
Small intestine	3	6.75*	1	0.64	4	2.58	4	1.47	12	6.29	1.91	0.23
Colon	15	1.02	59	1.18	56	1.19	93	1.24*	223	186.67	1.19*	1.48
Rectum, rectosigmoid junction	2	0.40	24	1.40	16	1.01	44	1.85*	86	61.80	1.39*	0.98
Rectum	1	0.31	16	1.43	11	1.07	31	1.97*	59	40.43	1.46*	0.75
Anus, anal canal	0	0.00	4	2.61	5	3.32*	10	4.17*	19	5.86	3.24*	0.53
Liver	2	2.79	2	0.80	2	0.83	3	0.72	9	9.81	0.92	-0.03
Gallbladder	2	2.85	3	1.29	4	1.87	5	1.60	14	8.29	1.69	0.23
Bile ducts, other biliary	0	0.00	2	0.97	1	0.50	2	0.56	5	8.26	0.61	-0.13
Pancreas	6	1.52	21	1.56	19	1.48	21	1.01	67	51.05	1.31*	0.65
<b>Respiratory system</b>	45	2.73*	212	3.53*	166	2.74*	202	1.90*	625	243.25	2.57*	15.51
Nose, nasal cavity, ear	0	0.00	1	1.43	0	0.00	1	0.99	2	2.57	0.78	-0.02
Larynx	4	5.90*	6	2.50	8	3.51*	10	2.88*	28	8.83	3.17*	0.78
Lung, bronchus	41	2.63*	203	3.58*	158	2.75*	191	1.88*	593	231.17	2.57*	14.70
<b>Female breast</b>	44	0.99	121	0.76*	143	0.93	150	0.63*	458	595.18	0.77*	-5.58
<b>Female genital system</b>	60	2.71*	62	0.82	73	1.09	111	1.15	306	261.13	1.17*	1.82
Cervix uteri	6	1.38	3	0.21*	4	0.35*	10	0.79	23	42.60	0.54*	-0.80
Corpus uteri	18	1.76*	10	0.29*	17	0.54*	25	0.53*	70	123.42	0.57*	-2.17
Ovary	23	3.84*	18	0.86	13	0.67	30	1.03	84	75.74	1.11	0.34
Vagina	7	22.37*	15	14.16*	16	16.80*	25	17.74*	63	3.73	16.87*	2.41
Vulva	2	2.61	14	5.31*	20	8.00*	15	3.69*	51	9.96	5.12*	1.67
<b>Urinary system</b>	19	3.17*	41	1.96*	36	1.77*	75	2.19*	171	81.56	2.10*	3.63
Urinary bladder	11	3.23*	33	2.80*	23	2.03*	49	2.58*	116	45.46	2.55*	2.87
Kidney parenchyma	6	2.87*	3	0.40	8	1.08	16	1.25	33	29.80	1.11	0.13
Renal pelvis, other urinary	2	4.02	5	2.95	5	3.14*	10	3.97*	22	6.30	3.49*	0.64
Ureter	0	0.00	2	4.10	1	2.14	8	10.88*	11	1.83	6.00*	0.37
<b>Bone, joints</b>	0	0.00	0	0.00	3	5.68*	2	2.77	5	2.03	2.46	0.12
<b>Soft tissue including heart</b>	0	0.00	1	0.43	5	2.36	4	1.24	10	8.33	1.20	0.07
<b>Kaposi sarcoma</b>	1	21.29	0	0.00	1	6.65	0	0.00	2	0.59	3.38	0.06
<b>Melanoma of skin</b>	3	0.84	6	0.46*	8	0.65	15	0.85	32	46.54	0.69*	-0.59
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.59	0.00	-0.11
<b>Brain, central nervous system</b>	1	0.61	4	0.69	4	0.75	6	0.77	15	20.55	0.73	-0.23
<b>Thyroid</b>	8	3.20*	9	1.02	3	0.40	6	0.63	26	28.36	0.92	-0.10
<b>Lymphatic, hematopoietic</b>	20	1.95*	34	0.95	35	1.03	57	1.03	146	135.42	1.08	0.43
Hodgkin lymphoma	1	1.62	2	0.98	0	0.00	2	1.09	5	6.07	0.82	-0.04
Non-Hodgkin lymphoma	7	1.53	16	0.98	20	1.23	38	1.39	81	64.58	1.25	0.67
Myeloma	1	0.54	4	0.62	7	1.15	6	0.60	18	24.37	0.74	-0.26
Leukemia	11	3.44*	12	1.10	8	0.78	11	0.69	42	40.40	1.04	0.07
Acute lymphocytic	1	7.91	0	0.00	0	0.00	1	1.74	2	1.55	1.29	0.02
Chronic lymphocytic	3	2.70	1	0.26	2	0.55	6	1.03	12	14.32	0.84	-0.09
Acute non-lymphocytic	4	3.39	8	1.97	3	0.80	3	0.50	18	14.99	1.20	0.12
Chronic myeloid	0	0.00	1	0.60	1	0.65	1	0.43	3	6.03	0.50	-0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Cervix Uteri Females, Long-term Follow-up

**Table 8.1.3:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,568	1.37*	443	1.20*	285	1.15*	178	1.22*	2,474	1,905.05	1.30*	23.12
All excluding same site	1,555	1.40*	439	1.21*	281	1.15*	176	1.22*	2,451	1,862.45	1.32*	23.92
<b>Buccal cavity, pharynx</b>	41	1.94*	15	2.35*	7	1.69	2	0.85	65	34.05	1.91*	1.26
Lip	0	0.00	1	2.84	1	4.09	0	0.00	2	1.83	1.09	0.01
Tongue	5	1.08	2	1.39	3	3.16	0	0.00	10	7.57	1.32	0.10
Salivary gland	5	2.03	0	0.00	0	0.00	0	0.00	5	3.97	1.26	0.04
Mouth	11	1.60	6	2.86*	2	1.47	1	1.28	20	11.14	1.80*	0.36
Nasopharynx	2	1.68	0	0.00	1	5.04	0	0.00	3	1.82	1.65	0.05
Tonsil	10	4.70*	3	4.90	0	0.00	0	0.00	13	3.32	3.92*	0.39
Oropharynx	0	0.00	1	6.20	0	0.00	0	0.00	1	0.86	1.17	0.01
Hypopharynx	7	4.62*	0	0.00	0	0.00	1	6.59	8	2.39	3.35*	0.23
<b>Digestive system</b>	305	1.31*	103	1.39*	75	1.49*	39	1.29	522	387.71	1.35*	5.46
Esophagus	11	1.54	6	2.64	2	1.30	0	0.00	19	11.87	1.60	0.29
Stomach	35	1.73*	12	2.00*	6	1.52	3	1.30	56	32.45	1.73*	0.96
Small intestine	8	2.24	1	0.80	1	1.11	2	3.48	12	6.29	1.91	0.23
Colon	130	1.16	42	1.17	31	1.27	20	1.37	223	186.67	1.19*	1.48
Rectum, rectosigmoid junction	42	1.10	17	1.46	20	2.63*	7	1.56	86	61.80	1.39*	0.98
Rectum	28	1.13	12	1.58	16	3.17*	3	0.98	59	40.43	1.46*	0.75
Anus, anal canal	9	2.60*	6	5.21*	3	3.79	1	2.20	19	5.86	3.24*	0.53
Liver	6	1.07	2	1.06	1	0.72	0	0.00	9	9.81	0.92	-0.03
Gallbladder	9	1.74	1	0.65	3	2.97	1	1.74	14	8.29	1.69	0.23
Bile ducts, other biliary	3	0.64	1	0.62	1	0.83	0	0.00	5	8.26	0.61	-0.13
Pancreas	46	1.52*	12	1.22	5	0.73	4	0.96	67	51.05	1.31*	0.65
<b>Respiratory system</b>	423	3.09*	105	2.14*	67	1.90*	30	1.37	625	243.25	2.57*	15.51
Nose, nasal cavity, ear	1	0.64	0	0.00	1	3.10	0	0.00	2	2.57	0.78	-0.02
Larynx	18	3.36*	4	2.32	4	3.57	2	3.16	28	8.83	3.17*	0.78
Lung, bronchus	402	3.10*	101	2.16*	62	1.84*	28	1.33	593	231.17	2.57*	14.70
<b>Female breast</b>	308	0.86*	69	0.59*	51	0.66*	30	0.68*	458	595.18	0.77*	-5.58
<b>Female genital system</b>	195	1.18*	55	1.15	33	1.06	23	1.32	306	261.13	1.17*	1.82
Cervix uteri	13	0.43*	4	0.57	4	1.04	2	1.14	23	42.60	0.54*	-0.80
Corpus uteri	45	0.59*	14	0.61	5	0.33*	6	0.67	70	123.42	0.57*	-2.17
Ovary	54	1.16	15	1.04	12	1.27	3	0.57	84	75.74	1.11	0.34
Vagina	38	16.34*	10	14.29*	10	22.16*	5	19.33*	63	3.73	16.87*	2.41
Vulva	36	6.10*	10	5.17*	1	0.75	4	5.05*	51	9.96	5.12*	1.67
<b>Urinary system</b>	96	2.03*	35	2.18*	13	1.15	27	3.88*	171	81.56	2.10*	3.63
Urinary bladder	67	2.53*	22	2.48*	9	1.44	18	4.68*	116	45.46	2.55*	2.87
Kidney parenchyma	17	1.00	9	1.51	3	0.70	4	1.54	33	29.80	1.11	0.13
Renal pelvis, other urinary	12	3.17*	4	3.35	1	1.22	5	9.90*	22	6.30	3.49*	0.64
Ureter	3	2.73	4	11.44*	0	0.00	4	27.31*	11	1.83	6.00*	0.37
<b>Bone, joints</b>	3	2.30	1	2.74	1	4.39	0	0.00	5	2.03	2.46	0.12
<b>Soft tissue including heart</b>	6	1.18	3	1.92	1	0.95	0	0.00	10	8.33	1.20	0.07
<b>Kaposi sarcoma</b>	2	5.62	0	0.00	0	0.00	0	0.00	2	0.59	3.38	0.06
<b>Melanoma of skin</b>	17	0.59*	8	0.91	3	0.53	4	1.23	32	46.54	0.69*	-0.59
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.59	0.00	-0.11
<b>Brain, central nervous system</b>	9	0.71	3	0.77	1	0.40	2	1.43	15	20.55	0.73	-0.23
<b>Thyroid</b>	20	1.06	6	1.20	0	0.00	0	0.00	26	28.36	0.92	-0.10
<b>Lymphatic, hematopoietic</b>	89	1.11	25	0.95	22	1.21	10	0.92	146	135.42	1.08	0.43
Hodgkin lymphoma	3	0.71	1	1.03	1	1.76	0	0.00	5	6.07	0.82	-0.04
Non-Hodgkin lymphoma	43	1.16	17	1.32	16	1.77*	5	0.90	81	64.58	1.25	0.67
Myeloma	12	0.84	1	0.21	4	1.21	1	0.51	18	24.37	0.74	-0.26
Leukemia	31	1.27	6	0.77	1	0.19	4	1.30	42	40.40	1.04	0.07
Acute lymphocytic	1	1.03	1	3.38	0	0.00	0	0.00	2	1.55	1.29	0.02
Chronic lymphocytic	6	0.71	2	0.71	1	0.52	3	2.75	12	14.32	0.84	-0.09
Acute non-lymphocytic	15	1.66	2	0.70	0	0.00	1	0.84	18	14.99	1.20	0.12
Chronic myeloid	2	0.54	1	0.87	0	0.00	0	0.00	3	6.03	0.50	-0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.1.4:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	67	2.52*	167	1.44*	193	1.36*	382	1.14*	809	619.62	1.31*	12.54
All excluding same site	61	2.47*	166	1.53*	189	1.40*	376	1.15*	792	595.92	1.33*	12.98
<b>Buccal cavity, pharynx</b>	3	6.64*	8	4.00*	2	0.79	10	1.70	23	10.88	2.11*	0.80
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.03
Tongue	0	0.00	1	2.41	0	0.00	3	2.15	4	2.47	1.62	0.10
Salivary gland	1	10.42	0	0.00	0	0.00	0	0.00	1	1.59	0.63	-0.04
Mouth	0	0.00	2	3.79	0	0.00	4	2.27	6	3.13	1.92	0.19
Nasopharynx	0	0.00	1	5.30	0	0.00	1	2.91	2	0.77	2.60	0.08
Tonsil	1	21.81	2	9.48*	1	3.45	1	1.53	5	1.20	4.16*	0.25
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.02
Hypopharynx	1	42.92	2	17.50*	1	6.17	1	2.33	5	0.73	6.86*	0.28
<b>Digestive system</b>	5	2.23	13	1.23	20	1.33	81	1.73*	119	74.62	1.59*	2.94
Esophagus	0	0.00	2	6.14	0	0.00	5	2.96	7	2.59	2.70*	0.29
Stomach	0	0.00	2	2.03	4	3.25	3	0.90	9	5.76	1.56	0.21
Small intestine	2	28.89*	0	0.00	2	4.97	1	0.90	5	1.89	2.65	0.21
Colon	2	2.09	4	0.89	7	1.09	27	1.29	40	32.78	1.22	0.48
Rectum, rectosigmoid junction	0	0.00	1	0.47	2	0.66	21	2.45*	24	14.18	1.69*	0.65
Rectum	0	0.00	1	0.70	1	0.50	16	2.81*	18	9.42	1.91*	0.57
Anus, anal canal	0	0.00	2	6.21	0	0.00	6	5.44*	8	1.94	4.13*	0.40
Liver	0	0.00	0	0.00	0	0.00	1	0.70	1	2.26	0.44	-0.08
Gallbladder	0	0.00	0	0.00	2	7.41	3	3.40	5	1.36	3.67*	0.24
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.49	0.00	-0.10
Pancreas	0	0.00	2	1.87	3	1.82	12	2.04*	17	8.81	1.93*	0.54
<b>Respiratory system</b>	6	3.70*	59	7.27*	45	3.55*	75	1.72*	185	66.06	2.80*	7.87
Nose, nasal cavity, ear	0	0.00	1	6.62	0	0.00	1	2.46	2	0.77	2.59	0.08
Larynx	0	0.00	1	2.16	4	5.96*	7	3.85*	12	3.05	3.94*	0.59
Lung, bronchus	6	4.06*	56	7.52*	41	3.48*	67	1.62*	170	62.02	2.74*	7.15
<b>Female breast</b>	13	1.19	41	0.85	58	0.99	81	0.64*	193	244.44	0.79*	-3.41
<b>Female genital system</b>	25	5.11*	18	0.87	32	1.37	56	1.14	131	98.08	1.34*	2.18
Cervix uteri	6	3.11*	1	0.14*	4	0.62	6	0.73	17	23.70	0.72	-0.44
Corpus uteri	4	3.05	1	0.16*	9	1.05	16	0.69	30	39.42	0.76	-0.62
Ovary	12	8.72*	10	1.68	8	1.14	16	1.08	46	29.20	1.58*	1.11
Vagina	2	46.32*	6	32.33*	5	21.85*	8	14.90*	21	0.99	21.11*	1.32
Vulva	0	0.00	0	0.00	6	8.95*	7	4.68*	13	2.89	4.50*	0.67
<b>Urinary system</b>	1	1.72	12	4.36*	10	2.56*	29	2.34*	52	19.62	2.65*	2.14
Urinary bladder	0	0.00	8	6.81*	5	2.88	15	2.52*	28	9.11	3.07*	1.25
Kidney parenchyma	1	3.19	2	1.39	3	1.52	8	1.40	14	9.44	1.48	0.30
Renal pelvis, other urinary	0	0.00	2	14.74*	2	9.88*	6	8.60*	10	1.06	9.40*	0.59
Ureter	0	0.00	2	94.62*	0	0.00	5	28.44*	7	0.24	29.31*	0.45
<b>Bone, joints</b>	0	0.00	0	0.00	1	4.16	1	2.57	2	0.95	2.11	0.07
<b>Soft tissue including heart</b>	0	0.00	0	0.00	2	2.52	1	0.65	3	3.30	0.91	-0.02
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.01
<b>Melanoma of skin</b>	2	1.19	3	0.44	6	0.88	8	0.74	19	26.06	0.73	-0.47
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	0.00	-0.06
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	4	1.07	4	7.96	0.50	-0.26
<b>Thyroid</b>	5	3.59*	3	0.57	1	0.20	6	0.88	15	18.39	0.82	-0.22
<b>Lymphatic, hematopoietic</b>	7	4.24*	7	1.01	7	0.86	20	0.98	41	37.14	1.10	0.26
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.46	0.00	-0.23
Non-Hodgkin lymphoma	3	4.14	4	1.25	1	0.25	13	1.22	21	18.63	1.13	0.16
Myeloma	0	0.00	0	0.00	2	2.06	1	0.30	3	5.07	0.59	-0.14
Leukemia	4	8.80*	3	1.57	4	1.81	6	1.11	17	9.97	1.71	0.47
Acute lymphocytic	1	22.14	0	0.00	0	0.00	1	3.46	2	0.68	2.92	0.09
Chronic lymphocytic	0	0.00	0	0.00	2	4.29	3	1.77	5	2.50	2.00	0.17
Acute non-lymphocytic	2	9.13*	3	3.41	1	1.04	1	0.47	7	4.19	1.67	0.19
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	1.12	1	1.84	0.54	-0.06

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Cervix Uteri Females, 50-69 Years of Age

**Table 8.1.5:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	121	1.77*	327	1.28*	348	1.37*	464	1.25*	1,260	947.47	1.33*	41.15
All excluding same site	121	1.82*	326	1.31*	348	1.39*	461	1.26*	1,256	932.90	1.35*	42.54
<b>Buccal cavity, pharynx</b>	4	2.67	12	2.22*	8	1.62	10	1.62	34	17.99	1.89*	2.11
Lip	0	0.00	0	0.00	0	0.00	1	2.39	1	0.92	1.08	0.01
Tongue	0	0.00	1	0.84	1	0.91	1	0.74	3	3.97	0.75	-0.13
Salivary gland	2	14.86*	0	0.00	0	0.00	0	0.00	2	1.75	1.15	0.03
Mouth	2	4.09	6	3.37*	1	0.61	4	1.86	13	6.06	2.15*	0.91
Nasopharynx	0	0.00	0	0.00	1	4.20	0	0.00	1	0.86	1.16	0.02
Tonsil	0	0.00	4	6.48*	2	3.95	1	2.01	7	1.80	3.89*	0.68
Oropharynx	0	0.00	0	0.00	0	0.00	1	6.39	1	0.50	2.00	0.07
Hypopharynx	0	0.00	1	2.16	2	4.92	0	0.00	3	1.42	2.11	0.21
<b>Digestive system</b>	22	1.74*	69	1.39*	73	1.36*	116	1.30*	280	205.23	1.36*	9.84
Esophagus	1	1.97	2	1.06	2	1.07	3	1.14	8	6.88	1.16	0.15
Stomach	4	3.97*	4	1.01	4	0.96	11	1.56	23	16.16	1.42	0.90
Small intestine	1	4.90	1	1.28	1	1.21	3	2.18	6	3.19	1.88	0.37
Colon	9	1.56	30	1.29	31	1.20	58	1.32*	128	98.76	1.30*	3.85
Rectum, rectosigmoid junction	0	0.00	13	1.48	10	1.12	19	1.47	42	32.90	1.28	1.20
Rectum	0	0.00	8	1.42	8	1.40	12	1.42	28	21.28	1.32	0.88
Anus, anal canal	0	0.00	2	2.51	4	5.01*	4	3.55	10	2.93	3.41*	0.93
Liver	1	3.27	2	1.64	1	0.74	2	0.84	6	5.26	1.14	0.10
Gallbladder	1	3.71	2	1.88	2	1.72	2	1.09	7	4.33	1.62	0.35
Bile ducts, other biliary	0	0.00	1	1.08	1	0.95	2	0.96	4	4.29	0.93	-0.04
Pancreas	5	3.04	12	1.83	13	1.78	8	0.65	38	27.88	1.36	1.33
<b>Respiratory system</b>	25	2.69*	111	3.04*	99	2.56*	115	2.01*	350	141.79	2.47*	27.41
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	1.29	0.00	-0.17
Larynx	4	9.18*	3	1.94	3	2.14	2	1.29	12	4.94	2.43*	0.93
Lung, bronchus	21	2.40*	107	3.10*	96	2.60*	113	2.05*	337	135.22	2.49*	26.57
<b>Female breast</b>	17	0.80	53	0.68*	67	0.91	65	0.65*	202	272.88	0.74*	-9.33
<b>Female genital system</b>	24	2.10*	27	0.68*	36	1.03	48	1.14	135	128.27	1.05	0.89
Cervix uteri	0	0.00	1	0.19	0	0.00*	3	0.78	4	14.57	0.27*	-1.39
Corpus uteri	9	1.45	6	0.28*	7	0.37*	7	0.32*	29	68.44	0.42*	-5.19
Ovary	7	2.35	4	0.38*	4	0.41	13	1.02	28	36.20	0.77	-1.08
Vagina	4	29.68*	8	16.00*	10	20.41*	16	22.11*	38	1.85	20.56*	4.76
Vulva	1	3.55	8	7.39*	12	10.47*	7	3.39*	28	4.57	6.12*	3.08
<b>Urinary system</b>	12	4.45*	18	1.70*	20	1.74*	42	2.24*	92	43.54	2.11*	6.38
Urinary bladder	7	4.84*	14	2.41*	13	2.03*	32	2.95*	66	24.52	2.69*	5.46
Kidney parenchyma	4	3.86*	1	0.25	5	1.20	6	0.95	16	15.48	1.03	0.07
Renal pelvis, other urinary	1	4.70	3	3.55	2	2.13	4	2.58	10	3.55	2.82*	0.85
Ureter	0	0.00	0	0.00	0	0.00	3	6.34*	3	1.05	2.85	0.26
<b>Bone, joints</b>	0	0.00	0	0.00	2	9.33*	1	3.41	3	0.80	3.74	0.29
<b>Soft tissue including heart</b>	0	0.00	1	1.02	3	3.17	2	1.40	6	3.61	1.66	0.31
<b>Kaposi sarcoma</b>	1	116.63*	0	0.00	0	0.00	0	0.00	1	0.22	4.61	0.10
<b>Melanoma of skin</b>	1	0.79	1	0.22	1	0.24	6	1.00	9	16.08	0.56	-0.93
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.29	0.00	-0.17
<b>Brain, central nervous system</b>	1	1.31	4	1.43	4	1.48	2	0.55	11	9.93	1.11	0.14
<b>Thyroid</b>	2	2.49	5	1.85	2	0.91	0	0.00	9	8.20	1.10	0.11
<b>Lymphatic, hematopoietic</b>	7	1.65	16	0.96	21	1.17	32	1.08	76	68.47	1.11	0.99
Hodgkin lymphoma	1	5.95	1	1.70	0	0.00	2	2.91	4	1.98	2.02	0.27
Non-Hodgkin lymphoma	2	0.99	7	0.88	13	1.49	20	1.38	42	33.24	1.26	1.15
Myeloma	1	1.20	2	0.61	5	1.41	5	0.88	13	13.35	0.97	-0.05
Leukemia	3	2.42	6	1.24	3	0.58	5	0.58	17	19.90	0.85	-0.38
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.08
Chronic lymphocytic	1	2.14	1	0.53	0	0.00	3	0.89	5	7.78	0.64	-0.37
Acute non-lymphocytic	1	2.25	3	1.73	1	0.54	2	0.63	7	7.19	0.97	-0.03
Chronic myeloid	0	0.00	1	1.45	1	1.42	0	0.00	2	2.74	0.73	-0.10

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.1.6:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	67	1.31*	180	1.28*	98	1.09	60	1.07	405	337.97	1.20*	35.18
All excluding same site	67	1.33*	179	1.29*	98	1.11	59	1.06	403	333.63	1.21*	36.41
<b>Buccal cavity, pharynx</b>	0	0.00	3	1.37	1	0.74	4	4.80*	8	5.18	1.54	1.48
Lip	0	0.00	0	0.00	0	0.00	1	10.98	1	0.48	2.07	0.27
Tongue	0	0.00	1	2.12	1	3.39	1	5.49	3	1.12	2.67	0.98
Salivary gland	0	0.00	2	7.73	0	0.00	0	0.00	2	0.64	3.14	0.72
Mouth	0	0.00	0	0.00	0	0.00	1	2.98	1	1.95	0.51	-0.50
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	1	30.04	1	0.31	3.21	0.36
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.12
<b>Digestive system</b>	14	0.89	58	1.32*	31	1.06	20	1.05	123	107.86	1.14	7.94
Esophagus	2	5.52	2	2.02	0	0.00	0	0.00	4	2.39	1.67	0.84
Stomach	3	1.94	12	2.82*	2	0.71	7	3.67*	24	10.52	2.28*	7.07
Small intestine	0	0.00	0	0.00	1	3.09	0	0.00	1	1.22	0.82	-0.11
Colon	4	0.51	25	1.12	18	1.20	8	0.80	55	55.14	1.00	-0.07
Rectum, rectosigmoid junction	2	0.87	10	1.60	4	1.02	4	1.75	20	14.73	1.36	2.77
Rectum	1	0.67	7	1.71	2	0.78	3	1.93	13	9.73	1.34	1.72
Anus, anal canal	0	0.00	0	0.00	1	3.78	0	0.00	1	1.00	1.00	0.00
Liver	1	2.95	0	0.00	1	1.63	0	0.00	2	2.29	0.87	-0.15
Gallbladder	1	2.52	1	0.91	0	0.00	0	0.00	2	2.59	0.77	-0.31
Bile ducts, other biliary	0	0.00	1	1.05	0	0.00	0	0.00	1	2.48	0.40	-0.78
Pancreas	1	0.48	7	1.21	3	0.78	1	0.38	12	14.36	0.84	-1.24
<b>Respiratory system</b>	14	2.50*	42	2.73*	22	2.40*	12	2.27*	90	35.41	2.54*	28.65
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.51	0.00	-0.27
Larynx	0	0.00	2	5.21	1	4.95	1	9.15	4	0.84	4.76*	1.66
Lung, bronchus	14	2.61*	40	2.72*	21	2.39*	11	2.17*	86	33.94	2.53*	27.33
<b>Female breast</b>	14	1.15	27	0.82	18	0.88	4	0.33*	63	77.87	0.81	-7.80
<b>Female genital system</b>	11	1.90	17	1.12	5	0.57	7	1.39	40	34.78	1.15	2.74
Cervix uteri	0	0.00	1	0.51	0	0.00	1	1.74	2	4.34	0.46	-1.23
Corpus uteri	5	1.85	3	0.43	1	0.26	2	1.00	11	15.55	0.71	-2.39
Ovary	4	2.44	4	0.91	1	0.37	1	0.62	10	10.35	0.97	-0.18
Vagina	1	7.41	1	2.67	1	4.28	1	6.72	4	0.89	4.49*	1.63
Vulva	1	2.90	6	6.17*	2	2.93	1	1.99	10	2.50	4.00*	3.94
<b>Urinary system</b>	6	2.21	11	1.46	6	1.22	4	1.24	27	18.40	1.47	4.51
Urinary bladder	4	2.33	11	2.30*	5	1.57	2	0.93	22	11.83	1.86*	5.34
Kidney parenchyma	1	1.35	0	0.00	0	0.00	2	2.50	3	4.89	0.61	-0.99
Renal pelvis, other urinary	1	3.90	0	0.00	1	2.21	0	0.00	2	1.69	1.18	0.16
Ureter	0	0.00	0	0.00	1	6.72	0	0.00	1	0.54	1.84	0.24
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	3.79	1	1.41	0.71	-0.22
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	13.53	0	0.00	1	0.25	4.01	0.39
<b>Melanoma of skin</b>	0	0.00	2	1.14	1	0.85	1	1.19	4	4.40	0.91	-0.21
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.21
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.66	0.00	-1.40
<b>Thyroid</b>	1	3.35	1	1.28	0	0.00	0	0.00	2	1.78	1.13	0.12
<b>Lymphatic, hematopoietic</b>	6	1.38	11	0.90	7	0.87	5	0.95	29	29.82	0.97	-0.43
Hodgkin lymphoma	0	0.00	1	3.57	0	0.00	0	0.00	1	0.63	1.59	0.19
Non-Hodgkin lymphoma	2	1.09	5	0.96	6	1.74	5	2.27	18	12.71	1.42	2.78
Myeloma	0	0.00	2	0.80	0	0.00	0	0.00	2	5.95	0.34	-2.07
Leukemia	4	2.65	3	0.71	1	0.35	0	0.00	8	10.53	0.76	-1.33
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.13
Chronic lymphocytic	2	3.38	0	0.00	0	0.00	0	0.00	2	4.04	0.49	-1.07
Acute non-lymphocytic	1	1.94	2	1.38	1	1.02	0	0.00	4	3.61	1.11	0.20
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.45	0.00	-0.76

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Cervix Uteri Females, Radiotherapy

**Table 8.1.7:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	151	1.55*	455	1.46*	391	1.44*	540	1.37*	1,537	1,072.72	1.43*	42.69
All excluding same site	151	1.59*	454	1.49*	391	1.47*	537	1.39*	1,533	1,052.27	1.46*	44.20
<b>Buccal cavity, pharynx</b>	6	3.20*	11	1.85	6	1.20	12	1.80	35	19.48	1.80*	1.43
Lip	0	0.00	0	0.00	0	0.00	1	2.39	1	1.10	0.91	-0.01
Tongue	0	0.00	1	0.78	2	1.80	4	2.68	7	4.29	1.63	0.25
Salivary gland	3	14.69*	1	1.57	0	0.00	0	0.00	4	2.12	1.89	0.17
Mouth	2	3.19	6	3.01*	0	0.00	4	1.77	12	6.55	1.83	0.50
Nasopharynx	0	0.00	0	0.00	1	4.03	0	0.00	1	0.98	1.02	0.00
Tonsil	1	5.15	3	4.97	2	4.09	1	1.73	7	1.86	3.76*	0.47
Oropharynx	0	0.00	0	0.00	0	0.00	1	6.05	1	0.50	2.01	0.05
Hypopharynx	0	0.00	0	0.00	1	2.74	1	2.23	2	1.39	1.44	0.06
<b>Digestive system</b>	29	1.33	98	1.41*	82	1.34*	142	1.61*	351	240.51	1.46*	10.16
Esophagus	2	3.00	4	1.90	2	1.09	5	1.90	13	7.23	1.80	0.53
Stomach	7	3.51*	16	2.58*	7	1.34	15	2.09*	45	20.57	2.19*	2.25
Small intestine	2	6.70	1	1.03	3	3.40	1	0.70	7	3.58	1.95	0.31
Colon	7	0.67	39	1.16	36	1.21	62	1.43*	144	117.04	1.23*	2.48
Rectum, rectosigmoid junction	2	0.56	14	1.24	8	0.83	33	2.53*	57	37.50	1.52*	1.79
Rectum	1	0.43	9	1.23	7	1.12	24	2.78*	41	24.46	1.68*	1.52
Anus, anal canal	0	0.00	2	2.13	1	1.19	8	6.57*	11	3.29	3.35*	0.71
Liver	1	2.02	1	0.62	2	1.38	0	0.00	4	5.90	0.68	-0.17
Gallbladder	1	1.97	1	0.63	2	1.46	2	1.10	6	5.29	1.13	0.07
Bile ducts, other biliary	0	0.00	2	1.45	1	0.79	2	0.96	5	5.14	0.97	-0.01
Pancreas	6	2.13	18	1.99*	15	1.86*	10	0.83	49	31.91	1.54*	1.57
<b>Respiratory system</b>	30	2.66*	164	4.35*	111	3.15*	127	2.26*	432	140.52	3.07*	26.80
Nose, nasal cavity, ear	0	0.00	1	2.32	0	0.00	0	0.00	1	1.49	0.67	-0.04
Larynx	2	4.34	4	2.70	2	1.57	5	2.88	13	4.95	2.63*	0.74
Lung, bronchus	28	2.63*	158	4.42*	109	3.26*	122	2.26*	417	133.71	3.12*	26.05
<b>Female breast</b>	27	0.94	73	0.80	65	0.81	57	0.50*	222	315.37	0.70*	-8.59
<b>Female genital system</b>	28	1.93*	37	0.83	45	1.25	80	1.69*	190	142.47	1.33*	4.37
Cervix uteri	0	0.00	1	0.14*	0	0.00*	3	0.56	4	20.45	0.20*	-1.51
Corpus uteri	10	1.43	8	0.37*	15	0.85	24	1.02	57	69.97	0.81	-1.19
Ovary	12	3.09*	11	0.89	8	0.77	22	1.54	53	40.87	1.30	1.12
Vagina	3	13.89*	5	7.41*	4	7.15*	18	23.62*	30	2.21	13.56*	2.55
Vulva	1	1.95	11	6.75*	15	10.45*	8	3.66*	35	5.77	6.07*	2.69
<b>Urinary system</b>	10	2.41*	29	2.15*	27	2.23*	40	2.14*	106	48.48	2.19*	5.29
Urinary bladder	7	2.92*	26	3.35*	20	2.87*	30	2.81*	83	27.78	2.99*	5.08
Kidney parenchyma	2	1.43	0	0.00*	3	0.72	5	0.76	10	16.74	0.60	-0.62
Renal pelvis, other urinary	1	2.80	3	2.63	4	3.99*	5	3.44*	13	3.95	3.29*	0.83
Ureter	0	0.00	1	2.96	1	3.31	4	9.16*	6	1.18	5.08*	0.44
<b>Bone, joints</b>	0	0.00	0	0.00	2	7.82	2	5.96	4	1.01	3.96*	0.27
<b>Soft tissue including heart</b>	0	0.00	1	0.77	3	2.71	4	2.48	8	4.44	1.80	0.33
<b>Kaposi sarcoma</b>	1	31.81	0	0.00	1	10.82	0	0.00	2	0.36	5.50	0.15
<b>Melanoma of skin</b>	1	0.52	2	0.32	2	0.37	9	1.18	14	21.12	0.66	-0.66
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.44	0.00	-0.13
<b>Brain, central nervous system</b>	0	0.00	4	1.22	2	0.71	1	0.26	7	10.96	0.64	-0.36
<b>Thyroid</b>	6	4.65*	4	1.02	3	0.99	5	1.32	18	12.02	1.50	0.55
<b>Lymphatic, hematopoietic</b>	8	1.16	19	0.86	23	1.17	35	1.17	85	78.58	1.08	0.59
Hodgkin lymphoma	0	0.00	2	2.24	0	0.00	1	1.24	3	2.68	1.12	0.03
Non-Hodgkin lymphoma	5	1.64	6	0.60	15	1.62	24	1.64*	50	36.97	1.35*	1.20
Myeloma	0	0.00	3	0.71	4	1.07	5	0.90	12	14.84	0.81	-0.26
Leukemia	3	1.37	8	1.15	4	0.66	5	0.56	20	24.08	0.83	-0.38
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.07
Chronic lymphocytic	0	0.00	0	0.00	1	0.44	3	0.90	4	8.96	0.45	-0.46
Acute non-lymphocytic	2	2.55	7	2.80*	2	0.92	1	0.31	12	8.70	1.38	0.30
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	0.79	1	3.47	0.29	-0.23

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.1.8:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	104	2.13*	219	1.09	248	1.16*	366	0.99	937	832.34	1.13*	7.62
All excluding same site	98	2.08*	217	1.12	244	1.18*	359	0.99	918	810.19	1.13*	7.85
<b>Buccal cavity, pharynx</b>	1	1.12	12	3.29*	5	1.31	12	1.93	30	14.57	2.06*	1.12
Lip	0	0.00	0	0.00	0	0.00	1	3.05	1	0.73	1.37	0.02
Tongue	0	0.00	2	2.52	0	0.00	1	0.70	3	3.27	0.92	-0.02
Salivary gland	0	0.00	1	2.04	0	0.00	0	0.00	1	1.85	0.54	-0.06
Mouth	0	0.00	2	1.77	1	0.84	5	2.52	8	4.59	1.74	0.25
Nasopharynx	0	0.00	1	4.25	0	0.00	1	3.11	2	0.84	2.37	0.08
Tonsil	0	0.00	3	8.16*	1	2.59	2	3.28	6	1.45	4.13*	0.33
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.03
Hypopharynx	1	16.81	3	11.96*	2	7.67	0	0.00	6	1.00	6.02*	0.36
<b>Digestive system</b>	12	1.35	42	1.21	42	1.13	75	1.13	171	147.20	1.16	1.73
Esophagus	1	3.67	2	1.83	0	0.00	3	1.43	6	4.63	1.30	0.10
Stomach	0	0.00	2	0.67	3	1.00	6	1.18	11	11.88	0.93	-0.06
Small intestine	1	6.85	0	0.00	1	1.50	3	2.33	5	2.71	1.85	0.17
Colon	8	1.90	20	1.22	20	1.14	31	0.98	79	69.63	1.13	0.68
Rectum, rectosigmoid junction	0	0.00	10	1.70	8	1.28	11	1.03	29	24.30	1.19	0.34
Rectum	0	0.00	7	1.82	4	0.98	7	0.99	18	15.98	1.13	0.15
Anus, anal canal	0	0.00	2	3.38	4	6.03*	2	1.69	8	2.58	3.10*	0.39
Liver	1	4.51	1	1.13	0	0.00	3	1.63	5	3.91	1.28	0.08
Gallbladder	1	5.19	2	2.73	2	2.62	3	2.30	8	3.00	2.67*	0.36
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	3.12	0.00	-0.23
Pancreas	0	0.00	3	0.68	4	0.84	11	1.24	18	19.14	0.94	-0.08
<b>Respiratory system</b>	15	2.87*	48	2.16*	55	2.17*	75	1.50*	193	102.73	1.88*	6.57
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	2.12	1	1.09	0.92	-0.01
Larynx	2	9.18*	2	2.18	6	5.97*	5	2.87	15	3.88	3.86*	0.81
Lung, bronchus	13	2.64*	45	2.14*	49	2.04*	69	1.45*	176	97.46	1.81*	5.72
<b>Female breast</b>	17	1.08	48	0.72*	78	1.07	93	0.75*	236	279.81	0.84*	-3.19
<b>Female genital system</b>	32	4.20*	25	0.81	28	0.90	31	0.63*	116	118.66	0.98	-0.19
Cervix uteri	6	3.36*	2	0.29	4	0.65	7	0.97	19	22.15	0.86	-0.23
Corpus uteri	8	2.50*	2	0.15*	2	0.15*	1	0.04*	13	53.45	0.24*	-2.95
Ovary	11	5.21*	7	0.80	5	0.55	8	0.54	31	34.87	0.89	-0.28
Vagina	4	41.24*	10	26.01*	12	30.50*	7	10.81*	33	1.52	21.68*	2.29
Vulva	1	3.97	3	2.98	5	4.70*	7	3.74*	16	4.19	3.82*	0.86
<b>Urinary system</b>	9	4.89*	12	1.61	9	1.10	35	2.25*	65	33.08	1.96*	2.32
Urinary bladder	4	3.97*	7	1.75	3	0.69	19	2.29*	33	17.67	1.87*	1.12
Kidney parenchyma	4	5.79*	3	1.03	5	1.54	11	1.77	23	13.07	1.76*	0.72
Renal pelvis, other urinary	1	7.15	2	3.62	1	1.69	5	4.70*	9	2.35	3.84*	0.48
Ureter	0	0.00	1	6.64	0	0.00	4	13.39*	5	0.65	7.67*	0.32
<b>Bone, joints</b>	0	0.00	0	0.00	1	3.68	0	0.00	1	1.02	0.98	0.00
<b>Soft tissue including heart</b>	0	0.00	0	0.00	2	1.98	0	0.00	2	3.89	0.51	-0.14
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.02
<b>Melanoma of skin</b>	2	1.22	4	0.58	6	0.87	6	0.60	18	25.42	0.71	-0.54
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.15	0.00	-0.08
<b>Brain, central nervous system</b>	1	1.64	0	0.00	2	0.79	5	1.27	8	9.59	0.83	-0.12
<b>Thyroid</b>	2	1.66	5	1.03	0	0.00*	1	0.17*	8	16.34	0.49*	-0.61
<b>Lymphatic, hematopoietic</b>	12	3.53*	15	1.10	12	0.84	22	0.86	61	56.85	1.07	0.30
Hodgkin lymphoma	1	3.21	0	0.00	0	0.00	1	0.98	2	3.39	0.59	-0.10
Non-Hodgkin lymphoma	2	1.31	10	1.58	5	0.72	14	1.09	31	27.61	1.12	0.25
Myeloma	1	1.84	1	0.46	3	1.27	1	0.23	6	9.52	0.63	-0.26
Leukemia	8	7.86*	4	1.00	4	0.96	6	0.84	22	16.32	1.35	0.41
Acute lymphocytic	1	19.26	0	0.00	0	0.00	1	3.40	2	0.76	2.64	0.09
Chronic lymphocytic	3	9.51*	1	0.81	1	0.75	3	1.21	8	5.37	1.49	0.19
Acute non-lymphocytic	2	5.05	1	0.64	1	0.62	2	0.73	6	6.29	0.95	-0.02
Chronic myeloid	0	0.00	1	1.54	1	1.51	0	0.00	2	2.56	0.78	-0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Cervix Uteri

### Females, Long-term Follow-up, Radiotherapy

**Table 8.1.9:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	16,404		4,380		2,652		1,344		16,404			
<b>Person-years in interval</b>	76,700		17,380		9,827		4,853		108,760			
<b>All subsequent cancers</b>	997	1.47*	273	1.38*	166	1.31*	101	1.46*	1,537	1,072.72	1.43*	42.69
All excluding same site	996	1.50*	273	1.40*	163	1.31*	101	1.48*	1,533	1,052.27	1.46*	44.20
<b>Buccal cavity, pharynx</b>	23	1.79*	8	2.32	2	0.95	2	1.82	35	19.48	1.80*	1.43
Lip	0	0.00	1	4.89	0	0.00	0	0.00	1	1.10	0.91	-0.01
Tongue	3	1.07	2	2.59	2	4.22	0	0.00	7	4.29	1.63	0.25
Salivary gland	4	2.92	0	0.00	0	0.00	0	0.00	4	2.12	1.89	0.17
Mouth	8	1.86	3	2.58	0	0.00	1	2.65	12	6.55	1.83	0.50
Nasopharynx	1	1.50	0	0.00	0	0.00	0	0.00	1	0.98	1.02	0.00
Tonsil	6	4.66*	1	3.18	0	0.00	0	0.00	7	1.86	3.76*	0.47
Oropharynx	0	0.00	1	11.39	0	0.00	0	0.00	1	0.50	2.01	0.05
Hypopharynx	1	1.06	0	0.00	0	0.00	1	14.59	2	1.39	1.44	0.06
<b>Digestive system</b>	209	1.37*	67	1.52*	51	1.80*	24	1.52	351	240.51	1.46*	10.16
Esophagus	8	1.74	3	2.27	2	2.38	0	0.00	13	7.23	1.80	0.53
Stomach	30	2.24*	8	2.19	4	1.76	3	2.41	45	20.57	2.19*	2.25
Small intestine	6	2.79*	0	0.00	0	0.00	1	3.59	7	3.58	1.95	0.31
Colon	82	1.11	29	1.34	21	1.51	12	1.55	144	117.04	1.23*	2.48
Rectum, rectosigmoid junction	24	0.98	13	1.93*	15	3.65*	5	2.24	57	37.50	1.52*	1.79
Rectum	17	1.07	10	2.28*	12	4.41*	2	1.32	41	24.46	1.68*	1.52
Anus, anal canal	3	1.45	4	6.55*	3	7.60*	1	4.73	11	3.29	3.35*	0.71
Liver	4	1.13	0	0.00	0	0.00	0	0.00	4	5.90	0.68	-0.17
Gallbladder	4	1.15	0	0.00	2	3.47	0	0.00	6	5.29	1.13	0.07
Bile ducts, other biliary	3	0.98	1	1.02	1	1.45	0	0.00	5	5.14	0.97	-0.01
Pancreas	39	1.96*	7	1.18	2	0.51	1	0.46	49	31.91	1.54*	1.57
<b>Respiratory system</b>	305	3.62*	74	2.71*	39	2.11*	14	1.33	432	140.52	3.07*	26.80
Nose, nasal cavity, ear	1	1.06	0	0.00	0	0.00	0	0.00	1	1.49	0.67	-0.04
Larynx	8	2.49*	1	1.11	3	5.48*	1	3.54	13	4.95	2.63*	0.74
Lung, bronchus	295	3.70*	73	2.80*	36	2.03*	13	1.29	417	133.71	3.12*	26.05
<b>Female breast</b>	165	0.82*	28	0.48*	16	0.44*	13	0.66	222	315.37	0.70*	-8.59
<b>Female genital system</b>	110	1.15	37	1.51*	27	1.80*	16	2.06*	190	142.47	1.33*	4.37
Cervix uteri	1	0.07*	0	0.00	3	1.86	0	0.00	4	20.45	0.20*	-1.51
Corpus uteri	33	0.71*	14	1.16	5	0.67	5	1.26	57	69.97	0.81	-1.19
Ovary	31	1.17	11	1.50	9	1.98	2	0.84	53	40.87	1.30	1.12
Vagina	12	8.28*	6	15.22*	8	33.19*	4	31.56*	30	2.21	13.56*	2.55
Vulva	27	7.54*	5	4.64*	1	1.40	2	5.02	35	5.77	6.07*	2.69
<b>Urinary system</b>	66	2.22*	18	1.96*	6	0.98	16	4.63*	106	48.48	2.19*	5.29
Urinary bladder	53	3.10*	13	2.49*	4	1.15	13	6.61*	83	27.78	2.99*	5.08
Kidney parenchyma	5	0.49	3	0.93	1	0.46	1	0.82	10	16.74	0.60	-0.62
Renal pelvis, other urinary	8	3.20*	2	2.78	1	2.14	2	7.55	13	3.95	3.29*	0.83
Ureter	2	2.69	2	9.20*	0	0.00	2	25.39*	6	1.18	5.08*	0.44
<b>Bone, joints</b>	2	2.96	1	5.82	1	9.41	0	0.00	4	1.01	3.96*	0.27
<b>Soft tissue including heart</b>	4	1.42	3	3.73	1	1.91	0	0.00	8	4.44	1.80	0.33
<b>Kaposi sarcoma</b>	2	8.89	0	0.00	0	0.00	0	0.00	2	0.36	5.50	0.15
<b>Melanoma of skin</b>	5	0.37*	5	1.31	2	0.82	2	1.46	14	21.12	0.66	-0.66
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.44	0.00	-0.13
<b>Brain, central nervous system</b>	6	0.84	1	0.50	0	0.00	0	0.00	7	10.96	0.64	-0.36
<b>Thyroid</b>	13	1.58	5	2.51	0	0.00	0	0.00	18	12.02	1.50	0.55
<b>Lymphatic, hematopoietic</b>	50	1.03	16	1.08	14	1.44	5	0.93	85	78.58	1.08	0.59
Hodgkin lymphoma	2	1.07	1	2.34	0	0.00	0	0.00	3	2.68	1.12	0.03
Non-Hodgkin lymphoma	26	1.16	11	1.55	9	1.88	4	1.47	50	36.97	1.35*	1.20
Myeloma	7	0.75	1	0.36	4	2.22	0	0.00	12	14.84	0.81	-0.26
Leukemia	15	0.99	3	0.67	1	0.35	1	0.64	20	24.08	0.83	-0.38
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.07
Chronic lymphocytic	1	0.18*	1	0.59	1	0.92	1	1.78	4	8.96	0.45	-0.46
Acute non-lymphocytic	11	2.02*	1	0.63	0	0.00	0	0.00	12	8.70	1.38	0.30
Chronic myeloid	0	0.00	1	1.56	0	0.00	0	0.00	1	3.47	0.29	-0.23

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.1.10:** Risk of subsequent primary cancers after cancer of the cervix uteri, females, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	571	1.23*	170	1.00	119	0.98	77	1.00	937	832.34	1.13*	7.62
All excluding same site	559	1.25*	166	1.00	118	0.99	75	0.99	918	810.19	1.13*	7.85
<b>Buccal cavity, pharynx</b>	18	2.16*	7	2.38	5	2.45	0	0.00	30	14.57	2.06*	1.12
Lip	0	0.00	0	0.00	1	9.24	0	0.00	1	0.73	1.37	0.02
Tongue	2	1.09	0	0.00	1	2.11	0	0.00	3	3.27	0.92	-0.02
Salivary gland	1	0.91	0	0.00	0	0.00	0	0.00	1	1.85	0.54	-0.06
Mouth	3	1.15	3	3.20	2	3.08	0	0.00	8	4.59	1.74	0.25
Nasopharynx	1	1.92	0	0.00	1	9.83	0	0.00	2	0.84	2.37	0.08
Tonsil	4	4.75*	2	6.71	0	0.00	0	0.00	6	1.45	4.13*	0.33
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.03
Hypopharynx	6	10.50*	0	0.00	0	0.00	0	0.00	6	1.00	6.02*	0.36
<b>Digestive system</b>	96	1.19	36	1.20	24	1.09	15	1.03	171	147.20	1.16	1.73
Esophagus	3	1.18	3	3.17	0	0.00	0	0.00	6	4.63	1.30	0.10
Stomach	5	0.74	4	1.70	2	1.19	0	0.00	11	11.88	0.93	-0.06
Small intestine	2	1.41	1	1.78	1	2.33	1	3.38	5	2.71	1.85	0.17
Colon	48	1.26	13	0.92	10	0.96	8	1.16	79	69.63	1.13	0.68
Rectum, rectosigmoid junction	18	1.32	4	0.81	5	1.43	2	0.89	29	24.30	1.19	0.34
Rectum	11	1.24	2	0.62	4	1.72	1	0.65	18	15.98	1.13	0.15
Anus, anal canal	6	4.30*	2	3.70	0	0.00	0	0.00	8	2.58	3.10*	0.39
Liver	2	0.97	2	2.53	1	1.61	0	0.00	5	3.91	1.28	0.08
Gallbladder	5	2.96	1	1.66	1	2.31	1	3.68	8	3.00	2.67*	0.36
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	3.12	0.00	-0.23
Pancreas	7	0.68	5	1.27	3	1.02	3	1.52	18	19.14	0.94	-0.08
<b>Respiratory system</b>	118	2.23*	31	1.42	28	1.67*	16	1.41	193	102.73	1.88*	6.57
Nose, nasal cavity, ear	0	0.00	0	0.00	1	6.57	0	0.00	1	1.09	0.92	-0.01
Larynx	10	4.67*	3	3.67	1	1.74	1	2.85	15	3.88	3.86*	0.81
Lung, bronchus	107	2.14*	28	1.35	26	1.63*	15	1.37	176	97.46	1.81*	5.72
<b>Female breast</b>	143	0.92	41	0.70*	35	0.86	17	0.69	236	279.81	0.84*	-3.19
<b>Female genital system</b>	85	1.22	18	0.77	6	0.37*	7	0.73	116	118.66	0.98	-0.19
Cervix uteri	12	0.80	4	1.01	1	0.45	2	1.93	19	22.15	0.86	-0.23
Corpus uteri	12	0.40*	0	0.00*	0	0.00*	1	0.20	13	53.45	0.24*	-2.95
Ovary	23	1.15	4	0.56	3	0.61	1	0.34	31	34.87	0.89	-0.28
Vagina	26	29.72*	4	13.10*	2	9.51*	1	7.58	33	1.52	21.68*	2.29
Vulva	9	3.88*	5	5.83*	0	0.00	2	5.09	16	4.19	3.82*	0.86
<b>Urinary system</b>	30	1.71*	17	2.47*	7	1.34	11	3.15*	65	33.08	1.96*	2.32
Urinary bladder	14	1.49	9	2.47*	5	1.81	5	2.66	33	17.67	1.87*	1.12
Kidney parenchyma	12	1.75	6	2.18	2	0.96	3	2.18	23	13.07	1.76*	0.72
Renal pelvis, other urinary	4	3.12	2	4.22	0	0.00	3	12.48*	9	2.35	3.84*	0.48
Ureter	1	2.83	2	15.13*	0	0.00	2	29.54*	5	0.65	7.67*	0.32
<b>Bone, joints</b>	1	1.59	0	0.00	0	0.00	0	0.00	1	1.02	0.98	0.00
<b>Soft tissue including heart</b>	2	0.88	0	0.00	0	0.00	0	0.00	2	3.89	0.51	-0.14
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.02
<b>Melanoma of skin</b>	12	0.78	3	0.61	1	0.31	2	1.06	18	25.42	0.71	-0.54
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.15	0.00	-0.08
<b>Brain, central nervous system</b>	3	0.53	2	1.05	1	0.78	2	2.64	8	9.59	0.83	-0.12
<b>Thyroid</b>	7	0.66	1	0.33	0	0.00	0	0.00	8	16.34	0.49*	-0.61
<b>Lymphatic, hematopoietic</b>	39	1.24	9	0.78	8	0.95	5	0.92	61	56.85	1.07	0.30
Hodgkin lymphoma	1	0.42	0	0.00	1	3.19	0	0.00	2	3.39	0.59	-0.10
Non-Hodgkin lymphoma	17	1.15	6	1.05	7	1.64	1	0.35	31	27.61	1.12	0.25
Myeloma	5	0.98	0	0.00	0	0.00	1	1.03	6	9.52	0.63	-0.26
Leukemia	16	1.75	3	0.91	0	0.00	3	1.99	22	16.32	1.35	0.41
Acute lymphocytic	1	2.16	1	6.79	0	0.00	0	0.00	2	0.76	2.64	0.09
Chronic lymphocytic	5	1.73	1	0.89	0	0.00	2	3.77	8	5.37	1.49	0.19
Acute non-lymphocytic	4	1.12	1	0.80	0	0.00	1	1.71	6	6.29	0.95	-0.02
Chronic myeloid	2	1.35	0	0.00	0	0.00	0	0.00	2	2.56	0.78	-0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.2.1:** Characteristics of patients with an initial cancer of the vagina, females, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	—	—	1,623	100.0	1,623	100.0
<b>Initial treatment</b>						
Any radiation	—	—	1,061	65.4	1,061	65.4
With surgery	—	—	272	16.8	272	16.8
Without surgery	—	—	789	48.6	789	48.6
No radiation	—	—	562	34.6	562	34.6
With surgery	—	—	327	20.1	327	20.1
Without surgery	—	—	235	14.5	235	14.5
<b>Race</b>						
White	—	—	1,299	80.0	1,299	80.0
Black	—	—	239	14.7	239	14.7
Other	—	—	76	4.7	76	4.7
Unknown	—	—	9	0.6	9	0.6
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	—	—	81	5.0	81	5.0
30–49	—	—	218	13.4	218	13.4
50–69	—	—	589	36.3	589	36.3
70–79	—	—	385	23.7	385	23.7
≥ 80	—	—	350	21.6	350	21.6
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	—	—	1,519	93.6	1,519	93.6
1st and 2nd cancers	—	—	99	6.1	99	6.1
1st, 2nd, and 3rd cancers	—	—	5	0.3	5	0.3
1st, 2nd, 3rd, and additional cancers	—	—	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	—	—	68.2	—	68.2	—
Median year of 1st cancer diagnosis	—	—	1986.6	—	1986.6	—
Median person-years at risk	—	—	2.4	—	2.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	—	—	98.1	—	98.1
1st, 2nd, and additional cancers	—	—	—	98.1	—	98.1
1st cancer only	—	—	—	1.0	—	1.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 8.2.2:** Risk of subsequent primary cancers after cancer of the vagina, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	10	0.75	40	1.09	31	1.18	28	1.05	109	103.12	1.06	6.78
All excluding same site	10	0.75	40	1.09	31	1.18	28	1.05	109	102.89	1.06	7.04
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.75	0.00	-2.02
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.14
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.44
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.23
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.71
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.17
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.13
<b>Digestive system</b>	1	0.29	10	1.07	7	1.06	10	1.52	28	25.99	1.08	2.31
Esophagus	1	10.65	2	7.83	0	0.00	1	5.36	4	0.72	5.54*	3.78
Stomach	0	0.00	3	3.71	0	0.00	0	0.00	3	2.22	1.35	0.90
Small intestine	0	0.00	1	8.22	0	0.00	0	0.00	1	0.36	2.77	0.74
Colon	0	0.00	1	0.22	6	1.80	1	0.30	8	13.01	0.61	-5.78
Rectum, rectosigmoid junction	0	0.00	1	0.70	0	0.00	5	5.47*	6	3.84	1.56	2.49
Rectum	0	0.00	1	1.08	0	0.00	4	6.61*	5	2.51	1.99	2.87
Anus, anal canal	0	0.00	0	0.00	1	12.38	0	0.00	1	0.31	3.18	0.79
Liver	0	0.00	0	0.00	0	0.00	1	6.32	1	0.57	1.76	0.50
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.66
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.65
Pancreas	0	0.00	1	0.80	0	0.00	1	1.09	2	3.51	0.57	-1.74
<b>Respiratory system</b>	1	0.64	6	1.32	10	2.95*	1	0.27	18	13.20	1.36	5.52
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.17
Larynx	1	18.93	0	0.00	0	0.00	0	0.00	1	0.41	2.42	0.68
Lung, bronchus	0	0.00	6	1.38	10	3.08*	1	0.28	17	12.61	1.35	5.05
<b>Female breast</b>	2	0.56	6	0.60	5	0.70	9	1.23	22	27.95	0.79	-6.85
<b>Female genital system</b>	3	1.76	8	1.71	5	1.60	1	0.33	17	12.53	1.36	5.15
Cervix uteri	1	4.29	1	1.62	2	5.17	0	0.00	4	1.59	2.52	2.78
Corpus uteri	1	1.20	1	0.43	2	1.31	0	0.00	4	6.12	0.65	-2.44
Ovary	0	0.00	4	3.01	0	0.00	0	0.00	4	3.66	1.09	0.40
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.26
Vulva	1	12.45	2	9.23*	1	6.28	1	6.10	5	0.62	8.06*	5.05
<b>Urinary system</b>	0	0.00	4	2.24	1	0.77	5	3.72*	10	5.07	1.97	5.68
Urinary bladder	0	0.00	3	2.78	0	0.00	4	5.04*	7	3.04	2.30	4.56
Kidney parenchyma	0	0.00	1	1.80	0	0.00	0	0.00	1	1.61	0.62	-0.70
Renal pelvis, other urinary	0	0.00	0	0.00	1	9.35	1	9.51	2	0.42	4.77	1.82
Ureter	0	0.00	0	0.00	1	31.19	1	32.31	2	0.13	15.89*	2.16
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.11
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.49
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.06
<b>Melanoma of skin</b>	0	0.00	2	3.13	0	0.00	1	1.93	3	1.85	1.62	1.32
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.16
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.99	0.00	-1.15
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-1.02
<b>Lymphatic, hematopoietic</b>	3	2.88	2	0.70	1	0.48	1	0.46	7	8.16	0.86	-1.34
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.29
Non-Hodgkin lymphoma	1	2.17	1	0.78	1	1.04	0	0.00	3	3.72	0.81	-0.83
Myeloma	1	4.95	0	0.00	0	0.00	0	0.00	1	1.58	0.63	-0.67
Leukemia	1	2.88	1	1.07	0	0.00	1	1.50	3	2.62	1.15	0.44
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.01	0.00	-1.16
Acute non-lymphocytic	1	8.36	1	3.11	0	0.00	1	4.15	3	0.92	3.27	2.40
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.42

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Vagina

### Females, <65 Years of Age

**Table 8.2.3:** Risk of subsequent primary cancers after cancer of the vagina, females, <65 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	693	532	585	1,664	320	1,309	215	1,581	693	5,086		
<b>All subsequent cancers</b>	3	0.96	13	1.20	10	0.98	17	1.05	43	40.25	1.07	5.40
All excluding same site	3	0.96	13	1.21	10	0.98	17	1.06	43	40.18	1.07	5.55
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-1.51
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.07
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.34
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.16
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.49
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.16
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.12
<b>Digestive system</b>	1	2.06	2	1.14	2	1.10	6	1.86	11	7.29	1.51	7.30
Esophagus	1	49.29	0	0.00	0	0.00	0	0.00	1	0.27	3.74	1.44
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-1.03
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.26
Colon	0	0.00	0	0.00	2	2.34	1	0.64	3	3.45	0.87	-0.88
Rectum, rectosigmoid junction	0	0.00	1	3.06	0	0.00	4	8.02*	5	1.23	4.05*	7.41
Rectum	0	0.00	1	4.76	0	0.00	3	9.19*	4	0.80	5.01*	6.29
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.25
Liver	0	0.00	0	0.00	0	0.00	1	11.76	1	0.18	5.63	1.62
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.29
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.28
Pancreas	0	0.00	1	4.46	0	0.00	0	0.00	1	0.98	1.02	0.04
<b>Respiratory system</b>	0	0.00	1	0.69	3	1.99	1	0.40	5	5.86	0.85	-1.69
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.10
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.44
Lung, bronchus	0	0.00	1	0.73	3	2.10	1	0.42	5	5.56	0.90	-1.11
<b>Female breast</b>	0	0.00	2	0.55	3	0.92	5	1.03	10	12.80	0.78	-5.51
<b>Female genital system</b>	2	3.75	5	2.85	2	1.35	1	0.49	10	5.79	1.73	8.28
Cervix uteri	1	11.01	0	0.00	1	4.75	0	0.00	2	0.82	2.45	2.33
Corpus uteri	1	3.72	1	1.11	1	1.33	0	0.00	3	2.94	1.02	0.12
Ovary	0	0.00	3	6.20*	0	0.00	0	0.00	3	1.66	1.80	2.63
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.15
Vulva	0	0.00	1	22.06	0	0.00	1	12.38	2	0.18	10.90*	3.57
<b>Urinary system</b>	0	0.00	0	0.00	0	0.00	3	4.01	3	1.70	1.76	2.55
Urinary bladder	0	0.00	0	0.00	0	0.00	2	4.86	2	0.92	2.18	2.13
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-1.30
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	18.06	1	0.12	8.07	1.72
Ureter	0	0.00	0	0.00	0	0.00	1	63.41	1	0.03	29.20	1.90
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.33
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-1.93
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.90
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-1.08
<b>Lymphatic, hematopoietic</b>	0	0.00	2	2.96	0	0.00	1	0.84	3	2.74	1.09	0.50
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.26
Non-Hodgkin lymphoma	0	0.00	1	3.07	0	0.00	0	0.00	1	1.34	0.74	-0.68
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.97
Leukemia	0	0.00	1	5.16	0	0.00	1	3.01	2	0.77	2.59	2.41
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.07
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.55
Acute non-lymphocytic	0	0.00	1	14.04	0	0.00	1	8.01	2	0.29	6.99	3.37
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.22

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.2.4:** Risk of subsequent primary cancers after cancer of the vagina, females, ≥65 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	7	0.69	27	1.04	21	1.31	11	1.04	66	62.86	1.05	8.73
All excluding same site	7	0.69	27	1.04	21	1.31	11	1.04	66	62.71	1.05	9.16
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-2.73
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.24
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.59
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.33
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-1.02
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.15
<b>Digestive system</b>	0	0.00	8	1.06	5	1.04	4	1.19	17	18.71	0.91	-4.75
Esophagus	0	0.00	2	10.74*	0	0.00	1	12.81	3	0.45	6.61*	7.08
Stomach	0	0.00	3	4.40	0	0.00	0	0.00	3	1.69	1.77	3.64
Small intestine	0	0.00	1	11.04	0	0.00	0	0.00	1	0.23	4.36	2.14
Colon	0	0.00	1	0.26	4	1.62	0	0.00	5	9.57	0.52	-12.70
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	2.41	1	2.60	0.38	-4.45
Rectum	0	0.00	0	0.00	0	0.00	1	3.59	1	1.71	0.58	-1.98
Anus, anal canal	0	0.00	0	0.00	1	20.76	0	0.00	1	0.19	5.32	2.26
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-1.08
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-1.18
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-1.16
Pancreas	0	0.00	0	0.00	0	0.00	1	2.13	1	2.54	0.39	-4.27
<b>Respiratory system</b>	1	0.85	5	1.61	7	3.71*	0	0.00	13	7.35	1.77	15.72
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.25
Larynx	1	30.06	0	0.00	0	0.00	0	0.00	1	0.19	5.35	2.26
Lung, bronchus	0	0.00	5	1.68	7	3.86*	0	0.00	12	7.05	1.70	13.77
<b>Female breast</b>	2	0.80	4	0.63	2	0.52	4	1.65	12	15.15	0.79	-8.76
<b>Female genital system</b>	1	0.86	3	1.03	3	1.81	0	0.00	7	6.74	1.04	0.73
Cervix uteri	0	0.00	1	2.91	1	5.66	0	0.00	2	0.77	2.59	3.42
Corpus uteri	0	0.00	0	0.00	1	1.29	0	0.00	1	3.18	0.31	-6.05
Ovary	0	0.00	1	1.19	0	0.00	0	0.00	1	1.99	0.50	-2.76
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.43
Vulva	1	14.86	1	5.84	1	8.70	0	0.00	3	0.44	6.87*	7.13
<b>Urinary system</b>	0	0.00	4	2.92	1	1.15	2	3.35	7	3.37	2.08	10.10
Urinary bladder	0	0.00	3	3.49	0	0.00	2	5.23	5	2.13	2.35	7.99
Kidney parenchyma	0	0.00	1	2.57	0	0.00	0	0.00	1	0.95	1.06	0.15
Renal pelvis, other urinary	0	0.00	0	0.00	1	13.23	0	0.00	1	0.30	3.38	1.96
Ureter	0	0.00	0	0.00	1	43.02	0	0.00	1	0.09	10.91	2.53
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.71
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.11
<b>Melanoma of skin</b>	0	0.00	2	5.65	0	0.00	1	6.55	3	0.87	3.44	5.92
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.22
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-1.49
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.93
<b>Lymphatic, hematopoietic</b>	3	3.51	0	0.00	1	0.71	0	0.00	4	5.42	0.74	-3.94
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.32
Non-Hodgkin lymphoma	1	2.70	0	0.00	1	1.61	0	0.00	2	2.37	0.84	-1.03
Myeloma	1	5.89	0	0.00	0	0.00	0	0.00	1	1.08	0.92	-0.23
Leukemia	1	3.41	0	0.00	0	0.00	0	0.00	1	1.84	0.54	-2.35
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.12
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-2.01
Acute non-lymphocytic	1	10.06	0	0.00	0	0.00	0	0.00	1	0.63	1.59	1.03
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.70

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.3.1:** Characteristics of patients with an initial cancer of the vulva, females, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	—	—	5,571	100.0	5,571	100.0
<b>Initial treatment</b>						
Any radiation	—	—	895	16.1	895	16.1
With surgery	—	—	616	11.1	616	11.1
Without surgery	—	—	279	5.0	279	5.0
No radiation	—	—	4,676	83.9	4,676	83.9
With surgery	—	—	4,297	77.1	4,297	77.1
Without surgery	—	—	379	6.8	379	6.8
<b>Race</b>						
White	—	—	4,997	89.7	4,997	89.7
Black	—	—	358	6.4	358	6.4
Other	—	—	175	3.1	175	3.1
Unknown	—	—	41	0.7	41	0.7
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	—	—	110	2.0	110	2.0
30–49	—	—	876	15.7	876	15.7
50–69	—	—	1,703	30.6	1,703	30.6
70–79	—	—	1,504	27.0	1,504	27.0
≥ 80	—	—	1,378	24.7	1,378	24.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	—	—	5,050	90.6	5,050	90.6
1st and 2nd cancers	—	—	472	8.5	472	8.5
1st, 2nd, and 3rd cancers	—	—	48	0.9	48	0.9
1st, 2nd, 3rd, and additional cancers	—	—	1	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	—	—	70.7	—	70.7	—
Median year of 1st cancer diagnosis	—	—	1989.0	—	1989.0	—
Median person-years at risk	—	—	4.5	—	4.5	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	—	—	95.2	—	95.2
1st, 2nd, and additional cancers	—	—	—	94.6	—	94.6
1st cancer only	—	—	—	4.4	—	4.4

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 8.3.2:** Risk of subsequent primary cancers after cancer of the vulva, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	54	1.02	213	1.20*	155	1.14	149	1.24*	571	485.23	1.18*	23.62
All excluding same site	54	1.03	201	1.14	142	1.06	143	1.20*	540	481.98	1.12*	15.98
<b>Buccal cavity, pharynx</b>	2	2.17	5	1.62	8	3.44*	6	3.01*	21	8.32	2.52*	3.49
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.18
Tongue	1	4.96	1	1.49	4	7.78*	1	2.27	7	1.83	3.83*	1.42
Salivary gland	0	0.00	0	0.00	0	0.00	1	4.17	1	0.97	1.03	0.01
Mouth	1	3.04	3	2.75	3	3.64	2	2.81	9	2.96	3.05*	1.66
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.08
Tonsil	0	0.00	1	4.17	0	0.00	0	0.00	1	0.63	1.59	0.10
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	1	7.11	1	8.76	2	0.50	4.00	0.41
<b>Digestive system</b>	13	0.94	45	0.99	37	1.07	37	1.23	132	124.11	1.06	2.17
Esophagus	2	5.77	3	2.59	1	1.12	0	0.00	6	3.21	1.87	0.77
Stomach	1	0.87	2	0.55	3	1.12	1	0.45	7	9.73	0.72	-0.75
Small intestine	0	0.00	1	1.74	2	4.41	0	0.00	3	1.63	1.84	0.38
Colon	6	0.85	20	0.86	22	1.24	17	1.10	65	63.62	1.02	0.38
Rectum, rectosigmoid junction	0	0.00	7	1.01	3	0.58	4	0.94	14	18.44	0.76	-1.22
Rectum	0	0.00	5	1.10	0	0.00	3	1.05	8	12.18	0.66	-1.15
Anus, anal canal	2	12.44*	4	7.40*	1	2.39	5	13.40*	12	1.49	8.04*	2.89
Liver	1	3.70	0	0.00	0	0.00	0	0.00	1	2.51	0.40	-0.41
Gallbladder	0	0.00	1	0.93	1	1.28	1	1.60	3	2.81	1.07	0.05
Bile ducts, other biliary	0	0.00	2	1.97	0	0.00	2	2.68	4	2.86	1.40	0.31
Pancreas	1	0.56	5	0.85	4	0.88	7	1.73	17	16.25	1.05	0.21
<b>Respiratory system</b>	10	1.61	36	1.68*	21	1.23	27	1.68*	94	60.75	1.55*	9.15
Nose, nasal cavity, ear	0	0.00	1	4.08	0	0.00	0	0.00	1	0.67	1.48	0.09
Larynx	1	5.31	1	1.55	2	4.07	2	4.67	6	1.75	3.42*	1.17
Lung, bronchus	9	1.52	34	1.66*	19	1.16	25	1.61*	87	58.17	1.50*	7.94
<b>Female breast</b>	8	0.56	55	1.15	28	0.76	29	0.89	120	131.08	0.92	-3.05
<b>Female genital system</b>	13	2.03*	34	1.61*	29	1.86*	24	1.82*	100	56.36	1.77*	12.02
Cervix uteri	2	2.71	5	2.12	2	1.24	0	0.00	9	5.91	1.52	0.85
Corpus uteri	4	1.27	7	0.67	7	0.91	11	1.70	29	27.76	1.04	0.34
Ovary	7	3.72*	6	0.96	5	1.05	3	0.73	21	17.03	1.23	1.09
Vagina	0	0.00	4	10.90*	0	0.00	2	8.74	6	0.98	6.12*	1.38
Vulva	0	0.00	12	10.26*	13	14.45*	6	7.32*	31	3.25	9.54*	7.64
<b>Urinary system</b>	1	0.38	6	0.68	4	0.58	5	0.81	16	24.55	0.65	-2.35
Urinary bladder	1	0.61	3	0.55	1	0.24	1	0.27	6	15.04	0.40*	-2.49
Kidney parenchyma	0	0.00	1	0.38	1	0.48	3	1.55	5	7.45	0.67	-0.67
Renal pelvis, other urinary	0	0.00	2	2.63	2	3.47	1	2.00	5	2.07	2.42	0.81
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.18
<b>Bone, joints</b>	0	0.00	1	6.08	0	0.00	0	0.00	1	0.44	2.29	0.15
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	1.84	0	0.00	1	1.96	0.51	-0.27
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.07
<b>Melanoma of skin</b>	1	1.03	8	2.42*	6	2.32	1	0.42	16	9.24	1.73	1.86
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.19
<b>Brain, central nervous system</b>	0	0.00	4	2.34	2	1.54	0	0.00	6	4.64	1.29	0.37
<b>Thyroid</b>	0	0.00	1	0.70	0	0.00	1	1.13	2	3.77	0.53	-0.49
<b>Lymphatic, hematopoietic</b>	3	0.70	14	0.98	12	1.09	14	1.41	43	39.50	1.09	0.96
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	4.14	1	1.08	0.92	-0.02
Non-Hodgkin lymphoma	3	1.53	8	1.20	6	1.15	8	1.66	25	18.67	1.34	1.74
Myeloma	0	0.00	4	1.65	2	1.07	3	1.79	9	6.70	1.34	0.63
Leukemia	0	0.00	2	0.42	4	1.10	2	0.62	8	13.05	0.61	-1.39
Acute lymphocytic	0	0.00	0	0.00	1	9.96	0	0.00	1	0.36	2.76	0.18
Chronic lymphocytic	0	0.00	0	0.00	3	2.13	1	0.81	4	5.05	0.79	-0.29
Acute non-lymphocytic	0	0.00	2	1.21	0	0.00	1	0.89	3	4.53	0.66	-0.42
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.81	0.00	-0.50

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Vulva Females, <55 Years of Age

**Table 8.3.3:** Risk of subsequent primary cancers after cancer of the vulva, females, <55 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	1,306	1,031										
			1,182	3,853	779	3,168	507	3,480		1,306	11,532	
<b>All subsequent cancers</b>	8	2.24	33	2.07*	36	2.01*	51	1.57*	128	69.87	1.83*	50.41
All excluding same site	8	2.25	32	2.01*	33	1.85*	49	1.52*	122	69.55	1.75*	45.48
<b>Buccal cavity, pharynx</b>	1	15.32	2	6.51	3	8.45*	6	10.35*	12	1.31	9.18*	9.27
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.05
Tongue	1	68.93	0	0.00	1	12.09	1	7.52	3	0.30	10.00*	2.34
Salivary gland	0	0.00	0	0.00	0	0.00	1	15.42	1	0.15	6.52	0.73
Mouth	0	0.00	1	10.79	1	9.01	2	10.97*	4	0.41	9.87*	3.12
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Tonsil	0	0.00	1	26.82	0	0.00	0	0.00	1	0.15	6.65	0.74
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	1	36.74	1	21.94	2	0.10	20.09*	1.65
<b>Digestive system</b>	1	2.69	3	1.62	3	1.25	10	1.83	17	10.10	1.68	5.99
Esophagus	0	0.00	0	0.00	1	10.19	0	0.00	1	0.38	2.62	0.54
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.61
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.19
Colon	0	0.00	1	1.23	2	1.85	3	1.18	6	4.60	1.30	1.21
Rectum, rectosigmoid junction	0	0.00	1	2.67	0	0.00	2	2.17	3	1.84	1.63	1.01
Rectum	0	0.00	1	4.11	0	0.00	1	1.65	2	1.20	1.66	0.69
Anus, anal canal	1	89.45*	1	19.57	0	0.00	3	28.42*	5	0.23	22.02*	4.14
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.23
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.17
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.17
Pancreas	0	0.00	0	0.00	0	0.00	2	2.71	2	1.28	1.56	0.62
<b>Respiratory system</b>	1	3.24	7	4.33*	6	2.72	10	2.00	24	9.13	2.63*	12.90
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.08
Larynx	0	0.00	1	11.67	1	9.44	2	10.88*	4	0.39	10.18*	3.13
Lung, bronchus	1	3.50	6	3.99*	5	2.41	8	1.68	20	8.62	2.32*	9.87
<b>Female breast</b>	2	1.36	14	2.20*	6	0.89	11	1.02	33	25.33	1.30	6.65
<b>Female genital system</b>	3	4.81	3	1.11	6	2.12	8	1.81	20	10.59	1.89*	8.16
Cervix uteri	2	12.19*	0	0.00	0	0.00	0	0.00	2	1.84	1.09	0.14
Corpus uteri	0	0.00	0	0.00	1	0.76	1	0.44	2	4.98	0.40	-2.59
Ovary	1	5.48	1	1.26	0	0.00	2	1.51	4	3.14	1.27	0.75
Vagina	0	0.00	1	38.78	0	0.00	1	18.33	2	0.12	17.20*	1.63
Vulva	0	0.00	1	13.34	3	38.51*	2	13.71*	6	0.32	18.93*	4.93
<b>Urinary system</b>	0	0.00	1	2.08	1	1.61	2	1.44	4	2.59	1.55	1.22
Urinary bladder	0	0.00	0	0.00	1	3.29	0	0.00	1	1.30	0.77	-0.26
Kidney parenchyma	0	0.00	0	0.00	0	0.00	2	3.49	2	1.13	1.77	0.76
Renal pelvis, other urinary	0	0.00	1	36.77	0	0.00	0	0.00	1	0.16	6.25	0.73
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.03
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.28
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Melanoma of skin</b>	0	0.00	1	1.48	4	6.46*	0	0.00	5	2.29	2.18	2.35
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.09
<b>Brain, central nervous system</b>	0	0.00	2	9.40*	2	9.21*	0	0.00	4	0.83	4.83*	2.75
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.38	0.00	-1.20
<b>Lymphatic, hematopoietic</b>	0	0.00	0	0.00	2	1.90	3	1.38	5	4.34	1.15	0.58
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.23
Non-Hodgkin lymphoma	0	0.00	0	0.00	1	1.87	2	1.80	3	2.20	1.37	0.70
Myeloma	0	0.00	0	0.00	1	6.12	1	2.59	2	0.69	2.89	1.13
Leukemia	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-1.03
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.33
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.40
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 8.3.4:** Risk of subsequent primary cancers after cancer of the vulva, females, ≥55 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	46	0.93	180	1.12	119	1.01	98	1.12	443	415.37	1.07	11.15
All excluding same site	46	0.94	169	1.06	109	0.93	94	1.08	418	412.43	1.01	2.25
<b>Buccal cavity, pharynx</b>	1	1.17	3	1.08	5	2.54	0	0.00	9	7.02	1.28	0.80
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.25
Tongue	0	0.00	1	1.66	3	6.95*	0	0.00	4	1.53	2.62	1.00
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.33
Mouth	1	3.23	2	2.00	2	2.81	0	0.00	5	2.55	1.96	0.99
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.19
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.16
<b>Digestive system</b>	12	0.89	42	0.96	34	1.06	27	1.10	115	114.01	1.01	0.40
Esophagus	2	5.99	3	2.76	0	0.00	0	0.00	5	2.83	1.77	0.88
Stomach	1	0.90	2	0.57	3	1.19	1	0.54	7	9.03	0.78	-0.82
Small intestine	0	0.00	1	1.89	2	5.00	0	0.00	3	1.41	2.13	0.64
Colon	6	0.87	19	0.85	20	1.20	14	1.08	59	59.02	1.00	-0.01
Rectum, rectosigmoid junction	0	0.00	6	0.92	3	0.64	2	0.60	11	16.60	0.66	-2.26
Rectum	0	0.00	4	0.93	0	0.00	2	0.89	6	10.98	0.55	-2.01
Anus, anal canal	1	6.68	3	6.13*	1	2.79	2	7.48	7	1.27	5.53*	2.31
Liver	1	3.83	0	0.00	0	0.00	0	0.00	1	2.25	0.45	-0.50
Gallbladder	0	0.00	1	0.96	1	1.36	1	1.93	3	2.62	1.14	0.15
Bile ducts, other biliary	0	0.00	2	2.04	0	0.00	2	3.17	4	2.66	1.50	0.54
Pancreas	1	0.57	5	0.88	4	0.94	5	1.51	15	14.97	1.00	0.01
<b>Respiratory system</b>	9	1.53	29	1.46	15	1.01	17	1.53	70	51.63	1.36*	7.41
Nose, nasal cavity, ear	0	0.00	1	4.44	0	0.00	0	0.00	1	0.59	1.70	0.17
Larynx	1	5.85	0	0.00	1	2.59	0	0.00	2	1.36	1.47	0.26
Lung, bronchus	8	1.42	28	1.48	14	0.98	17	1.59	67	49.54	1.35*	7.04
<b>Female breast</b>	6	0.47	41	0.99	22	0.73	18	0.83	87	105.75	0.82	-7.57
<b>Female genital system</b>	10	1.73	31	1.68*	23	1.80*	16	1.83*	80	45.77	1.75*	13.81
Cervix uteri	0	0.00	5	2.87	2	1.81	0	0.00	7	4.07	1.72	1.18
Corpus uteri	4	1.37	7	0.75	6	0.94	10	2.38*	27	22.78	1.19	1.70
Ovary	6	3.54*	5	0.91	5	1.28	1	0.36	17	13.89	1.22	1.25
Vagina	0	0.00	3	8.79*	0	0.00	1	5.74	4	0.86	4.63*	1.26
Vulva	0	0.00	11	10.05*	10	12.17*	4	5.94*	25	2.93	8.53*	8.90
<b>Urinary system</b>	1	0.39	5	0.60	3	0.48	3	0.62	12	21.96	0.55*	-4.02
Urinary bladder	1	0.62	3	0.57	0	0.00*	1	0.33	5	13.74	0.36*	-3.52
Kidney parenchyma	0	0.00	1	0.41	1	0.56	1	0.73	3	6.32	0.47	-1.34
Renal pelvis, other urinary	0	0.00	1	1.36	2	3.71	1	2.44	4	1.91	2.09	0.84
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.24
<b>Bone, joints</b>	0	0.00	1	7.10	0	0.00	0	0.00	1	0.35	2.82	0.26
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	2.16	0	0.00	1	1.65	0.61	-0.26
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.10
<b>Melanoma of skin</b>	1	1.25	7	2.66*	2	1.02	1	0.64	11	6.95	1.58	1.63
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.24
<b>Brain, central nervous system</b>	0	0.00	2	1.34	0	0.00	0	0.00	2	3.82	0.52	-0.73
<b>Thyroid</b>	0	0.00	1	1.02	0	0.00	1	2.25	2	2.39	0.84	-0.16
<b>Lymphatic, hematopoietic</b>	3	0.74	14	1.05	10	1.00	11	1.41	38	35.16	1.08	1.14
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	6.32	1	0.82	1.22	0.07
Non-Hodgkin lymphoma	3	1.61	8	1.29	5	1.07	6	1.61	22	16.47	1.34	2.23
Myeloma	0	0.00	4	1.73	1	0.59	2	1.55	7	6.01	1.16	0.40
Leukemia	0	0.00	2	0.44	4	1.20	2	0.76	8	11.87	0.67	-1.56
Acute lymphocytic	0	0.00	0	0.00	1	11.85	0	0.00	1	0.30	3.32	0.28
Chronic lymphocytic	0	0.00	0	0.00	3	2.27	1	0.98	4	4.67	0.86	-0.27
Acute non-lymphocytic	0	0.00	2	1.30	0	0.00	1	1.10	3	4.07	0.74	-0.43
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-0.65

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.





# Chapter 9

## New Malignancies Following Cancer of the Uterine Corpus and Ovary

D. Michal Freedman, Rochelle E. Curtis, Lois B. Travis, Joseph F. Fraumeni Jr.

### Synopsis

The risk of subsequent primary cancers was evaluated in more than 115,000 women diagnosed with cancer of the uterine corpus (UCC) or cancer of the ovary between 1973 and 2000. The overall risk of subsequent primary cancers outside the female genital tract was significantly increased among survivors of ovarian cancer (O/E=1.18,<sup>1</sup> O=2,091, EAR=15 per 10,000 person-years) but not of UCC (O/E=0.99,<sup>1</sup> O=8,409). Overall, nongenital cancer risk did not increase over time among UCC patients, but it rose to 31% among those surviving 5 years or more after ovarian cancer diagnosis. Excess new malignancies of the colon, rectum, urinary bladder, and breast were associated with both gynecologic cancer sites. Hormonal and dietary factors, as well as genetic predisposition, may have contributed to the elevated risks of cancers of the breast and colon. In particular, BRCA1/2 susceptibility genes are involved in hereditary forms of breast and ovarian cancer. In addition, UCC and ovarian cancers are associated with hereditary nonpolyposis colorectal cancer, which may explain the excess of colorectal cancer among younger gynecologic patients and also account for some of the excess cancers of the small intestine, renal pelvis, and biliary tract among ovarian cancer patients. Radiotherapy may have also contributed to the observed excess of certain solid tumors following UCC and ovarian cancers, particularly sarcomas, and cancers of the urinary bladder and colon, as well as rectal cancer following UCC. While the excess of acute leukemia following UCC appeared to be related to radiotherapy, the elevated risks after ovarian cancer were more likely due to chemotherapy regimens that include alkylating agents or platinum compounds. Ovarian cancer was also associated with other new malignancies, including ocular melanoma. Further studies are needed to untangle the genetic and other risk factors linking colorectal cancer to both gynecologic tumors and to clarify the relation of ovarian cancer to less common tumors, such as cancers of the biliary tract and ocular melanoma.

<sup>1</sup>Observed-to-expected ratios of subsequent primary cancers following cancers of the UCC and ovary exclude new cancers of the female genital sites.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

### Uterine Corpus Cancer

Uterine corpus cancer (UCC) is the fourth most common cancer among U.S. women, accounting for about 6% of incident cancers and 2.7% of cancer deaths among females (Jemal et al, 2005). The relative survival rate is 87.0% at 5 years (83.0% at 10 years) among white females but only 64.7% at 5 years among black females, reflecting racial disparities in the stage of disease at the time of diagnosis. Because most women (91%) are treated surgically with removal of the uterus, cervix, ovaries, and fallopian tubes (Rose, 1996), few remain at risk to develop subsequent cancers of the female genital tract. Adjuvant radiotherapy to the pelvis is given to 35% of patients, while primary radiotherapy is administered to a much smaller percentage of cases, usually those considered at high risk of surgical complications.

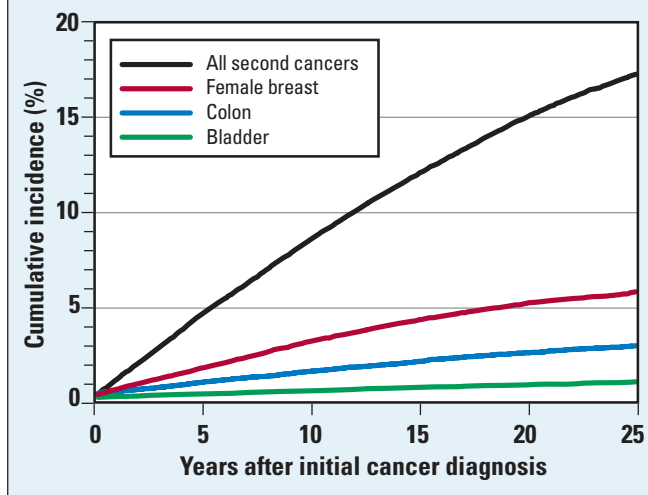
Most of the established risk factors for UCC involve sustained estrogen stimulation of the endometrium, including estrogen replacement therapy, nulliparity, late menopause, and obesity (Hulka, 1997; Brinton and Hoover, 2000). Some, but not all, studies have reported a positive relation to socioeconomic status, diabetes, and hypertension, and an inverse relation to cigarette smoking (Hulka, 1997; Brinton and Hoover, 2000).

### Results and Discussion

The overall risk of subsequent primary cancers was not increased at any time among the 74,185 women who survived 2 months or more following a diagnosis of UCC (O/E= 0.99 excluding female genital sites, O=8,409, 95% CI=0.97-1.01). The cumulative incidence of developing a second cancer following uterine cancer, adjusting for the competing risk of death due to other causes, was 17.5% at 25 years, 95% CI=17.1%-17.9% (Figure 9.1). The risk of developing a new malignancy (including 2nd, 3rd, and 4th cancers), however, varied significantly by age at diagnosis, race, and subsequent cancer site although not substantially by histologic type of UCC (leiomyosarcomas, other sarcomas, carcinomas). Elevated risks were limited to younger women (25% excess for women diagnosed at younger than 50 years of age, and 47% for those diagnosed at younger than 40 years), while black women (O/E=1.27, EAR=29 per 10,000 person-years) had a higher risk of new

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**Figure 9.1:** Cumulative incidence of developing a second cancer among patients with cancer of the corpus uteri, females, SEER 1973-2000.



malignancies than white women ( $O/E=0.98$ ). There were significantly increased risks for subsequent cancers of the small intestine, colon, urinary bladder, breast, vagina, and soft tissue, as well as for acute leukemia. Also noteworthy was a 64% nonsignificant higher risk for bone cancer after uterine cancer and a small (12%), but borderline significant, risk for subsequent rectal cancer. Significant deficits were seen for new malignancies of the buccal cavity, esophagus, and respiratory system, as well as for chronic lymphocytic leukemia. Our findings are consistent with previous surveys of UCC revealing elevated risks for subsequent cancers of the colon, urinary bladder, and breast, as well as for leukemia (Annegers and Malkasian, 1981; Curtis et al, 1985, 1994; Schwartz et al, 1985; Storm and Ewertz, 1985; Schoen et al, 1994; Bergfeldt et al, 1995; Re et al, 1997; Zimmerman and Westhoff, 1999).

Subsequent breast and colon cancers were the 2 most frequent cancers after a diagnosis of UCC. While the underlying mechanisms are unclear, it has been shown that endometrial, ovarian, and breast cancers have many similar reproductive and menstrual risk factors (Schottenfeld, 1996; Brinton and Hoover, 2000; McPherson et al, 2000). Hormonal factors may also play a role in subsequent colon cancers; however, while hormone replacement therapy increases the risk of breast cancer and UCC, it appears to lower the risk of colon cancer (Potter, 1999). A number of studies also suggest that obesity and physical inactivity increase the risk of UCC, colon cancer, and postmenopausal breast cancer (Potter, 1999; Brinton and Hoover, 2000; Willett, 2001). In addition, we found a reciprocal significantly increased risk for UCC following both breast and colon cancer, providing further evidence of shared risk factors with UCC. Radiotherapy probably contributed to the elevated risk of colon cancer

(UNSCEAR, 2000), particularly because the excess in our study seemed limited to women who received radiotherapy in the initial regimen.

The risks of subsequent breast and colon cancers varied by age at UCC diagnosis. While breast cancer risks were highest in the oldest age groups, the increase in colon cancer was limited to women younger than 50 years at UCC diagnosis (a nearly 4-fold risk increase, rising to 7-fold among women younger than 40 years). This tendency to early onset of multiple primary cancers is characteristic of genetic syndromes such as hereditary nonpolyposis colorectal cancer, which encompasses endometrial and certain other extracolonic cancers (Lynch et al, 1991; Weinberg et al, 1999). This syndrome may provide insights into the increased risk we observed for small intestinal cancer after UCC and for the 3-fold excess of rectal cancer among women younger than 50 years of age.

It seems likely that radiotherapy contributed to the elevated risks observed for subsequent acute non-lymphocytic leukemia (ANLL) and cancers of the rectum, urinary bladder, bone, and soft tissue, particularly because the excesses were noted primarily among women who received radiotherapy in the initial treatment regimen (Boice et al, 1988; UNSCEAR, 2000). For example, a large majority of new soft tissue and bone sarcomas diagnosed among UCC survivors receiving initial radiotherapy occurred in the irradiated pelvic fields. The excesses of rectal and urinary bladder cancer in our study are interesting in view of the dose-dependent excesses of urinary bladder and rectal cancers previously reported following comparable pelvic radiotherapy for cervical cancer (Boice et al, 1988). Similarly, the increased risk for acute leukemia in our study is consistent with the radiogenic effects described in an international survey of patients with UCC (Curtis et al, 1994). Although the temporal sequence of these new malignancies was generally consistent with the latency periods of radiogenic cancers, there was some excess risk of solid tumors in the first 5 years of follow-up, suggesting that heightened medical surveillance may have played some role.

The reduced risk of new malignancies of the buccal cavity and lung is noteworthy in view of reports suggesting that cigarette smoking may lower the risk of UCC (Brinton and Hoover, 2000), perhaps through its inhibition of ovarian function and relation to early menopause. Significant excesses of new malignancies of the vagina and ovary within the first year of follow-up are likely to reflect uncertainties in the diagnosis of the primary or subsequent tumor, although heightened gynecologic surveillance may improve cancer detection. The deficit in chronic lymphocytic leukemia among survivors of UCC was seen with other first primary cancer sites and could be related to earlier detection during the first 2 months of follow-up and thus excluded from this analysis.

## Ovarian Cancer

Ovarian cancer, while accounting for only 3% of female malignancies, is the leading cause of gynecologic cancer death and the fourth most common cause of cancer mortality in women (Jemal et al, 2005). Because most patients present with late-stage disease, the 5-year relative survival rate is only 43.9% (excluding borderline ovarian tumors). Treatment for ovarian cancer typically includes surgery (including removal of most genital tract organs), followed by chemotherapy, depending on disease stage (Cannistra, 1993); less than 10% of patients also receive radiotherapy during the first course of treatment.

Several factors increase the risk of ovarian cancer, including nulliparity, antecedent breast cancer, and a family history of ovarian cancer. Total years of ovulation, use of fertility drugs, using talc on the perineum, and high dietary fat or lactose intake have also been implicated in some, but not all, studies. In addition, a reduced risk has been reported with oral contraceptive use, tubal ligation, and hysterectomy (Hulka, 1997; Brinton and Hoover, 2000).

### Results and Discussion

A total of 2,091 subsequent nongenital primary cancers were observed among 41,489 2-month survivors of ovarian cancer (O/E=1.18 excluding female genital sites, 95% CI=1.13-1.23, EAR=15). The cumulative incidence of second cancer, adjusted for the competing risk of death due to other causes, was 9.4% within 25 years (95% CI=8.9%-9.9%). Subsequent primary cancer risk was low during the first 5 years of follow-up, but rose to a 31% excess among those surviving 5 years or more. Excluding female genital sites, overall subsequent cancer risk was higher in blacks (O/E=1.42, EAR=29) than whites (O/E=1.16, EAR=14). Women younger than age 50 years at ovarian cancer diagnosis had a 58% increased risk of new malignancies, whereas risk declined to below unity among patients diagnosed at ages older than 70 years. Most of the overall excess was attributable to significantly increased risks for acute leukemia, as well as for cancers of the breast, colon, rectum, small intestine, bladder, renal pelvis, eye, and intrahepatic bile ducts. Significant deficits were noted only for cancers of the female genital tract, due to surgical removal of those organs. The findings are generally consistent with prior studies of ovarian cancer, which have shown significantly increased risks for acute leukemia and for cancers of the breast, colon, rectum, and urinary bladder (Reimer et al, 1978; Curtis et al, 1985; Storm and Ewertz, 1985; Coleman et al, 1987; Kaldor et al, 1987; Prior and Pope, 1989; Bergfeldt et al, 1995; Travis et al, 1996).

As observed for UCC, breast and colon cancers were the most common new malignancies. Subsequent primary breast cancer excesses were strongly related to age at initial ovarian cancer diagnosis, with the largest increase in risk (27%) among women diagnosed before age 50 years. The findings are consistent with genetic

susceptibility, as hereditary breast and ovarian cancer tend to affect younger women as a result of germline mutations in the BRCA1/2 genes (Li and Karlan, 2001). The role of genetic factors is also consistent with the reciprocal 2-fold increased risk of ovarian cancer following early-onset breast cancer. Among women diagnosed with ovarian cancer at ages younger than 50 years, there was a rapid decline in breast cancer risk 5 years or more after initial surgery, probably caused by therapeutic ablation of gonadal function. Older patients with ovarian cancer (diagnosed at age  $\geq 50$  years) had only a small (4%) nonsignificant increased risk of subsequent breast cancer, with the excesses attributable to women between the ages of 50 and 69 years. The association between breast and ovarian cancer at least partly reflects shared reproductive factors, which also may contribute to the reciprocal 27% increased risk for ovarian neoplasms seen after breast cancer in our survey.

Breast cancer risks varied somewhat by histologic type, with highest, nonsignificant risks after endometrioid tumors of the ovary, although confidence intervals overlapped with those of other histologic types. There is some evidence that distinct histologic types may be associated with different risk factors, including family cancer history (Travis et al, 1996).

The increased risk for subsequent primary colon cancer may also reflect shared risk factors with ovarian cancer, including nutritional, hormonal, and genetic influences (Weinberg et al, 1999). The early onset of ovarian cancer was a strong predictor of increased colon cancer risk, with 3-fold increased risks for women younger than age 50 years at ovarian cancer diagnosis, and 4-fold for those younger than age 35 years. It is noteworthy that subsequent endometrial and ovarian cancers have been associated with hereditary nonpolyposis colorectal cancer, a syndrome that may also contribute to the 2- to 3-fold excesses we observed for new malignancies of the small intestine, bile ducts, and renal pelvis (Lynch et al, 1991). The role of genetic factors is further suggested by the reciprocal 6-fold increase in ovarian cancer risk among colon cancer patients diagnosed at younger than age 40 years. Excesses of colon cancer also have been reported in some studies of familial breast/ovarian cancer, as well as in individuals with BRCA1 mutations, although the results have not been consistent (Ford et al, 1994). In addition, radiation may have contributed to excess colon cancers, as risks were particularly high in women surviving 10 years or more who had received initial radiotherapy. The possibility exists, however, that some subsequent intestinal cancers following ovarian cancer may represent misclassified metastases (Bergfeldt et al, 2000).

Similar genetic and other risk factors may contribute to the excess of subsequent primary rectal cancers, although interpretation is limited by small numbers. However, no differential risk was seen between women with and without radiotherapy during initial treatment of their ovarian cancer, in contrast to the excess of rectal cancer linked to pelvic radiotherapy for cervical cancer (Boice et al, 1988).



The increased risks of subsequent primary urinary bladder, soft tissue, and bone cancers after ovarian cancer appeared related to treatment. Risk of urinary bladder cancer was substantially higher among irradiated patients, with 3- to 4-fold increases in risk observed 10 years or more after initial treatment. This finding resembles an earlier study revealing a radiation-related excess of bladder cancer following ovarian cancer (Kaldor et al, 1995). Chemotherapy may have played a role also, since some patients in earlier years probably received long-term treatment with cyclophosphamide, a known bladder carcinogen (Kaldor et al, 1995; Travis et al, 1995). Excess risks for soft tissue and bone cancers were seen only among irradiated women, with 5 of the 7 sarcomas arising within the radiation field.

A significantly increased risk of subsequent primary acute leukemia, including non-lymphocytic and lymphocytic types, occurred within the first 10 years after diagnosis of ovarian cancer. Previous analytic studies of ovarian cancer have attributed these risks primarily to treatment with alkylating agents (especially melphalan and chlorambucil) and platinum-based chemotherapy (Kaldor et al, 1990; Travis et al, 1999).

Increased risks were also noted for subsequent primary ocular melanoma (the most common form of eye cancer in adults). Reports of this tumor in families with hereditary breast and ovarian cancer suggest the role of genetic factors (Houlston and Damato, 1999), although endogenous hormones may be involved as well (Hartge et al, 1989).

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## Corpus Uteri Females

**Table 9.1.1:** Characteristics of patients with an initial cancer of the corpus uteri, females, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	—	—	74,185	100.0	74,185	100.0
<b>Initial treatment</b>						
Any radiation	—	—	29,629	39.9	29,629	39.9
With surgery	—	—	26,161	35.3	26,161	35.3
Without surgery	—	—	3,468	4.7	3,468	4.7
No radiation	—	—	44,556	60.1	44,556	60.1
With surgery	—	—	41,162	55.5	41,162	55.5
Without surgery	—	—	3,394	4.6	3,394	4.6
<b>Race</b>						
White	—	—	66,697	89.9	66,697	89.9
Black	—	—	3,607	4.9	3,607	4.9
Other	—	—	3,556	4.8	3,556	4.8
Unknown	—	—	325	0.4	325	0.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	—	—	304	0.4	304	0.4
30–49	—	—	8,864	11.9	8,864	11.9
50–69	—	—	42,589	57.4	42,589	57.4
70–79	—	—	16,203	21.8	16,203	21.8
≥ 80	—	—	6,225	8.4	6,225	8.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	—	—	66,199	89.2	66,199	89.2
1st and 2nd cancers	—	—	7,253	9.8	7,253	9.8
1st, 2nd, and 3rd cancers	—	—	673	0.9	673	0.9
1st, 2nd, 3rd, and additional cancers	—	—	60	0.1	60	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	—	—	63.7	—	63.7	—
Median year of 1st cancer diagnosis	—	—	1986.8	—	1986.8	—
Median person-years at risk	—	—	7.7	—	7.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	—	—	95.9	—	95.9
1st, 2nd, and additional cancers	—	—	—	95.5	—	95.5
1st cancer only	—	—	—	4.0	—	4.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 9.1.2:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	699	1.07	2,421	0.93*	2,347	0.91*	3,324	0.86*	8,791	9,695.69	0.91*	-12.83
All excluding same site	542	0.97	2,326	1.03	2,289	1.01	3,252	0.95*	8,409	8,485.35	0.99	-1.08
<b>Buccal cavity, pharynx</b>	6	0.48	24	0.48*	39	0.82	54	0.83	123	174.30	0.71*	-0.73
Lip	0	0.00	3	0.99	5	1.59	9	1.76	17	12.05	1.41	0.07
Tongue	1	0.37	7	0.64	7	0.67	11	0.77	26	38.34	0.68*	-0.18
Salivary gland	2	1.56	1	0.20	6	1.23	3	0.41	12	18.53	0.65	-0.09
Mouth	2	0.47	8	0.47*	9	0.55	18	0.78	37	60.99	0.61*	-0.34
Nasopharynx	0	0.00	2	1.00	2	1.09	1	0.43	5	6.70	0.75	-0.02
Tonsil	0	0.00	2	0.43	3	0.72	4	0.84	9	14.86	0.61	-0.08
Oropharynx	1	3.09	0	0.00	2	1.58	2	1.32	5	4.42	1.13	0.01
Hypopharynx	0	0.00	0	0.00	3	0.88	4	0.98	7	12.03	0.58	-0.07
<b>Digestive system</b>	133	0.92	626	1.07	623	1.05	969	1.04	2,351	2,251.37	1.04*	1.41
Esophagus	5	1.23	15	0.92	4	0.25*	13	0.52*	37	61.46	0.60*	-0.35
Stomach	8	0.71	38	0.87	39	0.89	57	0.85	142	165.68	0.86	-0.34
Small intestine	7	3.49*	8	0.99	17	2.06*	18	1.32	50	31.95	1.56*	0.26
Colon	56	0.78	344	1.19*	351	1.17*	520	1.09*	1,271	1,135.40	1.12*	1.92
Rectum, rectosigmoid junction	19	0.79	93	0.96	109	1.15	148	1.09	369	351.72	1.05	0.25
Rectum	16	1.02	65	1.04	69	1.12	109	1.21	259	230.31	1.12	0.41
Anus, anal canal	0	0.00	3	0.37	5	0.63	11	0.93	19	29.78	0.64*	-0.15
Liver	2	0.68	11	0.92	7	0.57	16	0.76	36	48.16	0.75	-0.17
Gallbladder	5	1.48	10	0.75	8	0.60	14	0.72	37	49.54	0.75	-0.18
Bile ducts, other biliary	7	2.36	10	0.83	15	1.17	22	0.96	54	50.77	1.06	0.05
Pancreas	17	0.91	79	1.05	57	0.73*	133	1.06	286	297.58	0.96	-0.16
<b>Respiratory system</b>	54	0.64*	314	0.90	304	0.84*	419	0.75*	1,091	1,356.45	0.80*	-3.77
Nose, nasal cavity, ear	1	1.12	5	1.41	6	1.70	4	0.75	16	13.30	1.20	0.04
Larynx	0	0.00	4	0.33*	3	0.26*	14	0.98	21	40.82	0.51*	-0.28
Lung, bronchus	53	0.66*	304	0.91	294	0.85*	400	0.74*	1,051	1,298.94	0.81*	-3.52
<b>Female breast</b>	217	1.15*	802	1.07	824	1.13*	973	0.93*	2,816	2,709.68	1.04*	1.51
<b>Female genital system</b>	157	1.68*	95	0.26*	58	0.18*	72	0.17*	382	1,210.34	0.32*	-11.75
Cervix uteri	7	0.66	4	0.10*	5	0.16*	3	0.09*	19	112.95	0.17*	-1.33
Corpus uteri	9	0.18*	3	0.02*	3	0.02*	7	0.03*	22	638.59	0.03*	-8.75
Ovary	124	4.78*	47	0.46*	23	0.24*	18	0.14*	212	357.89	0.59*	-2.07
Vagina	7	5.61*	16	3.25*	10	2.10*	17	2.45*	50	17.85	2.80*	0.46
Vulva	3	0.85	19	1.33	17	1.16	25	1.02	64	56.93	1.12	0.10
<b>Urinary system</b>	41	1.36	163	1.35*	131	1.04	255	1.28*	590	477.46	1.24*	1.60
Urinary bladder	22	1.24	105	1.46*	94	1.26*	183	1.53*	404	283.64	1.42*	1.71
Kidney parenchyma	18	1.82*	45	1.12	27	0.66*	45	0.71*	135	153.97	0.88	-0.27
Renal pelvis, other urinary	1	0.39	13	1.26	10	0.95	27	1.64*	51	39.86	1.28	0.16
Ureter	0	0.00	4	1.25	2	0.60	10	1.97	16	12.38	1.29	0.05
<b>Bone, joints</b>	1	1.62	4	1.65	6	2.63	3	0.93	14	8.54	1.64	0.08
<b>Soft tissue including heart</b>	0	0.00	18	1.83*	16	1.66	18	1.19	52	37.08	1.40*	0.21
<b>Kaposi sarcoma</b>	1	5.04	2	2.45	0	0.00	1	0.63	4	3.51	1.14	0.01
<b>Melanoma of skin</b>	12	0.96	59	1.17	44	0.91	74	1.02	189	183.79	1.03	0.07
<b>Eye, orbit</b>	2	1.89	3	0.72	3	0.78	2	0.37	10	14.42	0.69	-0.06
<b>Brain, central nervous system</b>	6	0.84	22	0.77	18	0.65	38	0.98	84	101.76	0.83	-0.25
<b>Thyroid</b>	11	1.82	21	0.92	10	0.50*	20	0.80	62	73.81	0.84	-0.17
<b>Lymphatic, hematopoietic</b>	39	0.82	184	0.95	180	0.91	330	1.04	733	755.97	0.97	-0.33
Hodgkin lymphoma	1	0.63	5	0.82	3	0.53	9	1.21	18	20.77	0.87	-0.04
Non-Hodgkin lymphoma	22	0.97	82	0.88	85	0.87	175	1.10	364	372.61	0.98	-0.12
Myeloma	7	0.85	23	0.70	34	1.01	56	1.07	120	127.31	0.94	-0.10
Leukemia	9	0.60	74	1.22	58	0.94	90	0.92	231	235.28	0.98	-0.06
Acute lymphocytic	0	0.00	2	1.15	4	2.30	1	0.38	7	6.54	1.07	0.01
Chronic lymphocytic	4	0.68	15	0.63	16	0.65	34	0.88	69	93.01	0.74*	-0.34
Acute non-lymphocytic	4	0.76	37	1.74*	27	1.25	40	1.14	108	83.23	1.30*	0.35
Chronic myeloid	0	0.00	11	1.35	6	0.73	9	0.68	26	31.63	0.82	-0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Corpus Uteri Females, Long-term Follow-up

**Table 9.1.3:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	5,467	0.93*	1,646	0.86*	1,099	0.88*	579	0.85*	8,791	9,695.69	0.91*	-12.83
All excluding same site	5,157	1.02	1,611	0.95*	1,073	0.97	568	0.93	8,409	8,485.35	0.99	-1.08
<b>Buccal cavity, pharynx</b>	69	0.63*	30	0.90	16	0.78	8	0.74	123	174.30	0.71*	-0.73
Lip	8	1.16	4	1.64	2	1.18	3	3.00	17	12.05	1.41	0.07
Tongue	15	0.62	6	0.81	4	0.89	1	0.43	26	38.34	0.68*	-0.18
Salivary gland	9	0.80	1	0.28	2	0.84	0	0.00	12	18.53	0.65	-0.09
Mouth	19	0.50*	9	0.77	6	0.82	3	0.76	37	60.99	0.61*	-0.34
Nasopharynx	4	0.92	0	0.00	1	1.35	0	0.00	5	6.70	0.75	-0.02
Tonsil	5	0.49	3	1.12	0	0.00	1	1.65	9	14.86	0.61	-0.08
Oropharynx	3	1.03	2	2.49	0	0.00	0	0.00	5	4.42	1.13	0.01
Hypopharynx	3	0.38	3	1.34	1	0.80	0	0.00	7	12.03	0.58	-0.07
<b>Digestive system</b>	1,382	1.05	469	1.04	335	1.11	165	0.95	2,351	2,251.37	1.04*	1.41
Esophagus	24	0.66*	8	0.65	3	0.37	2	0.43	37	61.46	0.60*	-0.35
Stomach	85	0.86	26	0.79	22	1.01	9	0.72	142	165.68	0.86	-0.34
Small intestine	32	1.74*	8	1.24	6	1.32	4	1.53	50	31.95	1.56*	0.26
Colon	751	1.14*	258	1.12	179	1.16	83	0.92	1,271	1,135.40	1.12*	1.92
Rectum, rectosigmoid junction	221	1.02	72	1.04	56	1.29	20	0.85	369	351.72	1.05	0.25
Rectum	150	1.07	53	1.18	42	1.45*	14	0.86	259	230.31	1.12	0.41
Anus, anal canal	8	0.45*	4	0.68	4	1.04	3	1.45	19	29.78	0.64*	-0.15
Liver	20	0.74	8	0.82	7	1.00	1	0.23	36	48.16	0.75	-0.17
Gallbladder	23	0.76	8	0.82	5	0.79	1	0.30	37	49.54	0.75	-0.18
Bile ducts, other biliary	32	1.15	7	0.67	8	1.04	7	1.47	54	50.77	1.06	0.05
Pancreas	153	0.89	61	1.01	38	0.92	34	1.44	286	297.58	0.96	-0.16
<b>Respiratory system</b>	672	0.84*	205	0.74*	133	0.72*	81	0.81	1,091	1,356.45	0.80*	-3.77
Nose, nasal cavity, ear	12	1.51	2	0.77	2	1.17	0	0.00	16	13.30	1.20	0.04
Larynx	7	0.26*	7	0.90	3	0.68	4	1.90	21	40.82	0.51*	-0.28
Lung, bronchus	651	0.86*	196	0.74*	127	0.71*	77	0.80*	1,051	1,298.94	0.81*	-3.52
<b>Female breast</b>	1,843	1.11*	518	0.97	316	0.95	139	0.80*	2,816	2,709.68	1.04*	1.51
<b>Female genital system</b>	310	0.40*	35	0.16*	26	0.19*	11	0.16*	382	1,210.34	0.32*	-11.75
Cervix uteri	16	0.20*	1	0.05*	2	0.20*	0	0.00*	19	112.95	0.17*	-1.33
Corpus uteri	15	0.04*	4	0.03*	3	0.04*	0	0.00*	22	638.59	0.03*	-8.75
Ovary	194	0.86*	7	0.10*	10	0.23*	1	0.05*	212	357.89	0.59*	-2.07
Vagina	33	3.02*	8	2.29	3	1.35	6	4.96*	50	17.85	2.80*	0.46
Vulva	39	1.20	14	1.21	7	0.87	4	0.84	64	56.93	1.12	0.10
<b>Urinary system</b>	335	1.20*	116	1.20	85	1.30*	54	1.46*	590	477.46	1.24*	1.60
Urinary bladder	221	1.35*	87	1.51*	53	1.35*	43	1.90*	404	283.64	1.42*	1.71
Kidney parenchyma	90	0.99	19	0.61*	20	0.96	6	0.53	135	153.97	0.88	-0.27
Renal pelvis, other urinary	24	1.02	10	1.25	12	2.22*	5	1.64	51	39.86	1.28	0.16
Ureter	6	0.82	3	1.21	5	3.01	2	2.13	16	12.38	1.29	0.05
<b>Bone, joints</b>	11	2.07*	1	0.63	1	0.95	1	1.72	14	8.54	1.64	0.08
<b>Soft tissue including heart</b>	34	1.54*	8	1.10	9	1.80	1	0.36	52	37.08	1.40*	0.21
<b>Kaposi sarcoma</b>	3	1.56	1	1.33	0	0.00	0	0.00	4	3.51	1.14	0.01
<b>Melanoma of skin</b>	115	1.03	35	0.99	26	1.10	13	0.96	189	183.79	1.03	0.07
<b>Eye, orbit</b>	8	0.88	1	0.37	0	0.00	1	1.13	10	14.42	0.69	-0.06
<b>Brain, central nervous system</b>	46	0.73*	20	1.00	12	0.97	6	0.95	84	101.76	0.83	-0.25
<b>Thyroid</b>	42	0.86	9	0.69	7	0.89	4	0.99	62	73.81	0.84	-0.17
<b>Lymphatic, hematopoietic</b>	403	0.92	144	0.94	108	1.04	78	1.32*	733	755.97	0.97	-0.33
Hodgkin lymphoma	9	0.68	2	0.52	4	1.64	3	2.53	18	20.77	0.87	-0.04
Non-Hodgkin lymphoma	189	0.88	73	0.96	56	1.07	46	1.53*	364	372.61	0.98	-0.12
Myeloma	64	0.85	26	1.01	20	1.17	10	1.05	120	127.31	0.94	-0.10
Leukemia	141	1.03	43	0.90	28	0.87	19	1.03	231	235.28	0.98	-0.06
Acute lymphocytic	6	1.53	0	0.00	1	1.18	0	0.00	7	6.54	1.07	0.01
Chronic lymphocytic	35	0.64*	15	0.79	15	1.19	4	0.58	69	93.01	0.74*	-0.34
Acute non-lymphocytic	68	1.41*	24	1.44	7	0.61	9	1.30	108	83.23	1.30*	0.35
Chronic myeloid	17	0.92	1	0.16*	4	0.93	4	1.64	26	31.63	0.82	-0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.1.4:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	63	2.71*	146	1.30*	142	1.01	368	1.10	719	610.71	1.18*	10.97
All excluding same site	27	1.41	131	1.41*	135	1.15	352	1.22*	645	516.77	1.25*	13.00
<b>Buccal cavity, pharynx</b>	0	0.00	1	0.50	0	0.00	3	0.50	4	11.09	0.36*	-0.72
Lip	0	0.00	0	0.00	0	0.00	1	3.48	1	0.49	2.05	0.05
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	2.54	0.00	-0.26
Salivary gland	0	0.00	1	3.26	0	0.00	0	0.00	1	1.37	0.73	-0.04
Mouth	0	0.00	0	0.00	0	0.00	1	0.53	1	3.37	0.30	-0.24
Nasopharynx	0	0.00	0	0.00	0	0.00	1	3.18	1	0.71	1.41	0.03
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-0.12
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.08
<b>Digestive system</b>	8	3.76*	39	3.41*	43	2.56*	132	2.53*	222	82.49	2.69*	14.14
Esophagus	0	0.00	0	0.00	0	0.00	1	0.59	1	2.50	0.40	-0.15
Stomach	0	0.00	1	1.04	2	1.62	3	0.87	6	5.84	1.03	0.02
Small intestine	1	16.64	0	0.00	0	0.00	2	1.87	3	1.81	1.65	0.12
Colon	4	4.38*	24	4.84*	32	4.32*	76	3.16*	136	37.36	3.64*	10.00
Rectum, rectosigmoid junction	1	2.25	10	4.09*	6	1.72	30	3.20*	47	15.78	2.98*	3.16
Rectum	1	3.33	8	4.99*	2	0.89	24	3.86*	35	10.37	3.38*	2.50
Anus, anal canal	0	0.00	0	0.00	0	0.00	5	4.64*	5	1.92	2.60	0.31
Liver	0	0.00	3	9.42*	0	0.00	0	0.00	3	2.28	1.31	0.07
Gallbladder	0	0.00	0	0.00	0	0.00	1	0.96	1	1.62	0.62	-0.06
Bile ducts, other biliary	1	24.35	0	0.00	0	0.00	3	2.58	4	1.75	2.28	0.23
Pancreas	1	4.78	1	0.83	1	0.52	10	1.50	13	10.02	1.30	0.30
<b>Respiratory system</b>	3	1.82	11	1.15	18	1.16	43	0.84	75	77.79	0.96	-0.28
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.08
Larynx	0	0.00	0	0.00	0	0.00	3	1.62	3	3.16	0.95	-0.02
Lung, bronchus	3	1.97	11	1.23	17	1.17	40	0.82	71	73.65	0.96	-0.27
<b>Female breast</b>	7	0.69	35	0.73	42	0.75	92	0.79*	176	229.82	0.77*	-5.45
<b>Female genital system</b>	36	8.76*	15	0.76	7	0.31*	16	0.34*	74	93.94	0.79*	-2.02
Cervix uteri	0	0.00	2	0.43	0	0.00*	2	0.37	4	15.34	0.26*	-1.15
Corpus uteri	0	0.00	0	0.00*	1	0.09*	4	0.16*	5	44.81	0.11*	-4.03
Ovary	35	28.00*	10	1.68	5	0.71	4	0.28*	54	28.51	1.89*	2.58
Vagina	1	28.77	1	6.09	1	4.80	3	5.93*	6	0.91	6.57*	0.52
Vulva	0	0.00	1	1.99	0	0.00	2	1.37	3	2.67	1.13	0.03
<b>Urinary system</b>	2	3.58	5	1.65	7	1.57	26	1.84*	40	22.17	1.80*	1.81
Urinary bladder	1	4.00	1	0.71	4	1.85	14	1.89*	20	11.21	1.78*	0.89
Kidney parenchyma	1	3.52	4	2.70	2	0.97	10	1.71	17	9.67	1.76*	0.74
Renal pelvis, other urinary	0	0.00	0	0.00	1	4.14	2	2.29	3	1.29	2.33	0.17
Ureter	0	0.00	0	0.00	0	0.00	2	8.02	2	0.34	5.84	0.17
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	2	3.43	1	1.56	2	1.49	5	2.70	1.85	0.23
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.01
<b>Melanoma of skin</b>	1	0.84	11	2.14*	7	1.32	8	0.88	27	20.68	1.31	0.64
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.93	0.00	-0.09
<b>Brain, central nervous system</b>	0	0.00	4	2.62	1	0.56	2	0.54	7	7.31	0.96	-0.03
<b>Thyroid</b>	4	4.46*	7	1.94	2	0.61	3	0.65	16	12.44	1.29	0.36
<b>Lymphatic, hematopoietic</b>	1	0.81	12	1.99*	8	1.02	29	1.35	50	36.63	1.37*	1.36
Hodgkin lymphoma	0	0.00	1	1.82	0	0.00	1	1.28	2	1.97	1.02	0.00
Non-Hodgkin lymphoma	1	1.61	5	1.61	3	0.72	16	1.38	25	19.45	1.29	0.56
Myeloma	0	0.00	0	0.00	0	0.00	3	0.90	3	5.13	0.58	-0.22
Leukemia	0	0.00	6	3.49*	5	2.30	9	1.54	20	10.08	1.98*	1.01
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.05
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	0.47	1	3.21	0.31	-0.22
Acute non-lymphocytic	0	0.00	6	8.25*	3	3.44	7	3.18*	16	3.96	4.04*	1.22
Chronic myeloid	0	0.00	0	0.00	1	2.59	1	1.19	2	1.64	1.22	0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Corpus Uteri Females, 50-69 Years of Age

**Table 9.1.5:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	353	1.05	1,313	0.88*	1,546	0.90*	2,597	0.84*	5,809	6,638.75	0.88*	-17.50
All excluding same site	276	0.98	1,270	1.00	1,513	1.02	2,548	0.93*	5,607	5,769.92	0.97*	-3.44
<b>Buccal cavity, pharynx</b>	2	0.28*	14	0.45*	31	0.92	49	0.95	96	124.02	0.77*	-0.59
Lip	0	0.00	0	0.00	4	2.19	7	1.76	11	7.58	1.45	0.07
Tongue	0	0.00	6	0.86	4	0.54	11	0.97	21	27.34	0.77	-0.13
Salivary gland	1	1.53	0	0.00	4	1.28	3	0.53	8	12.33	0.65	-0.09
Mouth	1	0.41	3	0.28*	7	0.61	16	0.87	27	42.86	0.63*	-0.33
Nasopharynx	0	0.00	2	1.52	2	1.51	0	0.00	4	4.81	0.83	-0.02
Tonsil	0	0.00	2	0.57	3	0.91	4	1.03	9	11.49	0.78	-0.05
Oropharynx	0	0.00	0	0.00	2	2.02	2	1.60	4	3.36	1.19	0.01
Hypopharynx	0	0.00	0	0.00	3	1.11	4	1.16	7	9.39	0.75	-0.05
<b>Digestive system</b>	61	1.01	337	1.18*	355	0.99	708	0.96	1,461	1,441.84	1.01	0.40
Esophagus	3	1.46	8	0.87	3	0.28*	9	0.45*	23	42.11	0.55*	-0.40
Stomach	6	1.39	20	1.00	23	0.92	44	0.84	93	101.50	0.92	-0.18
Small intestine	4	4.09*	8	1.81	13	2.43*	14	1.28	39	21.68	1.80*	0.37
Colon	21	0.74	174	1.28*	186	1.06	375	1.00	756	715.26	1.06	0.86
Rectum, rectosigmoid junction	10	0.88	52	0.99	66	1.07	102	0.94	230	234.00	0.98	-0.08
Rectum	9	1.23	36	1.07	44	1.11	74	1.03	163	152.19	1.07	0.23
Anus, anal canal	0	0.00	1	0.21	4	0.74	6	0.64	11	20.55	0.54*	-0.20
Liver	2	1.59	7	1.18	4	0.52	15	0.88	28	32.04	0.87	-0.09
Gallbladder	2	1.51	9	1.42	5	0.62	12	0.78	28	31.13	0.90	-0.07
Bile ducts, other biliary	3	2.67	4	0.74	10	1.39	17	0.95	34	31.64	1.07	0.05
Pancreas	7	0.90	46	1.24	35	0.73	101	1.01	189	192.61	0.98	-0.08
<b>Respiratory system</b>	28	0.60*	165	0.75*	213	0.81*	332	0.71*	738	997.68	0.74*	-5.48
Nose, nasal cavity, ear	1	2.17	5	2.52	3	1.32	3	0.70	12	8.98	1.34	0.06
Larynx	0	0.00	3	0.35	2	0.22*	10	0.86	15	31.38	0.48*	-0.35
Lung, bronchus	27	0.61*	157	0.76*	208	0.82*	318	0.71*	710	954.93	0.74*	-5.17
<b>Female breast</b>	120	1.14	465	1.02	600	1.20*	784	0.95	1,969	1,888.21	1.04	1.70
<b>Female genital system</b>	77	1.36*	43	0.18*	33	0.14*	49	0.14*	202	868.83	0.23*	-14.07
Cervix uteri	4	0.62	1	0.04*	4	0.19*	1	0.04*	10	76.68	0.13*	-1.41
Corpus uteri	2	0.06*	0	0.00*	1	0.01*	3	0.02*	6	476.25	0.01*	-9.92
Ovary	60	4.03*	22	0.35*	12	0.18*	12	0.11*	106	251.80	0.42*	-3.08
Vagina	4	6.83*	5	1.93	6	2.02	12	2.19*	27	11.64	2.32*	0.32
Vulva	2	1.40	12	1.80	10	1.19	20	1.06	44	35.30	1.25	0.18
<b>Urinary system</b>	21	1.50	93	1.42*	75	0.92	202	1.26*	391	320.93	1.22*	1.48
Urinary bladder	11	1.42	60	1.62*	48	1.03	148	1.55*	267	186.64	1.43*	1.69
Kidney parenchyma	10	1.94	26	1.11	20	0.71	31	0.60*	87	107.90	0.81*	-0.44
Renal pelvis, other urinary	0	0.00	7	1.35	7	1.04	23	1.71*	37	26.38	1.40	0.22
Ureter	0	0.00	2	1.28	2	0.96	8	1.93	12	8.12	1.48	0.08
<b>Bone, joints</b>	0	0.00	3	2.18	4	2.65	3	1.17	10	5.77	1.73	0.09
<b>Soft tissue including heart</b>	0	0.00	10	1.85	11	1.82	15	1.27	36	24.44	1.47*	0.24
<b>Kaposi sarcoma</b>	0	0.00	1	4.70	0	0.00	1	0.88	2	1.72	1.16	0.01
<b>Melanoma of skin</b>	4	0.58	27	0.91	28	0.88	60	1.08	119	124.01	0.96	-0.11
<b>Eye, orbit</b>	0	0.00	2	0.77	3	1.11	2	0.47	7	10.14	0.69	-0.07
<b>Brain, central nervous system</b>	5	1.26	11	0.63	14	0.71	36	1.13	66	73.04	0.90	-0.15
<b>Thyroid</b>	5	1.42	9	0.64	5	0.38*	15	0.81	34	49.29	0.69*	-0.32
<b>Lymphatic, hematopoietic</b>	18	0.84	90	0.90	112	0.90	271	1.07	491	500.34	0.98	-0.20
Hodgkin lymphoma	1	1.21	1	0.29	2	0.54	8	1.34	12	14.00	0.86	-0.04
Non-Hodgkin lymphoma	9	0.85	43	0.86	52	0.83	150	1.17	254	251.93	1.01	0.04
Myeloma	3	0.82	11	0.64	21	0.98	46	1.08	81	84.81	0.96	-0.08
Leukemia	5	0.79	35	1.19	37	1.01	67	0.87	144	149.60	0.96	-0.12
Acute lymphocytic	0	0.00	1	1.07	4	3.76*	1	0.50	6	4.20	1.43	0.04
Chronic lymphocytic	3	1.20	6	0.50	10	0.66	30	0.98	49	60.26	0.81	-0.24
Acute non-lymphocytic	2	0.90	17	1.63	17	1.32	27	0.97	63	53.37	1.18	0.20
Chronic myeloid	0	0.00	6	1.53	3	0.63	5	0.50	14	19.66	0.71	-0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.1.6:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	283	0.96	962	0.96	659	0.92*	359	0.83*	2,263	2,446.23	0.93*	-13.86
All excluding same site	239	0.92	925	1.03	641	0.99	352	0.89*	2,157	2,198.66	0.98	-3.15
<b>Buccal cavity, pharynx</b>	4	0.83	9	0.56	8	0.71	2	0.29	23	39.19	0.59*	-1.22
Lip	0	0.00	3	2.01	1	0.82	1	1.16	5	3.99	1.25	0.08
Tongue	1	0.96	1	0.29	3	1.24	0	0.00	5	8.45	0.59	-0.26
Salivary gland	1	1.80	0	0.00	2	1.42	0	0.00	3	4.83	0.62	-0.14
Mouth	1	0.56	5	0.83	2	0.47	1	0.37	9	14.76	0.61	-0.44
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	2.18	0.00	-0.16
Oropharynx	1	9.06	0	0.00	0	0.00	0	0.00	1	0.77	1.29	0.02
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.85	0.00	-0.14
<b>Digestive system</b>	64	0.78*	250	0.88*	225	1.03	129	0.91	668	727.03	0.92*	-4.46
Esophagus	2	1.02	7	1.04	1	0.20	3	0.94	13	16.85	0.77	-0.29
Stomach	2	0.30	17	0.74	14	0.80	10	0.89	43	58.33	0.74*	-1.16
Small intestine	2	2.06	0	0.00	4	1.58	2	1.24	8	8.46	0.95	-0.03
Colon	31	0.73	146	0.98	133	1.15	69	0.90	379	382.79	0.99	-0.29
Rectum, rectosigmoid junction	8	0.65	31	0.74	37	1.24	16	0.90	92	101.95	0.90	-0.75
Rectum	6	0.74	21	0.76	23	1.16	11	0.90	61	67.75	0.90	-0.51
Anus, anal canal	0	0.00	2	0.67	1	0.47	0	0.00	3	7.32	0.41	-0.33
Liver	0	0.00	1	0.18*	3	0.73	1	0.41	5	13.84	0.36*	-0.67
Gallbladder	3	1.50	1	0.15*	3	0.61	1	0.33	8	16.78	0.48*	-0.66
Bile ducts, other biliary	3	1.67	6	0.93	5	0.94	2	0.52	16	17.38	0.92	-0.10
Pancreas	9	0.84	32	0.86	21	0.74	22	1.18	84	94.95	0.88	-0.83
<b>Respiratory system</b>	23	0.64*	138	1.13	73	0.90	44	1.05	278	280.97	0.99	-0.22
Nose, nasal cavity, ear	0	0.00	0	0.00	3	2.78	1	1.52	4	3.56	1.12	0.03
Larynx	0	0.00	1	0.35	1	0.59	1	1.25	3	6.27	0.48	-0.25
Lung, bronchus	23	0.66*	136	1.16	69	0.88	42	1.04	270	270.36	1.00	-0.03
<b>Female breast</b>	90	1.22	302	1.22*	182	1.06	97	0.99	671	591.65	1.13*	6.00
<b>Female genital system</b>	44	1.35	37	0.35*	18	0.26*	7	0.18*	106	247.57	0.43*	-10.71
Cervix uteri	3	0.99	1	0.11*	1	0.18*	0	0.00	5	20.93	0.24*	-1.21
Corpus uteri	7	0.43*	3	0.06*	1	0.03*	0	0.00*	11	117.53	0.09*	-8.06
Ovary	29	2.96*	15	0.46*	6	0.27*	2	0.16*	52	77.58	0.67*	-1.93
Vagina	2	3.18	10	4.63*	3	1.91	2	2.12	17	5.30	3.21*	0.88
Vulva	1	0.50	6	0.84	7	1.23	3	0.73	17	18.96	0.90	-0.15
<b>Urinary system</b>	18	1.15	65	1.21	49	1.23	27	1.08	159	134.36	1.18*	1.86
Urinary bladder	10	1.03	44	1.30	42	1.64*	21	1.25	117	85.78	1.36*	2.36
Kidney parenchyma	7	1.58	15	0.99	5	0.47	4	0.65	31	36.39	0.85	-0.41
Renal pelvis, other urinary	1	0.70	6	1.20	2	0.55	2	0.93	11	12.19	0.90	-0.09
Ureter	0	0.00	2	1.25	0	0.00	0	0.00	2	3.92	0.51	-0.14
<b>Bone, joints</b>	1	3.86	1	1.15	2	3.30	0	0.00	4	2.08	1.93	0.15
<b>Soft tissue including heart</b>	0	0.00	6	1.55	4	1.34	1	0.51	11	9.95	1.11	0.08
<b>Kaposi sarcoma</b>	1	6.60	1	1.70	0	0.00	0	0.00	2	1.73	1.16	0.02
<b>Melanoma of skin</b>	7	1.57	21	1.36	9	0.79	6	0.77	43	39.11	1.10	0.29
<b>Eye, orbit</b>	2	4.70	1	0.72	0	0.00	0	0.00	3	3.35	0.90	-0.03
<b>Brain, central nervous system</b>	1	0.36	7	0.75	3	0.49	0	0.00	11	21.42	0.51*	-0.79
<b>Thyroid</b>	2	1.23	5	0.95	3	0.88	2	1.11	12	12.08	0.99	-0.01
<b>Lymphatic, hematopoietic</b>	20	0.80	82	0.94	60	0.92	30	0.73	192	219.01	0.88	-2.04
Hodgkin lymphoma	0	0.00	3	1.45	1	0.72	0	0.00	4	4.80	0.83	-0.06
Non-Hodgkin lymphoma	12	1.03	34	0.83	30	0.99	9	0.48*	85	101.24	0.84	-1.23
Myeloma	4	0.90	12	0.79	13	1.17	7	1.07	36	37.36	0.96	-0.10
Leukemia	4	0.48	33	1.13	16	0.71	14	0.91	67	75.60	0.89	-0.65
Acute lymphocytic	0	0.00	1	1.44	0	0.00	0	0.00	1	1.82	0.55	-0.06
Chronic lymphocytic	1	0.30	9	0.78	6	0.68	3	0.51	19	29.54	0.64	-0.80
Acute non-lymphocytic	2	0.70	14	1.39	7	0.90	6	1.16	29	25.90	1.12	0.23
Chronic myeloid	0	0.00	5	1.28	2	0.65	3	1.34	10	10.33	0.97	-0.02

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Corpus Uteri Females, Radiotherapy

**Table 9.1.7:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	312	1.16*	1,062	1.00	1,003	0.93*	1,637	0.97	4,014	4,091.70	0.98	-2.69
All excluding same site	224	0.98	1,034	1.14*	978	1.04	1,609	1.07*	3,845	3,580.08	1.07*	9.16
<b>Buccal cavity, pharynx</b>	4	0.76	10	0.49*	14	0.70	26	0.91	54	74.09	0.73*	-0.69
Lip	0	0.00	3	2.41	1	0.76	6	2.63	10	5.15	1.94	0.17
Tongue	1	0.88	1	0.22	4	0.91	3	0.48	9	16.23	0.55	-0.25
Salivary gland	2	3.85	0	0.00	3	1.50	2	0.62	7	7.76	0.90	-0.03
Mouth	1	0.55	5	0.70	3	0.43	11	1.08	20	26.11	0.77	-0.21
Nasopharynx	0	0.00	1	1.24	0	0.00	0	0.00	1	2.77	0.36	-0.06
Tonsil	0	0.00	0	0.00	1	0.57	0	0.00	1	6.32	0.16*	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.89	0.00	-0.07
Hypopharynx	0	0.00	0	0.00	1	0.70	2	1.12	3	5.13	0.58	-0.07
<b>Digestive system</b>	53	0.87	279	1.15*	283	1.12	523	1.26*	1,138	972.13	1.17*	5.74
Esophagus	2	1.17	5	0.74	2	0.29	7	0.63	16	26.37	0.61*	-0.36
Stomach	5	1.04	18	0.97	20	1.07	36	1.20	79	72.23	1.09	0.23
Small intestine	3	3.74	2	0.62	5	1.48	11	1.84	21	13.36	1.57	0.26
Colon	22	0.73	158	1.31*	170	1.33*	289	1.36*	639	491.75	1.30*	5.09
Rectum, rectosigmoid junction	5	0.48	38	0.94	51	1.26	79	1.31*	173	151.96	1.14	0.73
Rectum	5	0.75	29	1.10	32	1.22	60	1.50*	126	99.24	1.27*	0.93
Anus, anal canal	0	0.00	3	0.93	2	0.60	4	0.77	9	12.53	0.72	-0.12
Liver	1	0.83	5	1.05	2	0.40	12	1.30	20	20.25	0.99	-0.01
Gallbladder	3	2.05	6	1.05	4	0.69	6	0.69	19	21.67	0.88	-0.09
Bile ducts, other biliary	5	4.14*	5	1.02	2	0.37	12	1.18	24	21.62	1.11	0.08
Pancreas	7	0.89	34	1.09	23	0.69	61	1.09	125	128.30	0.97	-0.11
<b>Respiratory system</b>	26	0.77	151	1.09	145	0.98	194	0.79*	516	565.13	0.91*	-1.70
Nose, nasal cavity, ear	1	2.72	2	1.38	1	0.68	1	0.42	5	5.65	0.89	-0.02
Larynx	0	0.00	2	0.41	1	0.21	8	1.29	11	17.12	0.64	-0.21
Lung, bronchus	25	0.78	146	1.11	142	1.01	184	0.78*	497	540.92	0.92	-1.52
<b>Female breast</b>	86	1.13	336	1.13*	298	1.00	413	0.91	1,133	1,125.76	1.01	0.25
<b>Female genital system</b>	88	2.24*	28	0.19*	25	0.18*	28	0.15*	169	511.62	0.33*	-11.85
Cervix uteri	5	1.11	1	0.06*	4	0.31*	0	0.00*	10	47.59	0.21*	-1.30
Corpus uteri	7	0.33*	1	0.01*	2	0.03*	1	0.01*	11	270.80	0.04*	-8.98
Ovary	71	6.67*	7	0.17*	7	0.17*	3	0.05*	88	150.21	0.59*	-2.15
Vagina	1	1.89	7	3.41*	4	1.98	9	2.93*	21	7.69	2.73*	0.46
Vulva	1	0.69	11	1.90	8	1.31	15	1.38	35	24.25	1.44*	0.37
<b>Urinary system</b>	16	1.29	81	1.63*	69	1.32*	162	1.84*	328	202.63	1.62*	4.34
Urinary bladder	11	1.50	58	1.96*	52	1.66*	122	2.30*	243	121.16	2.01*	4.21
Kidney parenchyma	4	1.01	16	1.01	11	0.66	23	0.83	54	64.26	0.84	-0.35
Renal pelvis, other urinary	1	0.93	7	1.62	6	1.33	17	2.33*	31	17.22	1.80*	0.48
Ureter	0	0.00	2	1.48	2	1.41	7	3.09*	11	5.37	2.05*	0.19
<b>Bone, joints</b>	0	0.00	1	1.02	4	4.23*	3	2.12	8	3.59	2.23	0.15
<b>Soft tissue including heart</b>	0	0.00	9	2.29*	5	1.26	12	1.81	26	15.53	1.67*	0.36
<b>Kaposi sarcoma</b>	1	12.16	1	2.94	0	0.00	1	1.37	3	1.55	1.94	0.05
<b>Melanoma of skin</b>	6	1.26	25	1.31	19	0.99	31	0.99	81	74.30	1.09	0.23
<b>Eye, orbit</b>	1	2.24	2	1.16	0	0.00	1	0.43	4	6.13	0.65	-0.07
<b>Brain, central nervous system</b>	4	1.37	7	0.60	7	0.61	17	1.00	35	42.91	0.82	-0.27
<b>Thyroid</b>	4	1.74	9	1.04	5	0.64	13	1.23	31	29.24	1.06	0.06
<b>Lymphatic, hematopoietic</b>	13	0.66	83	1.06	89	1.07	163	1.16	348	321.21	1.08	0.93
Hodgkin lymphoma	0	0.00	1	0.40	1	0.43	6	1.84	8	8.74	0.92	-0.03
Non-Hodgkin lymphoma	6	0.65	35	0.94	42	1.04	90	1.29*	173	156.83	1.10	0.56
Myeloma	3	0.87	11	0.80	15	1.05	22	0.94	51	54.73	0.93	-0.13
Leukemia	4	0.64	36	1.45*	31	1.19	45	1.03	116	100.91	1.15	0.52
Acute lymphocytic	0	0.00	1	1.45	2	2.79	0	0.00	3	2.73	1.10	0.01
Chronic lymphocytic	1	0.40	3	0.30*	7	0.67	19	1.10	30	40.21	0.75	-0.35
Acute non-lymphocytic	2	0.92	20	2.31*	18	2.00*	19	1.22	59	35.41	1.67*	0.82
Chronic myeloid	0	0.00	8	2.40*	2	0.58	6	1.02	16	13.53	1.18	0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.1.8:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	387	1.00	1,359	0.87*	1,344	0.89*	1,687	0.78*	4,777	5,603.98	0.85*	-19.89
All excluding same site	318	0.96	1,292	0.96	1,311	0.99	1,643	0.86*	4,564	4,905.27	0.93*	-8.21
<b>Buccal cavity, pharynx</b>	2	0.28*	14	0.48*	25	0.91	28	0.77	69	100.20	0.69*	-0.75
Lip	0	0.00	0	0.00	4	2.20	3	1.05	7	6.90	1.01	0.00
Tongue	0	0.00	6	0.93	3	0.49	8	1.00	17	22.11	0.77	-0.12
Salivary gland	0	0.00	1	0.33	3	1.05	1	0.24	5	10.77	0.46	-0.14
Mouth	1	0.40	3	0.30*	6	0.63	7	0.54	17	34.87	0.49*	-0.43
Nasopharynx	0	0.00	1	0.83	2	1.83	1	0.75	4	3.93	1.02	0.00
Tonsil	0	0.00	2	0.73	2	0.83	4	1.49	8	8.54	0.94	-0.01
Oropharynx	1	5.35	0	0.00	2	2.75	2	2.35	5	2.53	1.98	0.06
Hypopharynx	0	0.00	0	0.00	2	1.02	2	0.87	4	6.90	0.58	-0.07
<b>Digestive system</b>	80	0.96	347	1.02	340	1.00	446	0.87*	1,213	1,279.24	0.95	-1.59
Esophagus	3	1.28	10	1.05	2	0.21*	6	0.43*	21	35.10	0.60*	-0.34
Stomach	3	0.47	20	0.79	19	0.77	21	0.57*	63	93.45	0.67*	-0.73
Small intestine	4	3.32	6	1.23	12	2.46*	7	0.92	29	18.59	1.56*	0.25
Colon	34	0.82	186	1.10	181	1.06	231	0.88	632	643.66	0.98	-0.28
Rectum, rectosigmoid junction	14	1.01	55	0.98	58	1.07	69	0.91	196	199.76	0.98	-0.09
Rectum	11	1.22	36	0.99	37	1.04	49	0.98	133	131.07	1.01	0.05
Anus, anal canal	0	0.00	0	0.00*	3	0.64	7	1.06	10	17.25	0.58	-0.17
Liver	1	0.57	6	0.84	5	0.69	4	0.34*	16	27.92	0.57*	-0.29
Gallbladder	2	1.05	4	0.52	4	0.53	8	0.75	18	27.87	0.65	-0.24
Bile ducts, other biliary	2	1.14	5	0.69	13	1.74	10	0.79	30	29.15	1.03	0.02
Pancreas	10	0.92	45	1.02	34	0.76	72	1.04	161	169.27	0.95	-0.20
<b>Respiratory system</b>	28	0.55*	163	0.77*	159	0.75*	225	0.71*	575	791.32	0.73*	-5.20
Nose, nasal cavity, ear	0	0.00	3	1.43	5	2.44	3	1.01	11	7.65	1.44	0.08
Larynx	0	0.00	2	0.28	2	0.30	6	0.74	10	23.70	0.42*	-0.33
Lung, bronchus	28	0.58*	158	0.78*	152	0.75*	216	0.71*	554	758.01	0.73*	-4.91
<b>Female breast</b>	131	1.16	466	1.03	526	1.22*	560	0.95	1,683	1,583.92	1.06*	2.38
<b>Female genital system</b>	69	1.27	67	0.32*	33	0.17*	44	0.18*	213	698.72	0.30*	-11.68
Cervix uteri	2	0.33	3	0.13*	1	0.06*	3	0.16*	9	65.36	0.14*	-1.36
Corpus uteri	2	0.07*	2	0.02*	1	0.01*	6	0.05*	11	367.79	0.03*	-8.58
Ovary	53	3.47*	40	0.66*	16	0.28*	15	0.20*	124	207.68	0.60*	-2.01
Vagina	6	8.35*	9	3.14*	6	2.20	8	2.08	29	10.17	2.85*	0.45
Vulva	2	0.96	8	0.94	9	1.05	10	0.74	29	32.68	0.89	-0.09
<b>Urinary system</b>	25	1.41	82	1.13	62	0.85	93	0.84	262	274.83	0.95	-0.31
Urinary bladder	11	1.06	47	1.10	42	0.97	61	0.92	161	162.48	0.99	-0.04
Kidney parenchyma	14	2.36*	29	1.20	16	0.67	22	0.62*	81	89.71	0.90	-0.21
Renal pelvis, other urinary	0	0.00	6	1.00	4	0.66	10	1.10	20	22.64	0.88	-0.06
Ureter	0	0.00	2	1.08	0	0.00	3	1.06	5	7.01	0.71	-0.05
<b>Bone, joints</b>	1	2.75	3	2.09	2	1.50	0	0.00	6	4.95	1.21	0.03
<b>Soft tissue including heart</b>	0	0.00	9	1.52	11	1.93	6	0.71	26	21.55	1.21	0.11
<b>Kaposi sarcoma</b>	0	0.00	1	2.10	0	0.00	0	0.00	1	1.97	0.51	-0.02
<b>Melanoma of skin</b>	6	0.77	34	1.09	25	0.85	43	1.04	108	109.49	0.99	-0.04
<b>Eye, orbit</b>	1	1.64	1	0.41	3	1.33	1	0.33	6	8.29	0.72	-0.06
<b>Brain, central nervous system</b>	2	0.48	15	0.89	11	0.68	21	0.97	49	58.85	0.83	-0.24
<b>Thyroid</b>	7	1.87	12	0.84	5	0.41*	7	0.49*	31	44.56	0.70*	-0.33
<b>Lymphatic, hematopoietic</b>	26	0.93	101	0.88	91	0.79*	167	0.95	385	434.77	0.89*	-1.20
Hodgkin lymphoma	1	1.07	4	1.10	2	0.61	3	0.72	10	12.03	0.83	-0.05
Non-Hodgkin lymphoma	16	1.18	47	0.84	43	0.75	85	0.96	191	215.79	0.89	-0.60
Myeloma	4	0.84	12	0.62	19	0.98	34	1.17	69	72.58	0.95	-0.09
Leukemia	5	0.57	38	1.07	27	0.76	45	0.83	115	134.37	0.86	-0.47
Acute lymphocytic	0	0.00	1	0.95	2	1.96	1	0.68	4	3.81	1.05	0.00
Chronic lymphocytic	3	0.88	12	0.86	9	0.64	15	0.70	39	52.81	0.74	-0.33
Acute non-lymphocytic	2	0.65	17	1.35	9	0.72	21	1.07	49	47.82	1.02	0.03
Chronic myeloid	0	0.00	3	0.62	4	0.84	3	0.41	10	18.10	0.55	-0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Corpus Uteri

### Females, Long-term Follow-up, Radiotherapy

**Table 9.1.9:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	29,629		12,886		8,385		4,657		29,629			
<b>Person-years in interval</b>	187,600		52,739		32,217		16,599		289,155			
<b>All subsequent cancers</b>	2,377	0.99	791	0.95	547	0.98	299	0.98	4,014	4,091.70	0.98	-2.69
All excluding same site	2,236	1.08*	778	1.06	539	1.09	292	1.06	3,845	3,580.08	1.07*	9.16
<b>Buccal cavity, pharynx</b>	28	0.61*	11	0.76	11	1.20	4	0.83	54	74.09	0.73*	-0.69
Lip	4	1.39	1	0.94	2	2.62	3	6.57*	10	5.15	1.94	0.17
Tongue	6	0.60	3	0.94	0	0.00	0	0.00	9	16.23	0.55	-0.25
Salivary gland	5	1.10	0	0.00	2	1.87	0	0.00	7	7.76	0.90	-0.03
Mouth	9	0.56	4	0.78	6	1.82	1	0.56	20	26.11	0.77	-0.21
Nasopharynx	1	0.57	0	0.00	0	0.00	0	0.00	1	2.77	0.36	-0.06
Tonsil	1	0.24	0	0.00	0	0.00	0	0.00	1	6.32	0.16*	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.89	0.00	-0.07
Hypopharynx	1	0.30	1	1.04	1	1.80	0	0.00	3	5.13	0.58	-0.07
<b>Digestive system</b>	615	1.10*	250	1.25*	184	1.35*	89	1.12	1,138	972.13	1.17*	5.74
Esophagus	9	0.59	4	0.75	1	0.28	2	0.95	16	26.37	0.61*	-0.36
Stomach	43	1.02	18	1.24	13	1.32	5	0.88	79	72.23	1.09	0.23
Small intestine	10	1.35	5	1.80	5	2.47	1	0.85	21	13.36	1.57	0.26
Colon	350	1.25*	145	1.43*	98	1.40*	46	1.12	639	491.75	1.30*	5.09
Rectum, rectosigmoid junction	94	1.03	38	1.26	30	1.54*	11	1.03	173	151.96	1.14	0.73
Rectum	66	1.11	30	1.52*	23	1.77*	7	0.95	126	99.24	1.27*	0.93
Anus, anal canal	5	0.68	1	0.39	0	0.00	3	3.23	9	12.53	0.72	-0.12
Liver	8	0.73	5	1.19	6	1.92	1	0.52	20	20.25	0.99	-0.01
Gallbladder	13	1.00	5	1.15	1	0.35	0	0.00	19	21.67	0.88	-0.09
Bile ducts, other biliary	12	1.05	4	0.88	4	1.15	4	1.84	24	21.62	1.11	0.08
Pancreas	64	0.88	23	0.86	23	1.24	15	1.40	125	128.30	0.97	-0.11
<b>Respiratory system</b>	322	1.00	101	0.85	62	0.76*	31	0.70*	516	565.13	0.91*	-1.70
Nose, nasal cavity, ear	4	1.21	1	0.88	0	0.00	0	0.00	5	5.65	0.89	-0.02
Larynx	3	0.27*	4	1.21	1	0.51	3	3.21	11	17.12	0.64	-0.21
Lung, bronchus	313	1.03	96	0.84	60	0.76*	28	0.65*	497	540.92	0.92	-1.52
<b>Female breast</b>	720	1.07	218	0.95	135	0.91	60	0.77*	1,133	1,125.76	1.01	0.25
<b>Female genital system</b>	141	0.43*	13	0.13*	8	0.13*	7	0.23*	169	511.62	0.33*	-11.85
Cervix uteri	10	0.30*	0	0.00*	0	0.00*	0	0.00	10	47.59	0.21*	-1.30
Corpus uteri	10	0.06*	0	0.00*	1	0.03*	0	0.00*	11	270.80	0.04*	-8.98
Ovary	85	0.92	3	0.10*	0	0.00*	0	0.00*	88	150.21	0.59*	-2.15
Vagina	12	2.60*	3	1.95	2	2.00	4	7.35*	21	7.69	2.73*	0.46
Vulva	20	1.49	7	1.38	5	1.37	3	1.38	35	24.25	1.44*	0.37
<b>Urinary system</b>	166	1.45*	71	1.69*	57	1.94*	34	2.04*	328	202.63	1.62*	4.34
Urinary bladder	121	1.78*	55	2.19*	39	2.21*	28	2.74*	243	121.16	2.01*	4.21
Kidney parenchyma	31	0.85	9	0.67	10	1.08	4	0.79	54	64.26	0.84	-0.35
Renal pelvis, other urinary	14	1.41	7	2.00	8	3.29*	2	1.45	31	17.22	1.80*	0.48
Ureter	4	1.29	2	1.83	3	4.02	2	4.70	11	5.37	2.05*	0.19
<b>Bone, joints</b>	5	2.29	1	1.46	1	2.14	1	3.83	8	3.59	2.23	0.15
<b>Soft tissue including heart</b>	14	1.57	5	1.60	6	2.69	1	0.79	26	15.53	1.67*	0.36
<b>Kaposi sarcoma</b>	2	2.45	1	2.93	0	0.00	0	0.00	3	1.55	1.94	0.05
<b>Melanoma of skin</b>	50	1.16	12	0.81	11	1.06	8	1.31	81	74.30	1.09	0.23
<b>Eye, orbit</b>	3	0.79	1	0.85	0	0.00	0	0.00	4	6.13	0.65	-0.07
<b>Brain, central nervous system</b>	18	0.69	8	0.93	6	1.09	3	1.06	35	42.91	0.82	-0.27
<b>Thyroid</b>	18	0.96	5	0.93	5	1.47	3	1.68	31	29.24	1.06	0.06
<b>Lymphatic, hematopoietic</b>	185	1.02	67	1.00	50	1.07	46	1.72*	348	321.21	1.08	0.93
Hodgkin lymphoma	2	0.37	1	0.61	2	1.84	3	5.63*	8	8.74	0.92	-0.03
Non-Hodgkin lymphoma	83	0.96	35	1.06	28	1.19	27	1.99*	173	156.83	1.10	0.56
Myeloma	29	0.92	11	0.97	5	0.65	6	1.40	51	54.73	0.93	-0.13
Leukemia	71	1.24	20	0.96	15	1.03	10	1.19	116	100.91	1.15	0.52
Acute lymphocytic	3	1.90	0	0.00	0	0.00	0	0.00	3	2.73	1.10	0.01
Chronic lymphocytic	11	0.48*	8	0.95	8	1.41	3	0.96	30	40.21	0.75	-0.35
Acute non-lymphocytic	40	2.02*	12	1.65	2	0.39	5	1.59	59	35.41	1.67*	0.82
Chronic myeloid	10	1.31	0	0.00	4	2.06	2	1.80	16	13.53	1.18	0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Corpus Uteri**  
**Females, Long-term Follow-up, No Radiotherapy**

**Table 9.1.10:** Risk of subsequent primary cancers after cancer of the corpus uteri, females, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	3,090	0.90*	855	0.78*	552	0.80*	280	0.75*	4,777	5,603.98	0.85*	-19.89
All excluding same site	2,921	0.98	833	0.87*	534	0.87*	276	0.82*	4,564	4,905.27	0.93*	-8.21
<b>Buccal cavity, pharynx</b>	41	0.64*	19	1.00	5	0.44	4	0.68	69	100.20	0.69*	-0.75
Lip	4	0.99	3	2.19	0	0.00	0	0.00	7	6.90	1.01	0.00
Tongue	9	0.64	3	0.71	4	1.61	1	0.78	17	22.11	0.77	-0.12
Salivary gland	4	0.60	1	0.49	0	0.00	0	0.00	5	10.77	0.46	-0.14
Mouth	10	0.45*	5	0.75	0	0.00*	2	0.93	17	34.87	0.49*	-0.43
Nasopharynx	3	1.15	0	0.00	1	2.40	0	0.00	4	3.93	1.02	0.00
Tonsil	4	0.68	3	1.98	0	0.00	1	2.97	8	8.54	0.94	-0.01
Oropharynx	3	1.79	2	4.36	0	0.00	0	0.00	5	2.53	1.98	0.06
Hypopharynx	2	0.44	2	1.57	0	0.00	0	0.00	4	6.90	0.58	-0.07
<b>Digestive system</b>	767	1.00	219	0.86*	151	0.91	76	0.80*	1,213	1,279.24	0.95	-1.59
Esophagus	15	0.71	4	0.58	2	0.45	0	0.00	21	35.10	0.60*	-0.34
Stomach	42	0.74	8	0.44*	9	0.76	4	0.59	63	93.45	0.67*	-0.73
Small intestine	22	2.01*	3	0.81	1	0.40	3	2.08	29	18.59	1.56*	0.25
Colon	401	1.05	113	0.88	81	0.96	37	0.75	632	643.66	0.98	-0.28
Rectum, rectosigmoid junction	127	1.02	34	0.88	26	1.09	9	0.69	196	199.76	0.98	-0.09
Rectum	84	1.04	23	0.91	19	1.19	7	0.79	133	131.07	1.01	0.05
Anus, anal canal	3	0.28*	3	0.89	4	1.88	0	0.00	10	17.25	0.58	-0.17
Liver	12	0.74	3	0.54	1	0.26	0	0.00	16	27.92	0.57*	-0.29
Gallbladder	10	0.58	3	0.55	4	1.16	1	0.55	18	27.87	0.65	-0.24
Bile ducts, other biliary	20	1.22	3	0.51	4	0.95	3	1.15	30	29.15	1.03	0.02
Pancreas	89	0.89	38	1.12	15	0.66	19	1.47	161	169.27	0.95	-0.20
<b>Respiratory system</b>	350	0.74*	104	0.66*	71	0.69*	50	0.91	575	791.32	0.73*	-5.20
Nose, nasal cavity, ear	8	1.71	1	0.68	2	2.12	0	0.00	11	7.65	1.44	0.08
Larynx	4	0.26*	3	0.68	2	0.81	1	0.85	10	23.70	0.42*	-0.33
Lung, bronchus	338	0.74*	100	0.66*	67	0.68*	49	0.92	554	758.01	0.73*	-4.91
<b>Female breast</b>	1,123	1.13*	300	0.98	181	0.97	79	0.82	1,683	1,583.92	1.06*	2.38
<b>Female genital system</b>	169	0.37*	22	0.17*	18	0.24*	4	0.11*	213	698.72	0.30*	-11.68
Cervix uteri	6	0.13*	1	0.09*	2	0.36	0	0.00	9	65.36	0.14*	-1.36
Corpus uteri	5	0.02*	4	0.06*	2	0.05*	0	0.00*	11	367.79	0.03*	-8.58
Ovary	109	0.82*	4	0.10*	10	0.42*	1	0.08*	124	207.68	0.60*	-2.01
Vagina	21	3.33*	5	2.55	1	0.82	2	3.00	29	10.17	2.85*	0.45
Vulva	19	0.99	7	1.07	2	0.45	1	0.38	29	32.68	0.89	-0.09
<b>Urinary system</b>	169	1.03	45	0.82	28	0.78	20	0.99	262	274.83	0.95	-0.31
Urinary bladder	100	1.04	32	0.98	14	0.65	15	1.21	161	162.48	0.99	-0.04
Kidney parenchyma	59	1.09	10	0.56	10	0.87	2	0.32	81	89.71	0.90	-0.21
Renal pelvis, other urinary	10	0.74	3	0.67	4	1.34	3	1.79	20	22.64	0.88	-0.06
Ureter	2	0.48	1	0.72	2	2.18	0	0.00	5	7.01	0.71	-0.05
<b>Bone, joints</b>	6	1.91	0	0.00	0	0.00	0	0.00	6	4.95	1.21	0.03
<b>Soft tissue including heart</b>	20	1.53	3	0.73	3	1.09	0	0.00	26	21.55	1.21	0.11
<b>Kaposi sarcoma</b>	1	0.91	0	0.00	0	0.00	0	0.00	1	1.97	0.51	-0.02
<b>Melanoma of skin</b>	65	0.95	23	1.12	15	1.14	5	0.67	108	109.49	0.99	-0.04
<b>Eye, orbit</b>	5	0.94	0	0.00	0	0.00	1	2.07	6	8.29	0.72	-0.06
<b>Brain, central nervous system</b>	28	0.75	12	1.06	6	0.88	3	0.86	49	58.85	0.83	-0.24
<b>Thyroid</b>	24	0.80	4	0.52	2	0.45	1	0.45	31	44.56	0.70*	-0.33
<b>Lymphatic, hematopoietic</b>	218	0.84*	77	0.89	58	1.01	32	0.98	385	434.77	0.89*	-1.20
Hodgkin lymphoma	7	0.89	1	0.46	2	1.48	0	0.00	10	12.03	0.83	-0.05
Non-Hodgkin lymphoma	106	0.84	38	0.88	28	0.96	19	1.15	191	215.79	0.89	-0.60
Myeloma	35	0.81	15	1.04	15	1.59	4	0.76	69	72.58	0.95	-0.09
Leukemia	70	0.88	23	0.86	13	0.74	9	0.89	115	134.37	0.86	-0.47
Acute lymphocytic	3	1.28	0	0.00	1	2.14	0	0.00	4	3.81	1.05	0.00
Chronic lymphocytic	24	0.76	7	0.66	7	1.01	1	0.27	39	52.81	0.74	-0.33
Acute non-lymphocytic	28	0.99	12	1.27	5	0.79	4	1.05	49	47.82	1.02	0.03
Chronic myeloid	7	0.65	1	0.28	0	0.00	2	1.50	10	18.10	0.55	-0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Ovary Females

**Table 9.2.1:** Characteristics of patients with an initial cancer of the ovary, females, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	—	—	41,489	100.0	41,489	100.0
<b>Initial treatment</b>						
Any radiation	—	—	3,462	8.3	3,462	8.3
With surgery	—	—	2,958	7.1	2,958	7.1
Without surgery	—	—	504	1.2	504	1.2
No radiation	—	—	38,027	91.7	38,027	91.7
With surgery	—	—	31,302	75.4	31,302	75.4
Without surgery	—	—	6,725	16.2	6,725	16.2
<b>Race</b>						
White	—	—	36,685	88.4	36,685	88.4
Black	—	—	2,435	5.9	2,435	5.9
Other	—	—	2,252	5.4	2,252	5.4
Unknown	—	—	117	0.3	117	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	—	—	2,241	5.4	2,241	5.4
30–49	—	—	9,173	22.1	9,173	22.1
50–69	—	—	18,906	45.6	18,906	45.6
70–79	—	—	7,739	18.7	7,739	18.7
≥ 80	—	—	3,430	8.3	3,430	8.3
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	—	—	39,440	95.1	39,440	95.1
1st and 2nd cancers	—	—	1,894	4.6	1,894	4.6
1st, 2nd, and 3rd cancers	—	—	144	0.3	144	0.3
1st, 2nd, 3rd, and additional cancers	—	—	11	0.0	11	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	—	—	60.4	—	60.4	—
Median year of 1st cancer diagnosis	—	—	1988.8	—	1988.8	—
Median person-years at risk	—	—	2.4	—	2.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	—	—	96.4	—	96.4
1st, 2nd, and additional cancers	—	—	—	95.9	—	95.9
1st cancer only	—	—	—	3.0	—	3.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 9.2.2:** Risk of subsequent primary cancers after cancer of the ovary, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	264	0.96	714	0.99	575	1.17*	662	1.18*	2,215	2,044.83	1.08*	8.18
All excluding same site	220	0.93	668	1.08	553	1.30*	650	1.32*	2,091	1,775.72	1.18*	15.16
<b>Buccal cavity, pharynx</b>	3	0.59	14	1.06	16	1.82*	9	0.95	42	36.55	1.15	0.26
Lip	0	0.00	0	0.00	0	0.00	1	1.52	1	2.29	0.44	-0.06
Tongue	2	1.78	8	2.74*	4	2.03	2	0.94	16	8.15	1.96*	0.38
Salivary gland	1	1.80	0	0.00	0	0.00	2	1.80	3	4.12	0.73	-0.05
Mouth	0	0.00	3	0.68	7	2.38	3	0.93	13	12.31	1.06	0.03
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-0.08
Tonsil	0	0.00	1	0.80	4	5.02*	0	0.00	5	3.31	1.51	0.08
Oropharynx	0	0.00	1	2.96	0	0.00	0	0.00	1	0.92	1.09	0.00
Hypopharynx	0	0.00	1	1.07	1	1.65	0	0.00	2	2.53	0.79	-0.03
<b>Digestive system</b>	68	1.17	139	0.94	145	1.42*	187	1.56*	539	428.61	1.26*	5.31
Esophagus	1	0.61	1	0.24	6	2.10	2	0.59	10	12.09	0.83	-0.10
Stomach	3	0.67	10	0.89	8	1.06	16	1.85*	37	31.94	1.16	0.24
Small intestine	4	4.71*	4	1.77	3	1.90	3	1.53	14	6.65	2.11*	0.35
Colon	37	1.29	71	0.97	70	1.39*	90	1.50*	268	211.86	1.26*	2.70
Rectum, rectosigmoid junction	8	0.83	28	1.14	31	1.88*	34	1.86*	101	68.91	1.47*	1.54
Rectum	5	0.79	16	1.00	24	2.23*	21	1.73*	66	45.20	1.46*	1.00
Anus, anal canal	2	2.39	2	0.90	3	1.96	3	1.71	10	6.33	1.58	0.18
Liver	0	0.00	0	0.00	1	0.43	4	1.38	5	9.75	0.51	-0.23
Gallbladder	1	0.75	1	0.30	2	0.90	2	0.82	6	9.29	0.65	-0.16
Bile ducts, other biliary	2	1.65	4	1.26	3	1.33	7	2.42	16	9.53	1.68	0.31
Pancreas	7	0.93	16	0.83	14	1.05	23	1.43	60	56.15	1.07	0.18
<b>Respiratory system</b>	17	0.48*	70	0.73*	83	1.24	100	1.23*	270	279.03	0.97	-0.43
Nose, nasal cavity, ear	0	0.00	0	0.00	1	1.53	0	0.00	1	2.73	0.37	-0.08
Larynx	2	1.59	2	0.61	1	0.46	6	2.56	11	9.09	1.21	0.09
Lung, bronchus	15	0.44*	68	0.75*	81	1.27*	94	1.20	258	266.49	0.97	-0.41
<b>Female breast</b>	72	0.88	239	1.09	175	1.18*	184	1.11	670	614.79	1.09*	2.65
<b>Female genital system</b>	44	1.14	46	0.46*	22	0.34*	12	0.18*	124	269.10	0.46*	-6.98
Cervix uteri	4	0.82	3	0.24*	1	0.13*	2	0.29	10	31.99	0.31*	-1.06
Corpus uteri	31	1.57*	17	0.34*	6	0.19*	2	0.06*	56	136.61	0.41*	-3.87
Ovary	6	0.54	18	0.62*	9	0.47*	2	0.10*	35	79.91	0.44*	-2.16
Vagina	1	1.95	4	3.05	2	2.28	3	3.07	10	3.68	2.72*	0.30
Vulva	1	0.68	2	0.52	4	1.49	3	0.92	10	11.26	0.89	-0.06
<b>Urinary system</b>	14	1.13	36	1.11	28	1.25	52	1.92*	130	94.26	1.38*	1.72
Urinary bladder	3	0.42	24	1.29	18	1.40	32	2.04*	77	54.31	1.42*	1.09
Kidney parenchyma	10	2.39*	11	0.98	8	1.03	13	1.39	42	32.55	1.29	0.45
Renal pelvis, other urinary	1	0.99	1	0.39	2	1.14	7	3.37*	11	7.40	1.49	0.17
Ureter	0	0.00	0	0.00	0	0.00	2	3.18	2	2.25	0.89	-0.01
<b>Bone, joints</b>	0	0.00	0	0.00	3	6.11*	1	1.94	4	2.04	1.96	0.09
<b>Soft tissue including heart</b>	2	1.82	1	0.34	6	3.01*	5	2.20	14	8.30	1.69	0.27
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.03
<b>Melanoma of skin</b>	11	1.82	14	0.82	7	0.60	14	1.10	46	47.38	0.97	-0.07
<b>Eye, orbit</b>	3	6.97*	1	0.91	1	1.39	5	6.39*	10	3.03	3.29*	0.33
<b>Brain, central nervous system</b>	2	0.66	6	0.75	6	1.12	6	1.03	20	22.24	0.90	-0.11
<b>Thyroid</b>	4	1.27	10	1.13	9	1.55	9	1.59	32	23.52	1.36	0.41
<b>Lymphatic, hematopoietic</b>	20	1.00	116	2.22*	62	1.71*	55	1.28	253	151.49	1.67*	4.88
Hodgkin lymphoma	1	1.24	0	0.00	1	0.72	3	2.27	5	5.68	0.88	-0.03
Non-Hodgkin lymphoma	10	1.04	26	1.02	16	0.89	25	1.14	77	74.98	1.03	0.10
Myeloma	4	1.19	5	0.58	4	0.68	8	1.13	21	24.95	0.84	-0.19
Leukemia	5	0.81	85	5.35*	41	3.75*	19	1.47	150	45.88	3.27*	5.01
Acute lymphocytic	0	0.00	5	9.04*	2	5.28	1	2.44	8	1.55	5.17*	0.31
Chronic lymphocytic	1	0.43	4	0.67	4	0.97	4	0.82	13	17.34	0.75	-0.21
Acute non-lymphocytic	3	1.36	69	12.00*	28	7.08*	9	1.91	109	16.62	6.56*	4.44
Chronic myeloid	1	1.15	4	1.79	5	3.27*	2	1.13	12	6.40	1.87	0.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Ovary

### Females, Long-term Follow-up

**Table 9.2.3:** Risk of subsequent primary cancers after cancer of the ovary, females, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,553	1.05	345	1.15*	216	1.25*	101	1.17	2,215	2,044.83	1.08*	8.18
All excluding same site	1,441	1.12*	340	1.29*	212	1.39*	98	1.28*	2,091	1,775.72	1.18*	15.16
<b>Buccal cavity, pharynx</b>	33	1.22	5	0.96	4	1.38	0	0.00	42	36.55	1.15	0.26
Lip	0	0.00	0	0.00	1	4.83	0	0.00	1	2.29	0.44	-0.06
Tongue	14	2.33*	1	0.85	1	1.53	0	0.00	16	8.15	1.96*	0.38
Salivary gland	1	0.33	2	3.38	0	0.00	0	0.00	3	4.12	0.73	-0.05
Mouth	10	1.10	1	0.57	2	2.04	0	0.00	13	12.31	1.06	0.03
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-0.08
Tonsil	5	1.98	0	0.00	0	0.00	0	0.00	5	3.31	1.51	0.08
Oropharynx	1	1.44	0	0.00	0	0.00	0	0.00	1	0.92	1.09	0.00
Hypopharynx	2	1.05	0	0.00	0	0.00	0	0.00	2	2.53	0.79	-0.03
<b>Digestive system</b>	352	1.14*	89	1.39*	68	1.83*	30	1.58*	539	428.61	1.26*	5.31
Esophagus	8	0.92	0	0.00	2	1.90	0	0.00	10	12.09	0.83	-0.10
Stomach	21	0.90	7	1.50	7	2.64*	2	1.52	37	31.94	1.16	0.24
Small intestine	11	2.35*	3	2.97	0	0.00	0	0.00	14	6.65	2.11*	0.35
Colon	178	1.17*	48	1.51*	26	1.40	16	1.68	268	211.86	1.26*	2.70
Rectum, rectosigmoid junction	67	1.32*	11	1.11	18	3.23*	5	1.81	101	68.91	1.47*	1.54
Rectum	45	1.36	6	0.92	12	3.22*	3	1.59	66	45.20	1.46*	1.00
Anus, anal canal	7	1.53	2	2.14	1	1.83	0	0.00	10	6.33	1.58	0.18
Liver	1	0.15*	2	1.35	1	1.09	1	1.99	5	9.75	0.51	-0.23
Gallbladder	4	0.58	1	0.75	0	0.00	1	2.78	6	9.29	0.65	-0.16
Bile ducts, other biliary	9	1.36	5	3.38*	2	2.17	0	0.00	16	9.53	1.68	0.31
Pancreas	37	0.92	10	1.18	9	1.79	4	1.55	60	56.15	1.07	0.18
<b>Respiratory system</b>	170	0.86*	58	1.36*	32	1.25	10	0.76	270	279.03	0.97	-0.43
Nose, nasal cavity, ear	1	0.50	0	0.00	0	0.00	0	0.00	1	2.73	0.37	-0.08
Larynx	5	0.74	4	3.07	2	2.83	0	0.00	11	9.09	1.21	0.09
Lung, bronchus	164	0.87	54	1.32	30	1.22	10	0.79	258	266.49	0.97	-0.41
<b>Female breast</b>	486	1.08	94	1.05	63	1.24	27	1.09	670	614.79	1.09*	2.65
<b>Female genital system</b>	112	0.56*	5	0.13*	4	0.19*	3	0.31*	124	269.10	0.46*	-6.98
Cervix uteri	8	0.32*	1	0.25	0	0.00	1	1.21	10	31.99	0.31*	-1.06
Corpus uteri	54	0.53*	1	0.05*	0	0.00*	1	0.20	56	136.61	0.41*	-3.87
Ovary	33	0.56*	1	0.09*	1	0.16*	0	0.00	35	79.91	0.44*	-2.16
Vagina	7	2.59*	0	0.00	2	6.74	1	6.77	10	3.68	2.72*	0.30
Vulva	7	0.87	2	1.17	1	0.98	0	0.00	10	11.26	0.89	-0.06
<b>Urinary system</b>	78	1.16	26	1.82*	19	2.24*	7	1.60	130	94.26	1.38*	1.72
Urinary bladder	45	1.16	16	1.94*	14	2.86*	2	0.79	77	54.31	1.42*	1.09
Kidney parenchyma	29	1.25	6	1.22	3	1.02	4	2.68	42	32.55	1.29	0.45
Renal pelvis, other urinary	4	0.75	4	3.66	2	3.09	1	2.96	11	7.40	1.49	0.17
Ureter	0	0.00	1	3.01	1	5.10	0	0.00	2	2.25	0.89	-0.01
<b>Bone, joints</b>	3	1.97	1	3.58	0	0.00	0	0.00	4	2.04	1.96	0.09
<b>Soft tissue including heart</b>	9	1.49	3	2.48	1	1.41	1	2.83	14	8.30	1.69	0.27
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.03
<b>Melanoma of skin</b>	32	0.92	11	1.61	3	0.76	0	0.00	46	47.38	0.97	-0.07
<b>Eye, orbit</b>	5	2.22	2	4.71	2	8.22	1	8.71	10	3.03	3.29*	0.33
<b>Brain, central nervous system</b>	14	0.85	3	0.94	1	0.56	2	2.33	20	22.24	0.90	-0.11
<b>Thyroid</b>	23	1.29	4	1.27	3	1.76	2	2.51	32	23.52	1.36	0.41
<b>Lymphatic, hematopoietic</b>	198	1.83*	32	1.40	8	0.59	15	2.18*	253	151.49	1.67*	4.88
Hodgkin lymphoma	2	0.46	2	2.67	0	0.00	1	5.68	5	5.68	0.88	-0.03
Non-Hodgkin lymphoma	52	0.98	13	1.14	5	0.73	7	1.96	77	74.98	1.03	0.10
Myeloma	13	0.73	4	1.07	2	0.91	2	1.79	21	24.95	0.84	-0.19
Leukemia	131	3.97*	13	1.89*	1	0.25	5	2.47	150	45.88	3.27*	5.01
Acute lymphocytic	7	6.15*	1	4.40	0	0.00	0	0.00	8	1.55	5.17*	0.31
Chronic lymphocytic	9	0.72	2	0.76	0	0.00	2	2.68	13	17.34	0.75	-0.21
Acute non-lymphocytic	100	8.40*	6	2.43	1	0.68	2	2.59	109	16.62	6.56*	4.44
Chronic myeloid	10	2.16*	2	2.10	0	0.00	0	0.00	12	6.40	1.87	0.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.2.4:** Risk of subsequent primary cancers after cancer of the ovary, females, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	58	2.70*	144	1.71*	125	1.49*	186	1.19*	513	345.49	1.48*	19.56
All excluding same site	42	2.38*	115	1.65*	116	1.66*	185	1.39*	458	290.44	1.58*	19.56
<b>Buccal cavity, pharynx</b>	0	0.00	1	0.73	2	1.37	2	0.73	5	5.90	0.85	-0.11
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.03
Tongue	0	0.00	1	3.32	0	0.00	1	1.53	2	1.36	1.47	0.07
Salivary gland	0	0.00	0	0.00	0	0.00	1	2.94	1	0.88	1.14	0.01
Mouth	0	0.00	0	0.00	1	2.37	0	0.00	1	1.70	0.59	-0.08
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.05
Tonsil	0	0.00	0	0.00	1	6.29	0	0.00	1	0.62	1.61	0.04
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.02
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.04
<b>Digestive system</b>	13	7.17*	17	2.21*	19	2.14*	55	2.51*	104	40.28	2.58*	7.44
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	1.17	0.00	-0.14
Stomach	1	6.06	0	0.00	0	0.00	6	4.07*	7	2.96	2.37	0.47
Small intestine	0	0.00	0	0.00	0	0.00	1	2.04	1	0.99	1.01	0.00
Colon	6	7.76*	10	3.05*	10	2.60*	29	2.93*	55	17.80	3.09*	4.34
Rectum, rectosigmoid junction	2	5.28	3	1.83	7	3.74*	10	2.46*	22	7.95	2.77*	1.64
Rectum	1	3.89	3	2.74	4	3.26	6	2.22	14	5.28	2.65*	1.02
Anus, anal canal	1	16.37	1	3.98	0	0.00	2	3.95	4	1.09	3.69	0.34
Liver	0	0.00	0	0.00	0	0.00	1	1.60	1	1.15	0.87	-0.02
Gallbladder	0	0.00	0	0.00	1	6.03	0	0.00	1	0.75	1.33	0.03
Bile ducts, other biliary	1	28.61	0	0.00	0	0.00	2	4.16	3	0.85	3.54	0.25
Pancreas	2	11.41*	3	3.81	0	0.00	3	1.10	8	4.70	1.70	0.39
<b>Respiratory system</b>	3	2.16	10	1.60	14	1.76	22	1.04	49	36.75	1.33	1.43
Nose, nasal cavity, ear	0	0.00	0	0.00	1	9.77	0	0.00	1	0.42	2.39	0.07
Larynx	0	0.00	0	0.00	0	0.00	2	2.46	2	1.59	1.25	0.05
Lung, bronchus	3	2.34	10	1.72	13	1.75	20	0.99	46	34.61	1.33	1.33
<b>Female breast</b>	15	1.64	61	1.72*	44	1.29	52	0.91	172	135.68	1.27*	4.24
<b>Female genital system</b>	16	4.23*	29	1.99*	9	0.65	1	0.04*	55	55.05	1.00	-0.01
Cervix uteri	1	0.83	2	0.49	1	0.32	0	0.00	4	11.90	0.34*	-0.92
Corpus uteri	11	9.19*	5	0.97	0	0.00*	1	0.09*	17	23.12	0.74	-0.71
Ovary	4	3.43	17	3.77*	7	1.64	0	0.00*	28	16.88	1.66*	1.30
Vagina	0	0.00	4	32.02*	1	8.05	0	0.00	5	0.52	9.67*	0.52
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-0.19
<b>Urinary system</b>	2	3.99	4	1.86	6	2.43	12	1.99*	24	11.15	2.15*	1.50
Urinary bladder	0	0.00	3	3.12	1	0.87	6	1.98	10	5.37	1.86	0.54
Kidney parenchyma	2	7.67	1	0.91	3	2.49	3	1.13	9	5.21	1.73	0.44
Renal pelvis, other urinary	0	0.00	0	0.00	2	16.67*	3	8.73*	5	0.58	8.67*	0.52
Ureter	0	0.00	0	0.00	0	0.00	2	21.45*	2	0.14	14.04*	0.22
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	1	1.92	3	6.60*	2	2.85	6	1.82	3.30*	0.49
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.01
<b>Melanoma of skin</b>	3	2.28	3	0.62	1	0.25	6	1.14	13	15.49	0.84	-0.29
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	3	12.99*	3	0.54	5.55*	0.29
<b>Brain, central nervous system</b>	0	0.00	1	0.77	2	1.71	2	1.10	5	4.63	1.08	0.04
<b>Thyroid</b>	3	3.00	5	1.40	8	2.87*	7	2.23	23	10.49	2.19*	1.46
<b>Lymphatic, hematopoietic</b>	0	0.00	9	1.79	13	2.63*	16	1.63	38	21.07	1.80*	1.98
Hodgkin lymphoma	0	0.00	0	0.00	1	1.79	1	1.77	2	2.14	0.93	-0.02
Non-Hodgkin lymphoma	0	0.00	0	0.00	3	1.20	6	1.15	9	10.74	0.84	-0.20
Myeloma	0	0.00	0	0.00	0	0.00	1	0.70	1	2.53	0.40	-0.18
Leukemia	0	0.00	9	6.58*	9	6.77*	8	3.06*	26	5.66	4.59*	2.37
Acute lymphocytic	0	0.00	0	0.00	1	9.56	1	7.30	2	0.41	4.89	0.19
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	2	2.32	2	1.48	1.35	0.06
Acute non-lymphocytic	0	0.00	9	14.80*	6	10.67*	4	3.92*	19	2.35	8.08*	1.94
Chronic myeloid	0	0.00	0	0.00	2	8.11	0	0.00	2	1.00	2.00	0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Ovary

### Females, 50-69 Years of Age

**Table 9.2.5:** Risk of subsequent primary cancers after cancer of the ovary, females, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	18,906		14,579		6,017		3,271		18,906			
<b>Person-years in interval</b>	13,734		35,699		22,225		20,886		92,544			
<b>All subsequent cancers</b>	131	0.98	373	0.97	336	1.16*	421	1.21*	1,261	1,154.37	1.09*	11.52
All excluding same site	113	1.01	362	1.11*	329	1.31*	410	1.33*	1,214	996.40	1.22*	23.51
<b>Buccal cavity, pharynx</b>	2	0.71	9	1.16	12	2.18*	6	1.02	29	21.92	1.32	0.77
Lip	0	0.00	0	0.00	0	0.00	1	2.35	1	1.20	0.83	-0.02
Tongue	2	3.17	4	2.29	4	3.22	1	0.78	11	4.90	2.24*	0.66
Salivary gland	0	0.00	0	0.00	0	0.00	1	1.56	1	2.18	0.46	-0.13
Mouth	0	0.00	3	1.18	4	2.18	2	0.98	9	7.35	1.23	0.18
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.93	0.00	-0.10
Tonsil	0	0.00	1	1.18	3	5.53*	0	0.00	4	2.18	1.84	0.20
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.07
Hypopharynx	0	0.00	1	1.57	1	2.28	0	0.00	2	1.72	1.16	0.03
<b>Digestive system</b>	32	1.37	71	1.02	86	1.49*	111	1.40*	300	229.82	1.31*	7.58
Esophagus	0	0.00	0	0.00	5	2.76	2	0.88	7	7.19	0.97	-0.02
Stomach	2	1.21	4	0.83	7	1.76	8	1.43	21	16.06	1.31	0.53
Small intestine	2	5.05	3	2.55	3	3.20	1	0.80	9	3.76	2.39*	0.57
Colon	18	1.65	38	1.16	39	1.40	53	1.33	148	111.48	1.33*	3.95
Rectum, rectosigmoid junction	4	0.92	15	1.19	17	1.74*	22	1.86*	58	38.56	1.50*	2.10
Rectum	2	0.71	10	1.23	15	2.37*	14	1.79	41	25.07	1.64*	1.72
Anus, anal canal	1	2.40	1	0.82	2	2.18	0	0.00	4	3.62	1.11	0.04
Liver	0	0.00	0	0.00	1	0.73	3	1.55	4	5.41	0.74	-0.15
Gallbladder	0	0.00	0	0.00	1	0.80	1	0.61	2	4.87	0.41	-0.31
Bile ducts, other biliary	1	2.25	1	0.73	2	1.66	4	2.10	8	4.92	1.63	0.33
Pancreas	3	1.00	7	0.77	6	0.78	15	1.38	31	30.62	1.01	0.04
<b>Respiratory system</b>	9	0.47*	43	0.75	55	1.20	71	1.30*	178	176.79	1.01	0.13
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	1.53	0.00	-0.16
Larynx	1	1.22	1	0.45	1	0.65	4	2.82	7	6.01	1.17	0.11
Lung, bronchus	8	0.44*	42	0.77	54	1.24	67	1.27	171	168.84	1.01	0.23
<b>Female breast</b>	36	0.84	125	1.04	95	1.09	116	1.21*	372	345.84	1.08	2.83
<b>Female genital system</b>	18	0.84	11	0.19*	7	0.18*	11	0.28*	47	157.97	0.30*	-11.99
Cervix uteri	3	1.20	1	0.16*	0	0.00	2	0.67	6	15.24	0.39*	-1.00
Corpus uteri	12	1.00	8	0.25*	5	0.23*	1	0.05*	26	86.49	0.30*	-6.54
Ovary	1	0.17*	1	0.06*	1	0.09*	2	0.16*	5	45.61	0.11*	-4.39
Vagina	0	0.00	0	0.00	1	2.02	3	4.90	4	1.98	2.02	0.22
Vulva	1	1.78	1	0.60	0	0.00	3	1.50	5	5.61	0.89	-0.07
<b>Urinary system</b>	8	1.44	20	1.21	17	1.26	39	2.20*	84	53.44	1.57*	3.30
Urinary bladder	3	0.99	12	1.31	14	1.84*	26	2.50*	55	30.20	1.82*	2.68
Kidney parenchyma	4	1.90	7	1.13	3	0.62	9	1.52	23	19.10	1.20	0.42
Renal pelvis, other urinary	1	2.45	1	0.81	0	0.00	4	2.75	6	4.15	1.45	0.20
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	1.25	0.00	-0.14
<b>Bone, joints</b>	0	0.00	0	0.00	3	12.04*	1	3.51	4	1.00	3.99*	0.32
<b>Soft tissue including heart</b>	2	3.97	0	0.00	2	1.90	2	1.52	6	4.29	1.40	0.18
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.02
<b>Melanoma of skin</b>	7	2.41	7	0.86	6	1.05	6	0.93	26	23.26	1.12	0.30
<b>Eye, orbit</b>	3	13.34*	0	0.00	1	2.28	2	4.20	6	1.76	3.41*	0.46
<b>Brain, central nervous system</b>	1	0.64	3	0.68	4	1.24	4	1.11	12	12.75	0.94	-0.08
<b>Thyroid</b>	1	0.67	4	1.01	1	0.41	1	0.44	7	10.21	0.69	-0.35
<b>Lymphatic, hematopoietic</b>	11	1.30	68	2.69*	39	1.88*	35	1.26	153	82.32	1.86*	7.64
Hodgkin lymphoma	1	3.11	0	0.00	0	0.00	2	3.01	3	2.46	1.22	0.06
Non-Hodgkin lymphoma	5	1.18	14	1.09	8	0.76	18	1.27	45	41.87	1.07	0.34
Myeloma	2	1.38	3	0.70	4	1.12	6	1.26	15	14.08	1.07	0.10
Leukemia	3	1.22	51	7.03*	27	4.55*	9	1.09	90	23.91	3.76*	7.14
Acute lymphocytic	0	0.00	5	20.03*	0	0.00	0	0.00	5	0.75	6.69*	0.46
Chronic lymphocytic	0	0.00	2	0.70	2	0.83	1	0.31	5	9.49	0.53	-0.49
Acute non-lymphocytic	2	2.28	41	15.74*	21	9.88*	5	1.66	69	8.62	8.01*	6.52
Chronic myeloid	1	2.85	1	1.00	2	2.56	1	0.93	5	3.20	1.56	0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.2.6:** Risk of subsequent primary cancers after cancer of the ovary, females, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	75	0.63*	197	0.78*	114	0.98	55	0.96	441	544.97	0.81*	-34.87
All excluding same site	65	0.61*	191	0.85*	108	1.03	55	1.05	419	488.89	0.86*	-23.44
<b>Buccal cavity, pharynx</b>	1	0.51	4	0.99	2	1.11	1	1.11	8	8.73	0.92	-0.24
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-0.28
Tongue	0	0.00	3	3.43	0	0.00	0	0.00	3	1.89	1.59	0.37
Salivary gland	1	4.46	0	0.00	0	0.00	0	0.00	1	1.05	0.95	-0.02
Mouth	0	0.00	0	0.00	2	2.91	1	2.83	3	3.26	0.92	-0.09
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.51	0.00	-0.17
Oropharynx	0	0.00	1	11.20	0	0.00	0	0.00	1	0.18	5.54	0.27
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.15
<b>Digestive system</b>	23	0.70	51	0.72*	40	1.13	21	1.12	135	158.51	0.85	-7.88
Esophagus	1	1.25	1	0.59	1	1.24	0	0.00	3	3.73	0.80	-0.25
Stomach	0	0.00	6	1.04	1	0.34	2	1.28	9	12.92	0.70	-1.31
Small intestine	2	5.02	1	1.15	0	0.00	1	4.62	4	1.90	2.11	0.71
Colon	13	0.77	23	0.63*	21	1.12	8	0.79	65	82.58	0.79	-5.89
Rectum, rectosigmoid junction	2	0.41	10	0.97	7	1.45	2	0.85	21	22.40	0.94	-0.47
Rectum	2	0.62	3	0.44	5	1.56	1	0.62	11	14.85	0.74	-1.29
Anus, anal canal	0	0.00	0	0.00	1	2.91	1	5.70	2	1.63	1.23	0.12
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	3.20	0.00	-1.07
Gallbladder	1	1.25	1	0.60	0	0.00	1	2.49	3	3.67	0.82	-0.23
Bile ducts, other biliary	0	0.00	3	1.82	1	1.14	1	1.96	5	3.77	1.33	0.41
Pancreas	2	0.46	6	0.64	8	1.72	5	2.01	21	20.84	1.01	0.05
<b>Respiratory system</b>	5	0.33*	17	0.54*	14	1.06	7	1.27	43	65.49	0.66*	-7.54
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.26
Larynx	1	2.70	1	1.36	0	0.00	0	0.00	2	1.48	1.35	0.17
Lung, bronchus	4	0.28*	16	0.52*	14	1.10	7	1.32	41	63.04	0.65*	-7.39
<b>Female breast</b>	21	0.70	53	0.84	36	1.31	16	1.25	126	133.26	0.95	-2.44
<b>Female genital system</b>	10	0.76	6	0.23*	6	0.54	0	0.00*	22	56.08	0.39*	-11.43
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	4.84	0.00*	-1.62
Corpus uteri	8	1.21	4	0.30*	1	0.19	0	0.00	13	27.00	0.48*	-4.69
Ovary	1	0.25	0	0.00*	1	0.28	0	0.00	2	17.42	0.11*	-5.17
Vagina	1	3.99	0	0.00	0	0.00	0	0.00	1	1.18	0.85	-0.06
Vulva	0	0.00	1	0.56	4	4.35*	0	0.00	5	4.05	1.23	0.32
<b>Urinary system</b>	4	0.63	12	0.88	5	0.78	1	0.30	22	29.67	0.74	-2.57
Urinary bladder	0	0.00*	9	1.06	3	0.72	0	0.00	12	18.74	0.64	-2.26
Kidney parenchyma	4	2.20	3	0.77	2	1.16	1	1.23	10	8.24	1.21	0.59
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	2.68	0.00	-0.90
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.29
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.16
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	2.05	1	3.85	2	2.19	0.91	-0.06
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.12
<b>Melanoma of skin</b>	1	0.54	4	1.01	0	0.00	2	1.99	7	8.63	0.81	-0.55
<b>Eye, orbit</b>	0	0.00	1	2.94	0	0.00	0	0.00	1	0.73	1.36	0.09
<b>Brain, central nervous system</b>	1	0.88	2	0.85	0	0.00	0	0.00	3	4.86	0.62	-0.62
<b>Thyroid</b>	0	0.00	1	0.74	0	0.00	1	4.11	2	2.82	0.71	-0.27
<b>Lymphatic, hematopoietic</b>	9	0.88	39	1.78*	10	0.95	4	0.74	62	48.10	1.29	4.66
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.07	0.00	-0.36
Non-Hodgkin lymphoma	5	1.05	12	1.16	5	1.03	1	0.41	23	22.37	1.03	0.21
Myeloma	2	1.11	2	0.52	0	0.00	1	1.15	5	8.34	0.60	-1.12
Leukemia	2	0.59	25	3.44*	5	1.37	2	0.98	34	16.31	2.08*	5.93
Acute lymphocytic	0	0.00	0	0.00	1	11.32	0	0.00	1	0.39	2.55	0.20
Chronic lymphocytic	1	0.75	2	0.70	2	1.42	1	1.30	6	6.37	0.94	-0.12
Acute non-lymphocytic	1	0.86	19	7.49*	1	0.79	0	0.00	21	5.65	3.72*	5.15
Chronic myeloid	0	0.00	3	3.11	1	2.00	1	3.40	5	2.20	2.27	0.94

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Ovary Females, Radiotherapy

**Table 9.2.7:** Risk of subsequent primary cancers after cancer of the ovary, females, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	3,462		2,628		1,499		1,117		3,462			
<b>Person-years in interval</b>	2,501		7,483		6,458		9,881		26,323			
<b>All subsequent cancers</b>	28	1.43	79	1.33*	74	1.25	167	1.40*	348	257.12	1.35*	34.52
All excluding same site	26	1.61*	74	1.49*	71	1.40*	163	1.56*	334	220.67	1.51*	43.05
<b>Buccal cavity, pharynx</b>	0	0.00	3	2.41	3	2.55	3	1.44	9	4.91	1.83	1.55
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
Tongue	0	0.00	2	7.57	1	3.85	2	4.30	5	1.08	4.64*	1.49
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.51	0.00	-0.20
Mouth	0	0.00	1	2.35	2	5.03	1	1.42	4	1.67	2.40	0.89
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.14
<b>Digestive system</b>	8	1.97	14	1.15	14	1.13	46	1.83*	82	53.79	1.52*	10.72
Esophagus	0	0.00	0	0.00	0	0.00	2	2.79	2	1.53	1.30	0.18
Stomach	1	2.98	2	2.06	2	2.14	4	2.24	9	4.03	2.23*	1.89
Small intestine	1	18.69	0	0.00	0	0.00	1	2.50	2	0.79	2.54	0.46
Colon	5	2.54	7	1.18	7	1.15	25	1.99*	44	26.54	1.66*	6.63
Rectum, rectosigmoid junction	0	0.00	2	0.91	4	1.86	5	1.27	11	9.03	1.22	0.75
Rectum	0	0.00	1	0.71	4	2.91	4	1.54	9	5.85	1.54	1.19
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	2.70	1	0.78	1.28	0.08
Liver	0	0.00	0	0.00	0	0.00	2	3.40	2	1.14	1.76	0.33
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.21	0.00	-0.46
Bile ducts, other biliary	1	13.43	0	0.00	0	0.00	0	0.00	1	1.12	0.89	-0.05
Pancreas	0	0.00	3	1.99	1	0.63	4	1.19	8	6.94	1.15	0.40
<b>Respiratory system</b>	1	0.46	6	0.85	9	1.16	19	1.09	35	34.44	1.02	0.21
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.13
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.22	0.00	-0.47
Lung, bronchus	1	0.49	6	0.90	9	1.22	19	1.13	35	32.77	1.07	0.85
<b>Female breast</b>	11	1.89	30	1.69*	27	1.52*	40	1.13	108	76.53	1.41*	11.96
<b>Female genital system</b>	2	0.59	5	0.51	3	0.35	4	0.27*	14	36.45	0.38*	-8.53
Cervix uteri	0	0.00	0	0.00	0	0.00	1	0.68	1	4.40	0.23	-1.29
Corpus uteri	2	1.08	3	0.57	2	0.45	1	0.13*	8	19.12	0.42*	-4.22
Ovary	0	0.00	1	0.39	0	0.00	0	0.00*	1	10.38	0.10*	-3.56
Vagina	0	0.00	0	0.00	1	9.11	1	4.86	2	0.47	4.28	0.58
Vulva	0	0.00	1	3.37	0	0.00	1	1.51	2	1.36	1.47	0.24
<b>Urinary system</b>	2	2.48	4	1.61	4	1.54	18	3.15*	28	11.60	2.41*	6.23
Urinary bladder	1	2.11	4	2.75	2	1.33	12	3.64*	19	6.73	2.82*	4.66
Kidney parenchyma	1	3.81	0	0.00	2	2.28	6	3.04*	9	3.93	2.29*	1.93
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.95	0.00	-0.36
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
<b>Bone, joints</b>	0	0.00	0	0.00	1	16.88	1	9.35	2	0.25	7.95	0.66
<b>Soft tissue including heart</b>	0	0.00	0	0.00	3	13.18*	2	4.28	5	1.00	4.98*	1.52
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.03
<b>Melanoma of skin</b>	2	5.16	1	0.79	1	0.77	3	1.15	7	5.54	1.26	0.56
<b>Eye, orbit</b>	1	27.24	0	0.00	0	0.00	0	0.00	1	0.41	2.44	0.22
<b>Brain, central nervous system</b>	1	4.28	1	1.40	0	0.00	2	1.58	4	2.90	1.38	0.42
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	3	2.64	3	2.74	1.09	0.10
<b>Lymphatic, hematopoietic</b>	0	0.00	12	2.99*	9	2.15	16	1.77*	37	18.54	2.00*	7.01
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	3.64	1	0.71	1.42	0.11
Non-Hodgkin lymphoma	0	0.00	1	0.54	3	1.49	8	1.75	12	9.07	1.32	1.11
Myeloma	0	0.00	0	0.00	0	0.00	2	1.35	2	3.08	0.65	-0.41
Leukemia	0	0.00	11	8.63*	6	4.65*	5	1.85	22	5.69	3.87*	6.20
Acute lymphocytic	0	0.00	1	24.72	0	0.00	1	11.64	2	0.18	10.98*	0.69
Chronic lymphocytic	0	0.00	0	0.00	2	3.98	2	1.91	4	2.20	1.82	0.68
Acute non-lymphocytic	0	0.00	10	22.08*	4	8.77*	1	1.03	15	2.03	7.39*	4.93
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.30

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.2.8:** Risk of subsequent primary cancers after cancer of the ovary, females, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	236	0.93	635	0.96	501	1.16*	495	1.12*	1,867	1,787.71	1.04	4.36
All excluding same site	194	0.88	594	1.04	482	1.28*	487	1.25*	1,757	1,555.05	1.13*	11.11
<b>Buccal cavity, pharynx</b>	3	0.64	11	0.92	13	1.71	6	0.81	33	31.63	1.04	0.08
Lip	0	0.00	0	0.00	0	0.00	1	1.92	1	2.01	0.50	-0.06
Tongue	2	1.93	6	2.26	3	1.76	0	0.00	11	7.07	1.55	0.22
Salivary gland	1	1.95	0	0.00	0	0.00	2	2.28	3	3.60	0.83	-0.03
Mouth	0	0.00	2	0.50	5	1.97	2	0.80	9	10.64	0.85	-0.09
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.40	0.00	-0.08
Tonsil	0	0.00	1	0.90	4	5.90*	0	0.00	5	2.84	1.76	0.12
Oropharynx	0	0.00	1	3.28	0	0.00	0	0.00	1	0.79	1.26	0.01
Hypopharynx	0	0.00	1	1.20	1	1.93	0	0.00	2	2.17	0.92	-0.01
<b>Digestive system</b>	60	1.11	125	0.92	131	1.46*	141	1.49*	457	374.82	1.22*	4.52
Esophagus	1	0.66	1	0.26	6	2.39	0	0.00	8	10.56	0.76	-0.14
Stomach	2	0.48	8	0.78	6	0.90	12	1.75	28	27.91	1.00	0.00
Small intestine	3	3.77	4	1.91	3	2.13	2	1.28	12	5.86	2.05*	0.34
Colon	32	1.20	64	0.96	63	1.42*	65	1.37*	224	185.32	1.21*	2.13
Rectum, rectosigmoid junction	8	0.90	26	1.17	27	1.89*	29	2.02*	90	59.88	1.50*	1.66
Rectum	5	0.86	15	1.03	20	2.13*	17	1.78*	57	39.34	1.45*	0.97
Anus, anal canal	2	2.56	2	0.98	3	2.23	2	1.45	9	5.55	1.62	0.19
Liver	0	0.00	0	0.00	1	0.48	2	0.87	3	8.62	0.35	-0.31
Gallbladder	1	0.81	1	0.33	2	1.04	2	1.04	6	8.08	0.74	-0.11
Bile ducts, other biliary	1	0.88	4	1.36	3	1.49	7	3.03*	15	8.41	1.78	0.36
Pancreas	7	1.00	13	0.73	13	1.10	19	1.49	52	49.21	1.06	0.15
<b>Respiratory system</b>	16	0.48*	64	0.72*	74	1.25	81	1.27*	235	244.58	0.96	-0.53
Nose, nasal cavity, ear	0	0.00	0	0.00	1	1.75	0	0.00	1	2.38	0.42	-0.08
Larynx	2	1.72	2	0.67	1	0.53	6	3.30*	11	7.86	1.40	0.17
Lung, bronchus	14	0.44*	62	0.74*	72	1.28	75	1.22	223	233.72	0.95	-0.59
<b>Female breast</b>	61	0.80	209	1.04	148	1.13	144	1.11	562	538.26	1.04	1.31
<b>Female genital system</b>	42	1.20	41	0.46*	19	0.34*	8	0.15*	110	232.66	0.47*	-6.75
Cervix uteri	4	0.91	3	0.27*	1	0.15*	1	0.19	9	27.58	0.33*	-1.02
Corpus uteri	29	1.62*	14	0.31*	4	0.14*	1	0.04*	48	117.49	0.41*	-3.82
Ovary	6	0.59	17	0.65	9	0.54	2	0.12*	34	69.53	0.49*	-1.96
Vagina	1	2.11	4	3.35	1	1.30	2	2.59	8	3.21	2.49*	0.26
Vulva	1	0.72	1	0.28	4	1.68	2	0.78	8	9.91	0.81	-0.10
<b>Urinary system</b>	12	1.04	32	1.07	24	1.21	34	1.59*	102	82.66	1.23*	1.06
Urinary bladder	2	0.30	20	1.17	16	1.40	20	1.62	58	47.58	1.22	0.57
Kidney parenchyma	9	2.29*	11	1.06	6	0.87	7	0.95	33	28.62	1.15	0.24
Renal pelvis, other urinary	1	1.07	1	0.43	2	1.30	7	4.28*	11	6.46	1.70	0.25
Ureter	0	0.00	0	0.00	0	0.00	2	4.04	2	1.96	1.02	0.00
<b>Bone, joints</b>	0	0.00	0	0.00	2	4.63	0	0.00	2	1.78	1.12	0.01
<b>Soft tissue including heart</b>	2	1.95	1	0.37	3	1.70	3	1.66	9	7.30	1.23	0.09
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.03
<b>Melanoma of skin</b>	9	1.59	13	0.83	6	0.58	11	1.09	39	41.84	0.93	-0.16
<b>Eye, orbit</b>	2	5.08	1	1.01	1	1.60	5	8.15*	9	2.63	3.43*	0.35
<b>Brain, central nervous system</b>	1	0.36	5	0.68	6	1.28	4	0.88	16	19.34	0.83	-0.18
<b>Thyroid</b>	4	1.37	10	1.22	9	1.75	6	1.32	29	20.77	1.40	0.45
<b>Lymphatic, hematopoietic</b>	20	1.07	104	2.16*	53	1.66*	39	1.14	216	132.95	1.62*	4.57
Hodgkin lymphoma	1	1.35	0	0.00	1	0.82	2	1.91	4	4.97	0.80	-0.05
Non-Hodgkin lymphoma	10	1.11	25	1.05	13	0.82	17	0.99	65	65.91	0.99	-0.05
Myeloma	4	1.28	5	0.63	4	0.77	6	1.07	19	21.88	0.87	-0.16
Leukemia	5	0.87	74	5.07*	35	3.63*	14	1.37	128	40.19	3.18*	4.83
Acute lymphocytic	0	0.00	4	7.80*	2	5.95	0	0.00	6	1.37	4.39*	0.26
Chronic lymphocytic	1	0.46	4	0.73	2	0.55	2	0.52	9	15.14	0.59	-0.34
Acute non-lymphocytic	3	1.46	59	11.14*	24	6.86*	8	2.14	94	14.59	6.44*	4.37
Chronic myeloid	1	1.24	4	1.95	5	3.70*	2	1.43	12	5.61	2.14*	0.35

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Ovary

## Females, Long-term Follow-up, Radiotherapy

**Table 9.2.9:** Risk of subsequent primary cancers after cancer of the ovary, females, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	3,462		1,117		770		510		3,462			
<b>Person-years in interval</b>	16,442		4,722		3,187		1,972		26,323			
<b>All subsequent cancers</b>	181	1.31*	74	1.45*	50	1.26	43	1.53*	348	257.12	1.35*	34.52
All excluding same site	171	1.47*	73	1.64*	49	1.41*	41	1.64*	334	220.67	1.51*	43.05
<b>Buccal cavity, pharynx</b>	6	2.12	1	1.07	2	2.93	0	0.00	9	4.91	1.83	1.55
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
Tongue	3	4.91	1	4.77	1	6.48	0	0.00	5	1.08	4.64*	1.49
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.51	0.00	-0.20
Mouth	3	3.11	0	0.00	1	4.37	0	0.00	4	1.67	2.40	0.89
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.14
<b>Digestive system</b>	36	1.26	19	1.78*	15	1.80*	12	1.96*	82	53.79	1.52*	10.72
Esophagus	0	0.00	0	0.00	2	8.49	0	0.00	2	1.53	1.30	0.18
Stomach	5	2.23	2	2.58	1	1.69	1	2.39	9	4.03	2.23*	1.89
Small intestine	1	2.58	1	6.37	0	0.00	0	0.00	2	0.79	2.54	0.46
Colon	19	1.36	11	2.06*	6	1.45	8	2.61*	44	26.54	1.66*	6.63
Rectum, rectosigmoid junction	6	1.18	2	1.14	2	1.56	1	1.12	11	9.03	1.22	0.75
Rectum	5	1.53	1	0.88	2	2.36	1	1.64	9	5.85	1.54	1.19
Anus, anal canal	0	0.00	1	6.34	0	0.00	0	0.00	1	0.78	1.28	0.08
Liver	0	0.00	2	8.89	0	0.00	0	0.00	2	1.14	1.76	0.33
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.21	0.00	-0.46
Bile ducts, other biliary	1	1.87	0	0.00	0	0.00	0	0.00	1	1.12	0.89	-0.05
Pancreas	4	1.11	0	0.00	3	2.68	1	1.20	8	6.94	1.15	0.40
<b>Respiratory system</b>	16	0.94	12	1.68	6	1.02	1	0.23	35	34.44	1.02	0.21
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.13
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.22	0.00	-0.47
Lung, bronchus	16	1.00	12	1.76	6	1.06	1	0.24	35	32.77	1.07	0.85
<b>Female breast</b>	68	1.65*	14	0.90	14	1.20	12	1.49	108	76.53	1.41*	11.96
<b>Female genital system</b>	10	0.46*	1	0.15*	1	0.21	2	0.63	14	36.45	0.38*	-8.53
Cervix uteri	0	0.00	0	0.00	0	0.00	1	3.93	1	4.40	0.23	-1.29
Corpus uteri	7	0.60	0	0.00	0	0.00	1	0.61	8	19.12	0.42*	-4.22
Ovary	1	0.17*	0	0.00	0	0.00	0	0.00	1	10.38	0.10*	-3.56
Vagina	1	3.81	0	0.00	1	14.91	0	0.00	2	0.47	4.28	0.58
Vulva	1	1.44	1	3.68	0	0.00	0	0.00	2	1.36	1.47	0.24
<b>Urinary system</b>	10	1.70	9	3.81*	4	2.08	5	3.51*	28	11.60	2.41*	6.23
Urinary bladder	7	2.04	7	5.13*	3	2.72	2	2.42	19	6.73	2.82*	4.66
Kidney parenchyma	3	1.53	2	2.46	1	1.50	3	6.14*	9	3.93	2.29*	1.93
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.95	0.00	-0.36
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
<b>Bone, joints</b>	1	6.92	1	21.49	0	0.00	0	0.00	2	0.25	7.95	0.66
<b>Soft tissue including heart</b>	3	5.60*	1	5.13	1	6.29	0	0.00	5	1.00	4.98*	1.52
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.03
<b>Melanoma of skin</b>	4	1.36	1	0.91	2	2.32	0	0.00	7	5.54	1.26	0.56
<b>Eye, orbit</b>	1	4.16	0	0.00	0	0.00	0	0.00	1	0.41	2.44	0.22
<b>Brain, central nervous system</b>	2	1.22	1	1.77	0	0.00	1	3.54	4	2.90	1.38	0.42
<b>Thyroid</b>	0	0.00	0	0.00	1	2.67	2	8.07	3	2.74	1.09	0.10
<b>Lymphatic, hematopoietic</b>	21	2.21*	8	2.13	2	0.66	6	2.68	37	18.54	2.00*	7.01
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	17.71	1	0.71	1.42	0.11
Non-Hodgkin lymphoma	4	0.89	5	2.68	2	1.29	1	0.86	12	9.07	1.32	1.11
Myeloma	0	0.00	1	1.61	0	0.00	1	2.77	2	3.08	0.65	-0.41
Leukemia	17	5.69*	2	1.75	0	0.00	3	4.58	22	5.69	3.87*	6.20
Acute lymphocytic	1	10.39	1	25.73	0	0.00	0	0.00	2	0.18	10.98*	0.69
Chronic lymphocytic	2	1.74	0	0.00	0	0.00	2	8.23	4	2.20	1.82	0.68
Acute non-lymphocytic	14	13.25*	0	0.00	0	0.00	1	3.99	15	2.03	7.39*	4.93
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.30

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 9.2.10:** Risk of subsequent primary cancers after cancer of the ovary, females, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,372	1.02	271	1.09	166	1.24*	58	0.99	1,867	1,787.71	1.04	4.36
All excluding same site	1,270	1.09*	267	1.22*	163	1.38*	57	1.10	1,757	1,555.05	1.13*	11.11
<b>Buccal cavity, pharynx</b>	27	1.11	4	0.94	2	0.90	0	0.00	33	31.63	1.04	0.08
Lip	0	0.00	0	0.00	1	6.23	0	0.00	1	2.01	0.50	-0.06
Tongue	11	2.03*	0	0.00	0	0.00	0	0.00	11	7.07	1.55	0.22
Salivary gland	1	0.37	2	4.05	0	0.00	0	0.00	3	3.60	0.83	-0.03
Mouth	7	0.86	1	0.69	1	1.33	0	0.00	9	10.64	0.85	-0.09
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.40	0.00	-0.08
Tonsil	5	2.24	0	0.00	0	0.00	0	0.00	5	2.84	1.76	0.12
Oropharynx	1	1.62	0	0.00	0	0.00	0	0.00	1	0.79	1.26	0.01
Hypopharynx	2	1.19	0	0.00	0	0.00	0	0.00	2	2.17	0.92	-0.01
<b>Digestive system</b>	316	1.13*	70	1.32*	53	1.84*	18	1.40	457	374.82	1.22*	4.52
Esophagus	8	1.01	0	0.00	0	0.00	0	0.00	8	10.56	0.76	-0.14
Stomach	16	0.76	5	1.29	6	2.92*	1	1.11	28	27.91	1.00	0.00
Small intestine	10	2.32*	2	2.35	0	0.00	0	0.00	12	5.86	2.05*	0.34
Colon	159	1.15	37	1.40	20	1.39	8	1.24	224	185.32	1.21*	2.13
Rectum, rectosigmoid junction	61	1.34*	9	1.10	16	3.74*	4	2.15	90	59.88	1.50*	1.66
Rectum	40	1.34	5	0.92	10	3.48*	2	1.57	57	39.34	1.45*	0.97
Anus, anal canal	7	1.68	1	1.29	1	2.37	0	0.00	9	5.55	1.62	0.19
Liver	1	0.16*	0	0.00	1	1.40	1	2.95	3	8.62	0.35	-0.31
Gallbladder	4	0.65	1	0.91	0	0.00	1	4.13	6	8.08	0.74	-0.11
Bile ducts, other biliary	8	1.31	5	3.99*	2	2.78	0	0.00	15	8.41	1.78	0.36
Pancreas	33	0.90	10	1.41	6	1.54	3	1.71	52	49.21	1.06	0.15
<b>Respiratory system</b>	154	0.85*	46	1.30	26	1.32	9	1.02	235	244.58	0.96	-0.53
Nose, nasal cavity, ear	1	0.56	0	0.00	0	0.00	0	0.00	1	2.38	0.42	-0.08
Larynx	5	0.83	4	3.78*	2	3.73	0	0.00	11	7.86	1.40	0.17
Lung, bronchus	148	0.86	42	1.24	24	1.27	9	1.06	223	233.72	0.95	-0.59
<b>Female breast</b>	418	1.02	80	1.08	49	1.25	15	0.89	562	538.26	1.04	1.31
<b>Female genital system</b>	102	0.57*	4	0.13*	3	0.19*	1	0.15*	110	232.66	0.47*	-6.75
Cervix uteri	8	0.36*	1	0.30	0	0.00	0	0.00	9	27.58	0.33*	-1.02
Corpus uteri	47	0.52*	1	0.07*	0	0.00*	0	0.00	48	117.49	0.41*	-3.82
Ovary	32	0.60*	1	0.11*	1	0.20	0	0.00	34	69.53	0.49*	-1.96
Vagina	6	2.46	0	0.00	1	4.35	1	9.98	8	3.21	2.49*	0.26
Vulva	6	0.82	1	0.70	1	1.26	0	0.00	8	9.91	0.81	-0.10
<b>Urinary system</b>	68	1.11	17	1.43	15	2.29*	2	0.68	102	82.66	1.23*	1.06
Urinary bladder	38	1.08	9	1.31	11	2.91*	0	0.00	58	47.58	1.22	0.57
Kidney parenchyma	26	1.22	4	0.97	2	0.88	1	0.99	33	28.62	1.15	0.24
Renal pelvis, other urinary	4	0.83	4	4.39*	2	4.00	1	4.42	11	6.46	1.70	0.25
Ureter	0	0.00	1	3.62	1	6.62	0	0.00	2	1.96	1.02	0.00
<b>Bone, joints</b>	2	1.45	0	0.00	0	0.00	0	0.00	2	1.78	1.12	0.01
<b>Soft tissue including heart</b>	6	1.09	2	1.97	0	0.00	1	4.16	9	7.30	1.23	0.09
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.03
<b>Melanoma of skin</b>	28	0.88	10	1.75	1	0.33	0	0.00	39	41.84	0.93	-0.16
<b>Eye, orbit</b>	4	1.99	2	5.70	2	10.80*	1	12.93	9	2.63	3.43*	0.35
<b>Brain, central nervous system</b>	12	0.81	2	0.76	1	0.74	1	1.74	16	19.34	0.83	-0.18
<b>Thyroid</b>	23	1.42	4	1.51	2	1.50	0	0.00	29	20.77	1.40	0.45
<b>Lymphatic, hematopoietic</b>	177	1.79*	24	1.26	6	0.58	9	1.94	216	132.95	1.62*	4.57
Hodgkin lymphoma	2	0.51	2	3.22	0	0.00	0	0.00	4	4.97	0.80	-0.05
Non-Hodgkin lymphoma	48	0.99	8	0.84	3	0.57	6	2.50	65	65.91	0.99	-0.05
Myeloma	13	0.80	3	0.96	2	1.17	1	1.32	19	21.88	0.87	-0.16
Leukemia	114	3.80*	11	1.92	1	0.32	2	1.46	128	40.19	3.18*	4.83
Acute lymphocytic	6	5.76*	0	0.00	0	0.00	0	0.00	6	1.37	4.39*	0.26
Chronic lymphocytic	7	0.62	2	0.92	0	0.00	0	0.00	9	15.14	0.59	-0.34
Acute non-lymphocytic	86	7.93*	6	2.89*	1	0.87	1	1.91	94	14.59	6.44*	4.37
Chronic myeloid	10	2.37*	2	2.52	0	0.00	0	0.00	12	5.61	2.14*	0.35

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Chapter 10

## New Malignancies Following Cancer of the Male Genital Tract

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### Synopsis

The risk of subsequent primary cancer was evaluated in more than 308,000 men diagnosed between 1973 and 2000 with cancer of the prostate, testis, or penis. The overall risk for new cancers was significantly increased among survivors of testis cancer ( $O/E=1.62$ ,  $O=803$ ,  $EAR=21$  per 10,000 person-years), but not of penile cancer ( $O/E=1.12$ ,  $O=293$ ,  $EAR=26$ ). The overall risk for new cancers was significantly decreased among survivors of prostate cancer ( $O/E=0.90$ ,<sup>1</sup>  $O=27,112$ ). Prostate cancer was associated with excess melanoma and subsequent cancers of the small intestine, soft tissue, bladder, thyroid, and thymus. The risk of new malignancies varied by age at prostate cancer diagnosis, with significant excesses seen only among younger men (ages <50 years). Treatment for prostate cancer with radiotherapy may have contributed to the observed excess of certain solid tumors occurring within the abdominal and pelvic fields, particularly bladder cancer. Risks for subsequent acute non-lymphocytic leukemia (ANLL) and cancers of the rectum, pancreas, testis, bladder, and kidney were significantly increased following testis cancer. Men with seminoma of the testis had substantially higher increased risks of new malignancies, excluding contralateral testis, than men with non-seminoma. Radiation treatment for testis cancer appeared to contribute to the increased risk for certain solid tumors, while chemotherapy and radiotherapy appeared largely responsible for the elevated risk of ANLL. Smoking may have contributed to the elevated risks for subsequent buccal cavity and lung cancers among patients with penile cancer, although alcohol consumption and infection with human papillomavirus may also have played a role in new cancers of the buccal cavity.

### Prostate Cancer

Prostate carcinoma, the most common malignancy among American men, constitutes 33% of all new cancer cases and 10% of all cancer deaths among males (Jemal et al, 2005). The introduction of prostate-specific antigen (PSA) screening in the late 1980s was associated with a

doubling of the observed incidence of prostate cancer; approximately 75% of prostate cancer cases are now diagnosed while the disease is still clinically organ-confined, whereas only 25% of prostate cancers were localized prior to PSA screening (Catalona et al, 1993). The incidence of prostate cancer varies with race, with low rates among Asians and the highest rates among blacks, who typically present with more advanced disease, and may have a poorer prognosis within each stage category, than white patients (Pienta et al, 1995). Overall, the 5- and 10-year relative survival rates are 99.3% and 88.7%, respectively. Therapy for prostate cancer is not standardized for any stage, and treatment decisions are based on tumor stage and grade combined with an assessment of patient age and performance status (Bahnsen et al, 2000). Approximately 26% of patients are treated initially with radiotherapy to a pelvic field encompassing a portion of the rectum and dome of the bladder. More recent radiation strategies, including interstitial brachytherapy and 3-dimensional conformational radiotherapy, produce lower radiation doses to adjacent normal tissue. Radical prostatectomy is frequently the initial therapy in younger patients, who may present with higher-grade tumors. Hormonal therapy and chemotherapy are generally reserved for patients with metastatic disease.

Established risk factors for prostate cancer include age, family history, and ethnicity (Key, 1995). Diet, including fat intake, is also associated with prostate cancer risk (Giovannucci et al, 1993), while the roles of smoking, body weight, and vasectomy remain uncertain (Key, 1995).

### Results and Discussion

We observed a significant overall deficit of subsequent primary cancers, excluding subsequent prostate cancer, among 292,029 patients at risk ( $O/E=0.90$ ,  $O=27,112$ , 95%  $CI=0.89-0.91$ ). The cumulative incidence of developing any second cancer following prostate cancer, adjusted for the competing risk of death due to other causes, was 15.2% at 25 years (95%  $CI=15.0\%-15.4\%$ ). The deficit in relative risk ( $O/E$ ) of subsequent cancers was observed only for whites and persisted throughout 20 years of follow-up. In contrast, no significant overall deficit or excess was observed among blacks ( $O/E=1.00$

<sup>1</sup>Observed-to-expected ratios for prostate cancer exclude subsequent primary prostate cancers.

Abbreviations:  $O$ =observed number of subsequent (2nd, 3rd, etc.) primary cancers;  $O/E$ =ratio of observed to expected cancers;  $CI$ =confidence interval;  $PYR$ =person-years at risk;  $EAR$ =excess absolute risk (excess cancers per 10,000 person-years, calculated as  $[(O-E)/PYR] \times 10,000$ ).

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excluding subsequent prostate cancers,  $O=2,817$ ). Significantly elevated risks were observed for subsequent cancers of the small intestine, soft tissue, bladder, thyroid, and thymus, as well as for melanoma. Significant deficits in risk were seen for cancers of the buccal cavity (specifically tongue, tonsil, mouth, and pharynx), digestive system (particularly esophagus, stomach, colon, rectum, liver, and gallbladder), and respiratory system (larynx and lung), as well as for chronic lymphocytic leukemia and Kaposi sarcoma. A significantly high overall risk for new malignancies (excluding prostate cancer) was seen among men diagnosed with prostate cancer at a young age ( $O/E=1.30$ , ages <50 years). In contrast, those diagnosed at ages 50 to 59 years had no increase in cancer risk ( $O/E=0.95$ ), and significant deficits in risk were observed for all age groups older than 60 years. Other large surveys (Kleinerman et al, 1985; Osterlind et al, 1985; Levi et al, 1999), including a previous SEER survey (Brenner et al, 2000), have noted overall deficits in second cancers following prostate cancer, particularly at older ages, suggesting that medical surveillance may be reduced among older men diagnosed with prostate cancer.

Radiation treatment may contribute to the excess risk at certain sites. Increased risks for cancers of the bladder (53%) and rectum excluding rectosigmoid junction (37%) among 10-year survivors, and a 2-fold excess of cancers of the soft tissues among 5-year survivors, were observed for patients receiving radiation during their initial course of therapy. At these new cancer sites, risk increased with time since initial radiation, consistent with a radiogenic effect. In contrast, patients who did not receive radiation had significant deficits of subsequent bladder and rectal cancers after 10 years of observation. Similar patterns of subsequent bladder cancers (Neugut et al, 1997; Brenner et al, 2000) and rectal cancers (Brenner et al, 2000; Baxter et al, 2005) have been linked to radiotherapy in earlier surveys of prostate cancer in the SEER Program. A prior study also revealed that the risk of developing sarcoma was significantly higher (2-fold) after radiotherapy compared with surgery (Brenner et al, 2000). In addition, we observed a 31% increase in risk for acute myeloid leukemia among patients receiving radiation as part of their initial therapy, with elevated risk concentrated in the first 10 years of follow-up. A similar temporal pattern has been shown in previous studies linking excess leukemia to pelvic radiotherapy for cancers of the uterine corpus (Curtis et al, 1994) and cervix (Boice et al, 1988).

Among the excess malignancies occurring in men diagnosed with early-onset prostate cancer was pancreatic cancer, with a 2.6-fold increase in risk for men younger than 50 years, based on 6 cases. Among older patients, there were 4 cases in which prostate cancer was followed by both melanoma and pancreatic cancer. Genetic factors may have been involved, because this pattern of tumors has been described in some individuals with BRCA2 mutations (Breast Cancer Linkage Consortium, 1999). The risk for melanoma was most

pronounced in the first year of follow-up, suggesting the influence of increased medical surveillance.

The significant excess risks for cancers of the small intestine, thyroid, and thymus cancers after prostate cancer appear to be new findings. As more than 50% of small intestinal tumors were carcinoid, it is possible that hormonal factors were involved (Quaedvlieg et al, 2001; Thellenberg et al, 2003). In addition, an increased reciprocal risk for prostate cancer following an initial diagnosis of thyroid cancer ( $O/E=1.31$ ,  $O=257$ ) also points to shared hormonal or other risk factors. Genetic factors may have been involved, particularly because mutations in *RET* have been described in prostate cancer as well as thyroid cancer (Dawson et al, 1998).

## Testis Cancer

Testicular cancer is rare, accounting for only 1% of all incident cancers and 0.1% of all deaths in males (Jemal et al, 2005). It is the most common cancer in white men ages 20 to 35 years, but it occurs less frequently among blacks. The incidence, which is age-dependent, has been increasing since the mid-twentieth century, a trend related to birth cohort (McKiernan et al, 1999). Germ cell tumors are the most common histology and are categorized as seminoma (56%) or non-seminoma (44%). Treatment depends on histology and usually consists of surgery followed by radiotherapy for seminoma, or surgery followed by combination chemotherapy for non-seminoma. The 5- and 10-year relative survival rates (95.8% and 94.8%, respectively) improved dramatically following introduction of platinum-based combination chemotherapy in the late 1970s. During the 25-year period of this survey, most patients with seminoma were initially treated with radiation, and only a small percentage received chemotherapy as part of their initial treatment. In contrast, substantially more patients in the SEER cohort diagnosed with non-seminoma received chemotherapy during their initial treatment, and many likely had chemotherapy as part of their subsequent treatment, whereas only 3% received radiation alone as initial therapy.

Cryptorchidism and family history of testis cancer are well-established risk factors for testis cancer (Schottenfeld, 1996). A variety of perinatal factors, such as genitourinary anomalies (e.g., hydrocele, inguinal hernia, testicular atrophy), hormone use during pregnancy, and increased maternal body weight, as well as postnatal factors (e.g., higher socioeconomic status, infertility, late-age puberty, testicular trauma) have been related to testis cancer with variable levels of confirmation. Environmental endocrine modulators, particularly exposure to certain organochlorines, may increase risk by binding estrogen and androgen receptors, but definitive data are lacking.

## Results and Discussion

A total of 803 subsequent primary cancers were observed among 14,984 2-month survivors of testicular cancer



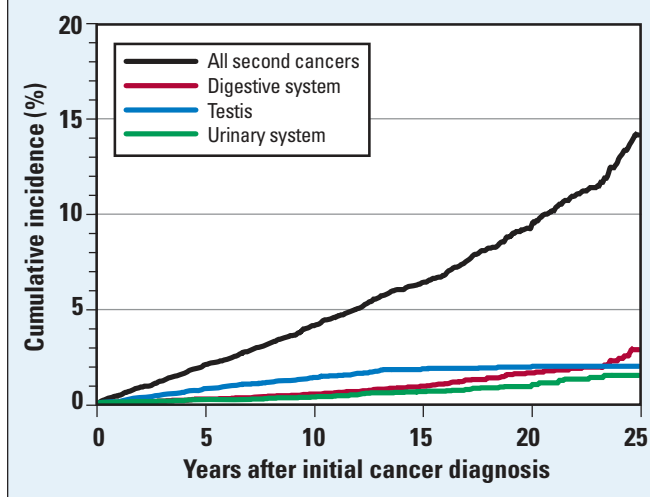
(O/E=1.62, O=803, 95% CI=1.51-1.74, EAR=21 per 10,000 person-years). The cumulative incidence of developing a second cancer following testis cancer was 14.1% at 25 years (95% CI=12.6%-15.7%), with new malignancies of the testis accounting for 1.9% of the incidence (Figure 10.1). Significantly elevated risks occurred only in whites, appeared early, and persisted throughout follow-up. Overall increases in relative risk were higher in patients diagnosed at ages younger than 35 years (O/E=2.80, EAR=21) as compared with older patients (O/E=1.31, EAR=23). Elevated risks were highest in the first year following diagnosis (O/E=2.58) but persisted among 20-year survivors (O/E=1.47, O=76).

Approximately 25% of the subsequent cancers were metachronous tumors in the contralateral testis. When subsequent primary testis cancers were excluded, however, the significant elevations in risk persisted, with an overall relative risk of 1.29 (95% CI=1.19-1.39, EAR=10). Significantly increased risks were seen for acute non-lymphocytic leukemia (ANLL) as well as cancers of the rectum, pancreas, testis, bladder, kidney, and thyroid. These findings are generally consistent with previous surveys of testicular cancer that revealed elevated risks for subsequent cancers of the stomach, rectum, pancreas, testis, bladder, and kidney, as well as for melanoma, non-Hodgkin lymphoma, and leukemia (Kaldor et al, 1987; Jacobsen et al, 1993; Moller et al, 1993; Travis et al, 1997, 2005).

Risk for all subsequent cancers combined (excluding testicular cancer) differed by histologic type of testicular cancer, with significant excesses following seminoma (O/E=1.33, O=458), but not non-seminoma (O/E=1.14, O=136). Among men with seminoma, significantly elevated risks were seen for ANLL and new malignancies of the esophagus, rectum, pancreas, and bladder, and for the combination of renal pelvis, ureters, and other urinary sites. Those with non-seminoma had increased risks for ANLL and cancers of the buccal cavity and kidney. In an international survey (Travis et al, 1997), the overall risks of second cancers were similar for seminoma (O/E=1.42) and non-seminoma (O/E=1.50), and both tumor types showed elevated risks for melanoma as well as cancers of the stomach, bladder, thyroid, and soft tissue. In this earlier study, however, there were substantial numbers of patients diagnosed in the prechemotherapy era (thus more likely to be treated with radiation) and greater numbers of long-term survivors, which may help explain the differences between studies.

There was a tendency for risks to increase with time for specific sites, with significant elevations observed for cancers of the rectum (excluding rectosigmoid junction) and pancreas among 15-year survivors and for bladder cancer among 20-year survivors. In contrast, significantly elevated risks for ANLL and renal cancer were confined to the first 10 years of follow-up. Among patients with seminoma who received initial radiotherapy, the excess risk for all subsequent solid tumors (excluding contralateral testis) increased significantly to 67% (O=128) among 15-year survivors. These late-onset

**Figure 10.1:** Cumulative incidence of developing a second cancer among patients with cancer of the testis, males, SEER 1973-2000.



risks affected several sites within or near the radiation field, including a 2-fold or greater increase in risks for cancers of the digestive tract (O=32), especially the stomach, rectum, and pancreas. Among 20-year survivors of seminoma treated initially with radiation, a 3-fold excess risk was seen for bladder cancer. The radiation-related risks for bladder cancer and other pelvic sites are consistent with findings from large international studies of cervical cancer implicating pelvic radiotherapy (Boice et al, 1985, 1988). For ANLL, the risks were increased up to 3-fold in both the irradiated and nonirradiated seminoma groups, with the 2 nonirradiated cases known to have received chemotherapy.

Among patients with non-seminoma, the overall risk for subsequent solid tumors (excluding testis) following radiation was not increased among 15- or 20-year survivors. Significant excesses for ANLL were confined to the first 10 years of follow-up and were likely related to chemotherapy, specifically alkylating agents and platinum-based chemotherapy (Travis et al, 2000). Increased risks of cancers of the buccal cavity, pancreas, and kidney occurred among men not known to have received radiotherapy.

Among patients initially diagnosed with a testicular germ cell tumor, new cancers arising in the contralateral testis were the most common new malignancies (O/E=13.44, EAR=12). In patients diagnosed with testis cancer at ages younger than 20 years, tumors of the contralateral testis accounted for about 90% of the excess subsequent cancer risk. The increased risk of contralateral testis cancer is well established (Bokemeyer et al, 1993; Fossà et al, 2005) and may reflect genetic susceptibility (Rapley et al, 2000).

## Penis Cancer

Cancer of the penis, while uncommon in the U.S., is of major significance worldwide, accounting for 10% to 20% of cancers in males in Asia, Africa, and South America.



More than 90% of reported penile cancers are squamous cell carcinomas. The wide population variation in incidence appears related to circumcision and hygienic practices, and preexisting inflammatory states, including phimosis (Brinton et al, 1991). The risk of penile cancer has been associated in some studies with smoking and psoralen-plus-ultraviolet-A therapy (Stern 1990; Tseng et al, 2001). It seems likely that human papillomavirus (HPV) is involved in many cases, although further work is needed to clarify the risk. The 5-year relative survival rate is 76.9%, decreasing to 63.5% at 10 years. Treatment is based on tumor extent at diagnosis; surgery is the mainstay, with radiation usually reserved for smaller lesions.

## Results and Discussion

There was a borderline significant increase in overall subsequent primary cancer risk among 1,808 men surviving at least 2 months following diagnosis of penile cancer (O/E=1.12, O=293, 95% CI=0.99-1.25, EAR=26). For these patients, the cumulative incidence of developing a second cancer following penis cancer was 19.7% at 20 years (95% CI=17.5%-22.1%). Only a small percentage of patients received radiotherapy as part of their initial treatment. The excess risk of subsequent cancers was most pronounced for cancers of the buccal cavity (especially the tongue) and respiratory tract, more than half of which were squamous cell cancers, and these risks remained elevated for up to 10 years after initial diagnosis. Cancers of the tonsil, tongue, and mouth constituted the majority of buccal cavity tumors. Smoking probably contributed to both buccal and respiratory cancers, while alcohol and HPV may have played a role in buccal cancers, particularly those of the tonsil and tongue (Herrero et al, 2003). Interestingly, there were no cases of subsequent anal cancer, which might have been expected from a field effect involving HPV infections of the anogenital epithelium (Peters et al, 1984).

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## Prostate Males

**Table 10.1.1:** Characteristics of patients with an initial cancer of the prostate gland, males, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	292,029	100.0	—	—	292,029	100.0
<b>Initial treatment</b>						
Any radiation	90,538	31.0	—	—	90,538	31.0
With surgery	23,513	8.1	—	—	23,513	8.1
Without surgery	67,025	23.0	—	—	67,025	23.0
No radiation	201,491	69.0	—	—	201,491	69.0
With surgery	132,941	45.5	—	—	132,941	45.5
Without surgery	68,550	23.5	—	—	68,550	23.5
<b>Race</b>						
White	245,375	84.0	—	—	245,375	84.0
Black	32,026	11.0	—	—	32,026	11.0
Other	12,490	4.3	—	—	12,490	4.3
Unknown	2,138	0.7	—	—	2,138	0.7
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	43	0.0	—	—	43	0.0
30–49	3,410	1.2	—	—	3,410	1.2
50–69	127,466	43.6	—	—	127,466	43.6
70–79	113,625	38.9	—	—	113,625	38.9
≥ 80	47,485	16.3	—	—	47,485	16.3
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	266,741	91.3	—	—	266,741	91.3
1st and 2nd cancers	23,570	8.1	—	—	23,570	8.1
1st, 2nd, and 3rd cancers	1,579	0.5	—	—	1,579	0.5
1st, 2nd, 3rd, and additional cancers	139	0.0	—	—	139	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	71.2	—	—	—	71.2	—
Median year of 1st cancer diagnosis	1992.0	—	—	—	1992.0	—
Median person-years at risk	4.4	—	—	—	4.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	93.1	—	—	—	93.1
1st, 2nd, and additional cancers	—	92.7	—	—	—	92.7
1st cancer only	—	5.4	—	—	—	5.4

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 10.1.2:** Risk of subsequent primary cancers after cancer of the prostate gland, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	292,029		259,830		135,663		41,363		292,029			
<b>Person-years in interval</b>	228,817		767,997		418,967		154,474		1,570,255			
<b>All subsequent cancers</b>	3,769	0.63*	12,624	0.59*	7,706	0.60*	3,057	0.59*	27,156	45,242.80	0.60*	-115.18
All excluding same site	3,765	0.96*	12,611	0.89*	7,690	0.90*	3,046	0.88*	27,112	30,057.55	0.90*	-18.76
<b>Buccal cavity, pharynx</b>	118	0.76*	421	0.80*	243	0.83*	85	0.78*	867	1,086.53	0.80*	-1.40
Lip	21	0.71	92	0.91	53	0.90	21	0.90	187	213.24	0.88	-0.17
Tongue	18	0.61*	71	0.71*	39	0.72*	16	0.83	144	202.24	0.71*	-0.37
Salivary gland	11	0.82	51	1.03	35	1.09	17	1.20	114	109.27	1.04	0.03
Mouth	36	0.99	77	0.64*	53	0.81	11	0.46*	177	247.19	0.72*	-0.45
Nasopharynx	3	0.56	9	0.51*	10	1.09	5	1.58	27	35.24	0.77	-0.05
Tonsil	10	0.72	40	0.87	14	0.60	6	0.78	70	91.14	0.77*	-0.13
Oropharynx	3	0.66	15	0.99	4	0.50	0	0.00	22	30.41	0.72	-0.05
Hypopharynx	14	0.79	51	0.87	24	0.79	7	0.68	96	116.56	0.82	-0.13
<b>Digestive system</b>	1,208	0.95	4,267	0.94*	2,474	0.89*	980	0.86*	8,929	9,762.64	0.91*	-5.31
Esophagus	78	1.00	232	0.84*	133	0.83*	53	0.85	496	575.62	0.86*	-0.51
Stomach	144	0.95	427	0.80*	247	0.77*	103	0.79*	921	1,135.58	0.81*	-1.37
Small intestine	25	1.46	74	1.19	54	1.40*	21	1.33	174	134.07	1.30*	0.25
Colon	513	0.93	1,994	0.99	1,115	0.89*	437	0.83*	4,059	4,349.55	0.93*	-1.85
Rectum, rectosigmoid junction	187	0.84*	743	0.96	452	0.99	143	0.81*	1,525	1,629.58	0.94*	-0.67
Anus, anal canal	14	1.81	18	0.66	17	1.07	15	2.46*	64	57.22	1.12	0.04
Liver	28	0.55*	126	0.69*	76	0.69*	39	0.91	269	385.76	0.70*	-0.74
Gallbladder	8	0.72	24	0.60*	19	0.76	7	0.66	58	86.92	0.67*	-0.18
Bile ducts, other biliary	23	0.84	85	0.82	66	0.96	30	0.98	204	230.26	0.89	-0.17
Pancreas	179	1.23*	503	0.97	268	0.86*	122	0.96	1,072	1,103.09	0.97	-0.20
<b>Respiratory system</b>	842	0.76*	3,075	0.79*	1,865	0.82*	697	0.80*	6,479	8,156.00	0.79*	-10.68
Nose, nasal cavity, ear	10	1.21	23	0.79	11	0.63	7	1.00	51	61.90	0.82	-0.07
Larynx	62	0.75*	253	0.91	120	0.80*	44	0.84	479	561.92	0.85*	-0.53
Lung, bronchus	768	0.76*	2,793	0.78*	1,729	0.82*	644	0.80*	5,934	7,513.30	0.79*	-10.06
<b>Male breast</b>	13	1.19	36	0.91	29	1.18	12	1.19	90	85.19	1.06	0.03
<b>Male genital system</b>	18	0.01*	47	0.01*	43	0.01*	26	0.02*	134	15,296.30	0.01*	-96.56
Prostate	4	0.00*	13	0.00*	16	0.00*	11	0.01*	44	15,185.25	0.00*	-96.43
Testis	2	0.62	6	0.61	2	0.44	1	0.72	11	19.04	0.58	-0.05
<b>Urinary system</b>	749	1.34*	2,063	1.01	1,248	0.97	542	1.02	4,602	4,418.29	1.04*	1.17
Urinary bladder	448	1.10	1,560	1.04	975	1.02	429	1.06	3,412	3,276.74	1.04*	0.86
Kidney parenchyma	255	2.16*	372	0.88*	203	0.80*	84	0.86	914	894.17	1.02	0.13
Renal pelvis, other urinary	46	1.43*	131	1.14	70	0.99	29	1.00	276	247.38	1.12	0.18
Ureter	10	0.92	27	0.69	30	1.26	8	0.84	75	83.10	0.90	-0.05
<b>Bone, joints</b>	5	1.21	15	1.05	14	1.72	6	1.89	40	29.74	1.35	0.07
<b>Soft tissue including heart</b>	22	1.05	75	0.98	74	1.54*	25	1.23	196	165.62	1.18*	0.19
<b>Kaposi sarcoma</b>	4	0.68	15	0.75	3	0.25*	5	0.94	27	43.20	0.62*	-0.10
<b>Melanoma of skin</b>	153	1.31*	494	1.12*	330	1.15*	123	1.03	1,100	966.30	1.14*	0.85
<b>Eye, orbit</b>	6	0.81	32	1.22	14	0.89	5	0.82	57	55.40	1.03	0.01
<b>Brain, central nervous system</b>	46	0.93	187	1.07	105	1.02	40	1.02	378	366.98	1.03	0.07
<b>Thyroid</b>	27	1.70*	56	1.03	34	1.16	16	1.51	133	110.04	1.21*	0.15
<b>Lymphatic, hematopoietic</b>	433	1.04	1,416	0.93*	958	1.00	379	0.96	3,186	3,286.63	0.97	-0.64
Hodgkin lymphoma	15	1.35	23	0.62*	19	0.94	4	0.54	61	75.97	0.80	-0.10
Non-Hodgkin lymphoma	210	1.22*	589	0.92	396	0.97	161	0.95	1,356	1,385.79	0.98	-0.19
Myeloma	74	0.98	265	0.97	187	1.10	64	0.91	590	590.05	1.00	0.00
Leukemia	134	0.85	539	0.94	356	1.00	150	1.00	1,179	1,234.82	0.95	-0.36
Acute lymphocytic	4	1.01	12	0.88	14	1.78	2	0.65	32	28.57	1.12	0.02
Chronic lymphocytic	60	0.94	160	0.70*	142	1.01	70	1.19	432	493.28	0.88*	-0.39
Acute non-lymphocytic	40	0.77	212	1.11	125	1.03	45	0.88	422	416.29	1.01	0.04
Chronic myeloid	16	0.75	94	1.21	48	0.98	18	0.86	176	168.89	1.04	0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Prostate**  
**Males, Long-term Follow-up**

**Table 10.1.3:** Risk of subsequent primary cancers after cancer of the prostate gland, males, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	292,029		41,363		11,503		2,837		292,029			
<b>Person-years in interval</b>	1,415,781		115,960		31,647		6,867		1,570,255			
<b>All subsequent cancers</b>	24,099	0.60*	2,238	0.58*	665	0.61*	154	0.67*	27,156	45,242.80	0.60*	-115.18
All excluding same site	24,066	0.90*	2,231	0.87*	662	0.91*	153	0.94	27,112	30,057.55	0.90*	-18.76
<b>Buccal cavity, pharynx</b>	782	0.80*	64	0.78*	17	0.77	4	0.85	867	1,086.53	0.80*	-1.40
Lip	166	0.87	16	0.92	3	0.62	2	1.95	187	213.24	0.88	-0.17
Tongue	128	0.70*	13	0.89	3	0.78	0	0.00	144	202.24	0.71*	-0.37
Salivary gland	97	1.02	12	1.17	5	1.59	0	0.00	114	109.27	1.04	0.03
Mouth	166	0.74*	7	0.38*	2	0.41	2	1.94	177	247.19	0.72*	-0.45
Nasopharynx	22	0.69	3	1.26	2	3.15	0	0.00	27	35.24	0.77	-0.05
Tonsil	64	0.77*	5	0.84	1	0.68	0	0.00	70	91.14	0.77*	-0.13
Oropharynx	22	0.80	0	0.00	0	0.00	0	0.00	22	30.41	0.72	-0.05
Hypopharynx	89	0.84	7	0.88	0	0.00	0	0.00	96	116.56	0.82	-0.13
<b>Digestive system</b>	7,949	0.92*	728	0.86*	209	0.87*	43	0.79	8,929	9,762.64	0.91*	-5.31
Esophagus	443	0.86*	43	0.93	9	0.69	1	0.35	496	575.62	0.86*	-0.51
Stomach	818	0.81*	68	0.70*	31	1.12	4	0.64	921	1,135.58	0.81*	-1.37
Small intestine	153	1.29*	15	1.28	6	1.77	0	0.00	174	134.07	1.30*	0.25
Colon	3,622	0.95*	335	0.86*	79	0.70*	23	0.90	4,059	4,349.55	0.93*	-1.85
Rectum, rectosigmoid junction	1,382	0.95	106	0.80*	33	0.90	4	0.51	1,525	1,629.58	0.94*	-0.67
Anus, anal canal	49	0.96	11	2.43*	4	3.10	0	0.00	64	57.22	1.12	0.04
Liver	230	0.67*	29	0.92	7	0.77	3	1.49	269	385.76	0.70*	-0.74
Gallbladder	51	0.67*	4	0.52	1	0.44	2	3.70	58	86.92	0.67*	-0.18
Bile ducts, other biliary	174	0.87	22	1.00	7	1.02	1	0.60	204	230.26	0.89	-0.17
Pancreas	950	0.97	90	0.96	29	1.08	3	0.49	1,072	1,103.09	0.97	-0.20
<b>Respiratory system</b>	5,782	0.79*	522	0.80*	143	0.80*	32	0.84	6,479	8,156.00	0.79*	-10.68
Nose, nasal cavity, ear	44	0.80	6	1.16	0	0.00	1	2.94	51	61.90	0.82	-0.07
Larynx	435	0.85*	31	0.77	11	1.07	2	0.99	479	561.92	0.85*	-0.53
Lung, bronchus	5,290	0.79*	483	0.80*	132	0.79*	29	0.82	5,934	7,513.30	0.79*	-10.06
<b>Male breast</b>	78	1.04	9	1.22	2	0.92	1	2.02	90	85.19	1.06	0.03
<b>Male genital system</b>	108	0.01*	14	0.01*	8	0.02*	4	0.06*	134	15,296.30	0.01*	-96.56
Prostate	33	0.00*	7	0.01*	3	0.01*	1	0.01*	44	15,185.25	0.00*	-96.43
Testis	10	0.57	0	0.00	1	3.90	0	0.00	11	19.04	0.58	-0.05
<b>Urinary system</b>	4,060	1.04*	374	0.96	141	1.24*	27	1.04	4,602	4,418.29	1.04*	1.17
Urinary bladder	2,983	1.04*	297	1.00	109	1.26*	23	1.15	3,412	3,276.74	1.04*	0.86
Kidney parenchyma	830	1.04	58	0.79	23	1.12	3	0.67	914	894.17	1.02	0.13
Renal pelvis, other urinary	247	1.13	19	0.89	9	1.46	1	0.69	276	247.38	1.12	0.18
Ureter	67	0.91	6	0.84	2	1.01	0	0.00	75	83.10	0.90	-0.05
<b>Bone, joints</b>	34	1.28	4	1.70	1	1.47	1	6.87	40	29.74	1.35	0.07
<b>Soft tissue including heart</b>	171	1.18*	16	1.08	8	1.80	1	0.95	196	165.62	1.18*	0.19
<b>Kaposi sarcoma</b>	22	0.58*	4	1.04	1	0.84	0	0.00	27	43.20	0.62*	-0.10
<b>Melanoma of skin</b>	977	1.15*	89	1.02	24	0.91	10	1.56	1,100	966.30	1.14*	0.85
<b>Eye, orbit</b>	52	1.05	3	0.66	2	1.58	0	0.00	57	55.40	1.03	0.01
<b>Brain, central nervous system</b>	338	1.03	31	1.05	9	1.10	0	0.00	378	366.98	1.03	0.07
<b>Thyroid</b>	117	1.18	14	1.75	1	0.46	1	2.20	133	110.04	1.21*	0.15
<b>Lymphatic, hematopoietic</b>	2,807	0.97	278	0.95	78	0.91	23	1.17	3,186	3,286.63	0.97	-0.64
Hodgkin lymphoma	57	0.83	4	0.71	0	0.00	0	0.00	61	75.97	0.80	-0.10
Non-Hodgkin lymphoma	1,195	0.98	124	1.00	32	0.88	5	0.59	1,356	1,385.79	0.98	-0.19
Myeloma	526	1.01	43	0.83	10	0.66	11	3.24*	590	590.05	1.00	0.00
Leukemia	1,029	0.95	107	0.97	36	1.12	7	0.94	1,179	1,234.82	0.95	-0.36
Acute lymphocytic	30	1.18	1	0.42	0	0.00	1	8.80	32	28.57	1.12	0.02
Chronic lymphocytic	362	0.83*	48	1.11	18	1.44	4	1.41	432	493.28	0.88*	-0.39
Acute non-lymphocytic	377	1.03	36	0.96	7	0.64	2	0.77	422	416.29	1.01	0.04
Chronic myeloid	158	1.07	11	0.71	7	1.55	0	0.00	176	168.89	1.04	0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.1.4:** Risk of subsequent primary cancers after cancer of the prostate gland, males, <60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	203	0.91	644	0.66*	538	0.66*	447	0.57*	1,832	2,801.23	0.65*	-50.03
All excluding same site	203	1.22*	642	0.94	538	0.99	446	0.89*	1,829	1,896.27	0.96	-3.47
<b>Buccal cavity, pharynx</b>	15	1.32	28	0.66*	27	0.95	22	1.11	92	102.27	0.90	-0.53
Lip	0	0.00	5	1.19	9	2.62*	3	0.98	17	11.76	1.45	0.27
Tongue	2	0.80	9	0.96	4	0.66	2	0.48	17	22.17	0.77	-0.27
Salivary gland	0	0.00	0	0.00	5	2.74	4	2.41	9	6.70	1.34	0.12
Mouth	5	1.75	5	0.47	6	0.86	5	1.11	21	24.96	0.84	-0.20
Nasopharynx	1	1.87	1	0.56	0	0.00	3	4.39	5	4.13	1.21	0.05
Tonsil	4	2.41	3	0.53	1	0.30	0	0.00	8	12.65	0.63	-0.24
Oropharynx	1	2.55	0	0.00	1	0.96	0	0.00	2	3.64	0.55	-0.08
Hypopharynx	2	1.52	5	1.01	1	0.28	3	1.24	11	12.23	0.90	-0.06
<b>Digestive system</b>	49	1.09	160	0.84*	132	0.85	110	0.74*	451	539.81	0.84*	-4.58
Esophagus	4	0.89	20	1.11	13	0.97	11	1.00	48	46.89	1.02	0.06
Stomach	7	1.46	12	0.59	13	0.80	13	0.82	45	57.24	0.79	-0.63
Small intestine	0	0.00	5	1.35	4	1.54	5	2.08	14	9.67	1.45	0.22
Colon	14	0.89	63	0.92	48	0.80	39	0.62*	164	207.40	0.79*	-2.24
Rectum, rectosigmoid junction	9	1.01	29	0.77	18	0.60*	17	0.65	73	103.03	0.71*	-1.55
Anus, anal canal	0	0.00	2	0.93	1	0.68	1	0.91	4	5.31	0.75	-0.07
Liver	1	0.37	6	0.56	5	0.63	10	1.42	22	28.49	0.77	-0.33
Gallbladder	0	0.00	1	0.98	0	0.00	1	0.95	2	3.23	0.62	-0.06
Bile ducts, other biliary	0	0.00	3	0.85	7	2.35	3	0.91	13	10.64	1.22	0.12
Pancreas	13	2.37*	17	0.75	23	1.26	9	0.52*	62	63.86	0.97	-0.10
<b>Respiratory system</b>	43	0.90	182	0.89	151	0.90	128	0.85	504	569.18	0.89*	-3.36
Nose, nasal cavity, ear	2	4.26	0	0.00	1	0.80	1	1.00	4	4.53	0.88	-0.03
Larynx	5	0.93	19	0.88	9	0.57	12	1.05	45	54.21	0.83	-0.48
Lung, bronchus	36	0.86	163	0.91	141	0.94	114	0.83*	454	509.17	0.89*	-2.85
<b>Male breast</b>	1	1.77	5	2.21	3	1.87	2	1.41	11	5.85	1.88	0.27
<b>Male genital system</b>	3	0.05*	5	0.02*	3	0.01*	4	0.01*	15	913.96	0.02*	-46.40
Prostate	0	0.00*	2	0.01*	0	0.00*	1	0.00*	3	904.96	0.00*	-46.56
Testis	1	1.36	1	0.49	0	0.00	1	2.66	3	4.03	0.74	-0.05
<b>Urinary system</b>	43	2.12*	104	1.21	95	1.32*	65	0.89	307	251.06	1.22*	2.89
Urinary bladder	22	1.83*	59	1.12	60	1.26	52	1.01	193	164.24	1.18*	1.48
Kidney parenchyma	18	2.44*	36	1.23	31	1.48*	11	0.64	96	74.87	1.28*	1.09
Renal pelvis, other urinary	3	3.64	9	2.38*	4	1.13	2	0.53	18	11.95	1.51	0.31
Ureter	0	0.00	2	1.73	3	2.51	0	0.00	5	3.85	1.30	0.06
<b>Bone, joints</b>	1	3.29	1	0.91	0	0.00	0	0.00	2	2.66	0.75	-0.03
<b>Soft tissue including heart</b>	1	0.87	2	0.47	3	1.02	8	2.98*	14	11.03	1.27	0.15
<b>Kaposi sarcoma</b>	0	0.00	2	0.85	0	0.00	1	1.83	3	4.75	0.63	-0.09
<b>Melanoma of skin</b>	11	1.27	36	1.09	28	1.22	17	0.89	92	83.70	1.10	0.43
<b>Eye, orbit</b>	0	0.00	1	0.63	3	2.71	1	1.02	5	4.10	1.22	0.05
<b>Brain, central nervous system</b>	4	1.16	21	1.61	6	0.65	13	1.83	44	32.76	1.34	0.58
<b>Thyroid</b>	2	1.23	9	1.58	3	0.84	4	1.76	18	13.14	1.37	0.25
<b>Lymphatic, hematopoietic</b>	23	1.28	68	0.97	62	1.13	61	1.14	214	196.62	1.09	0.90
Hodgkin lymphoma	3	3.12	0	0.00	4	2.03	1	0.74	8	7.53	1.06	0.02
Non-Hodgkin lymphoma	12	1.38	27	0.80	25	0.99	21	0.88	85	91.64	0.93	-0.34
Myeloma	2	0.66	14	1.16	14	1.46	13	1.34	43	34.43	1.25	0.44
Leukemia	6	1.15	27	1.26	19	1.07	26	1.40	78	63.03	1.24	0.77
Acute lymphocytic	0	0.00	3	3.73	0	0.00	1	2.24	4	2.01	1.99	0.10
Chronic lymphocytic	4	1.76	2	0.21*	9	1.16	15	1.97*	30	27.06	1.11	0.15
Acute non-lymphocytic	1	0.67	12	1.90	7	1.26	5	0.79	25	19.68	1.27	0.27
Chronic myeloid	1	1.39	7	2.47	3	1.28	4	1.62	15	8.37	1.79*	0.34

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



**Prostate**  
**Males, 60-69 Years of Age**

**Table 10.1.5:** Risk of subsequent primary cancers after cancer of the prostate gland, males, 60-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	96,647		88,716		52,254		18,753		96,647			
<b>Person-years in interval</b>	77,104		277,494		172,290		76,621		603,508			
<b>All subsequent cancers</b>	1,126	0.71*	3,924	0.59*	2,985	0.59*	1,597	0.61*	9,632	15,951.86	0.60*	-104.72
All excluding same site	1,123	1.07*	3,919	0.91*	2,977	0.91*	1,590	0.91*	9,609	10,365.45	0.93*	-12.53
<b>Buccal cavity, pharynx</b>	30	0.58*	160	0.84*	100	0.83	47	0.86	337	416.73	0.81*	-1.32
Lip	4	0.55	33	1.14	19	0.92	12	1.07	68	68.26	1.00	0.00
Tongue	7	0.68	26	0.67*	20	0.81	11	1.08	64	83.68	0.76*	-0.33
Salivary gland	1	0.31	22	1.64*	9	0.87	11	1.70	43	33.48	1.28	0.16
Mouth	9	0.72	21	0.47*	18	0.67	4	0.33*	52	95.87	0.54*	-0.73
Nasopharynx	0	0.00	2	0.28	5	1.24	1	0.64	8	14.83	0.54	-0.11
Tonsil	3	0.56	18	0.94	7	0.62	4	1.02	32	39.70	0.81	-0.13
Oropharynx	0	0.00	8	1.24	3	0.79	0	0.00	11	13.53	0.81	-0.04
Hypopharynx	6	0.89	20	0.82	12	0.83	4	0.74	42	50.95	0.82	-0.15
<b>Digestive system</b>	344	1.11	1,192	0.92*	884	0.89*	500	0.89*	2,920	3,159.28	0.92*	-3.96
Esophagus	29	1.16	73	0.75*	48	0.71*	27	0.84	177	222.33	0.80*	-0.75
Stomach	35	1.02	110	0.77*	89	0.80*	43	0.69*	277	350.68	0.79*	-1.22
Small intestine	5	1.09	29	1.48	19	1.24	11	1.35	64	47.68	1.34*	0.27
Colon	149	1.22*	505	0.96	391	0.92	210	0.81*	1,255	1,333.60	0.94*	-1.30
Rectum, rectosigmoid junction	59	1.00	227	0.95	176	1.01	87	0.97	549	561.38	0.98	-0.21
Anus, anal canal	7	2.90*	4	0.41	6	0.91	10	3.42*	27	21.60	1.25	0.09
Liver	7	0.47*	43	0.71*	31	0.69*	21	0.95	102	142.45	0.72*	-0.67
Gallbladder	1	0.48	6	0.65	6	0.77	6	1.21	19	24.20	0.79	-0.09
Bile ducts, other biliary	6	1.03	19	0.73	18	0.82	16	1.12	59	68.05	0.87	-0.15
Pancreas	45	1.24	163	1.08	95	0.83	64	1.02	367	364.61	1.01	0.04
<b>Respiratory system</b>	260	0.78*	1,052	0.78*	827	0.86*	370	0.80*	2,509	3,106.08	0.81*	-9.89
Nose, nasal cavity, ear	4	1.74	6	0.67	6	0.96	4	1.15	20	20.94	0.96	-0.02
Larynx	20	0.68	91	0.83	56	0.81	20	0.71	187	237.07	0.79*	-0.83
Lung, bronchus	236	0.78*	951	0.78*	763	0.86*	345	0.81*	2,295	2,841.41	0.81*	-9.05
<b>Male breast</b>	5	1.78	9	0.77	13	1.45	7	1.37	34	28.50	1.19	0.09
<b>Male genital system</b>	4	0.01*	16	0.01*	13	0.01*	18	0.02*	51	5,621.72	0.01*	-92.31
Prostate	3	0.01*	5	0.00*	8	0.00*	7	0.01*	23	5,586.41	0.00*	-92.18
Testis	0	0.00	4	1.11	0	0.00	0	0.00	4	7.31	0.55	-0.05
<b>Urinary system</b>	233	1.67*	637	1.07	461	0.97	285	1.07	1,616	1,475.73	1.10*	2.32
Urinary bladder	132	1.39*	450	1.08	358	1.05	219	1.09	1,159	1,053.89	1.10*	1.74
Kidney parenchyma	90	2.48*	145	0.99	79	0.74*	53	1.04	367	340.51	1.08	0.44
Renal pelvis, other urinary	11	1.44	42	1.26	24	0.92	13	0.90	90	81.33	1.11	0.14
Ureter	5	1.94	7	0.62	9	1.02	5	1.02	26	27.60	0.94	-0.03
<b>Bone, joints</b>	1	0.82	6	1.23	9	2.63*	3	1.99	19	11.05	1.72*	0.13
<b>Soft tissue including heart</b>	5	0.97	25	1.14	33	1.95*	11	1.11	74	53.82	1.38*	0.33
<b>Kaposi sarcoma</b>	0	0.00	6	1.41	0	0.00	2	0.93	8	10.74	0.74	-0.05
<b>Melanoma of skin</b>	56	1.57*	174	1.18*	134	1.20*	70	1.18	434	354.60	1.22*	1.32
<b>Eye, orbit</b>	1	0.50	9	1.07	1	0.16*	3	0.94	14	19.84	0.71	-0.10
<b>Brain, central nervous system</b>	20	1.25	72	1.15	42	0.97	18	0.87	152	142.59	1.07	0.16
<b>Thyroid</b>	9	1.61	17	0.82	14	1.08	9	1.69	49	44.59	1.10	0.07
<b>Lymphatic, hematopoietic</b>	125	1.22*	415	0.95	341	0.98	194	0.98	1,075	1,082.30	0.99	-0.12
Hodgkin lymphoma	4	1.18	10	0.80	5	0.61	2	0.52	21	27.89	0.75	-0.11
Non-Hodgkin lymphoma	71	1.58*	172	0.90	168	1.11	80	0.93	491	472.91	1.04	0.30
Myeloma	16	0.85	79	0.98	55	0.88	38	1.08	188	197.70	0.95	-0.16
Leukemia	34	0.97	154	1.01	113	0.91	74	1.03	375	383.79	0.98	-0.15
Acute lymphocytic	1	1.08	1	0.26	6	2.13	1	0.67	9	9.06	0.99	0.00
Chronic lymphocytic	20	1.33	48	0.75*	47	0.93	36	1.29	151	157.60	0.96	-0.11
Acute non-lymphocytic	9	0.81	59	1.16	34	0.79	21	0.83	123	130.07	0.95	-0.12
Chronic myeloid	2	0.42	31	1.54*	14	0.86	9	0.89	56	51.17	1.09	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.1.6:** Risk of subsequent primary cancers after cancer of the prostate gland, males, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,440	0.59*	8,056	0.59*	4,183	0.60*	1,013	0.59*	15,692	26,489.71	0.59*	-139.68
All excluding same site	2,439	0.90*	8,050	0.88*	4,175	0.88*	1,010	0.84*	15,674	17,795.83	0.88*	-27.45
<b>Buccal cavity, pharynx</b>	73	0.78*	233	0.79*	116	0.81*	16	0.46*	438	567.53	0.77*	-1.68
Lip	17	0.80	54	0.79	25	0.73	6	0.67	102	133.21	0.77*	-0.40
Tongue	9	0.55	36	0.70*	15	0.64	3	0.61	63	96.40	0.65*	-0.43
Salivary gland	10	1.05	29	0.87	21	1.05	2	0.33	62	69.09	0.90	-0.09
Mouth	22	1.05	51	0.77	29	0.92	2	0.27*	104	126.36	0.82*	-0.29
Nasopharynx	2	0.72	6	0.70	5	1.26	1	1.10	14	16.28	0.86	-0.03
Tonsil	3	0.43	19	0.90	6	0.67	2	1.09	30	38.79	0.77	-0.11
Oropharynx	2	0.86	7	0.98	0	0.00	0	0.00	9	13.23	0.68	-0.05
Hypopharynx	6	0.63	26	0.90	11	0.90	0	0.00	43	53.38	0.81	-0.13
<b>Digestive system</b>	815	0.89*	2,915	0.95*	1,458	0.89*	370	0.87*	5,558	6,063.54	0.92*	-6.54
Esophagus	45	0.92	139	0.87	72	0.90	15	0.79	271	306.40	0.88*	-0.46
Stomach	102	0.91	305	0.82*	145	0.75*	47	0.90	599	727.66	0.82*	-1.66
Small intestine	20	1.73*	40	1.02	31	1.49*	5	0.95	96	76.72	1.25*	0.25
Colon	350	0.84*	1,426	1.01	676	0.88*	188	0.91	2,640	2,808.55	0.94*	-2.18
Rectum, rectosigmoid junction	119	0.78*	487	0.98	258	1.03	39	0.64*	903	965.17	0.94*	-0.80
Anus, anal canal	7	1.48	12	0.77	10	1.27	4	1.94	33	30.31	1.09	0.03
Liver	20	0.60*	77	0.69*	40	0.70*	8	0.60	145	214.82	0.67*	-0.90
Gallbladder	7	0.79	17	0.57*	13	0.79	0	0.00*	37	59.50	0.62*	-0.29
Bile ducts, other biliary	17	0.82	63	0.85	41	0.93	11	0.85	132	151.58	0.87	-0.25
Pancreas	121	1.17	323	0.94	150	0.83*	49	1.05	643	674.63	0.95	-0.41
<b>Respiratory system</b>	539	0.74*	1,841	0.78*	887	0.78*	199	0.77*	3,466	4,480.74	0.77*	-13.13
Nose, nasal cavity, ear	4	0.73	17	0.92	4	0.40	2	0.78	27	36.43	0.74	-0.12
Larynx	37	0.78	143	0.98	55	0.86	12	0.91	247	270.64	0.91	-0.31
Lung, bronchus	496	0.74*	1,679	0.77*	825	0.78*	185	0.77*	3,185	4,162.71	0.77*	-12.65
<b>Male breast</b>	7	0.92	22	0.85	13	0.93	3	0.85	45	50.84	0.89	-0.08
<b>Male genital system</b>	11	0.01*	26	0.01*	27	0.01*	4	0.01*	68	8,760.62	0.01*	-112.45
Prostate	1	0.00*	6	0.00*	8	0.00*	3	0.01*	18	8,693.88	0.00*	-112.24
Testis	1	0.73	1	0.24	2	1.10	0	0.00	4	7.70	0.52	-0.05
<b>Urinary system</b>	473	1.18*	1,322	0.97	692	0.94	192	1.01	2,679	2,691.50	1.00	-0.16
Urinary bladder	294	0.98	1,051	1.01	557	0.98	158	1.05	2,060	2,058.61	1.00	0.02
Kidney parenchyma	147	1.97*	191	0.77*	93	0.74*	20	0.68	451	478.79	0.94	-0.36
Renal pelvis, other urinary	32	1.36	80	1.02	42	1.02	14	1.30	168	154.10	1.09	0.18
Ureter	5	0.62	18	0.68	18	1.31	3	0.89	44	51.64	0.85	-0.10
<b>Bone, joints</b>	3	1.16	8	0.96	5	1.26	3	2.65	19	16.03	1.19	0.04
<b>Soft tissue including heart</b>	16	1.10	48	0.96	38	1.35	6	0.77	108	100.78	1.07	0.09
<b>Kaposi sarcoma</b>	4	1.05	7	0.52	3	0.38	2	0.75	16	27.71	0.58*	-0.15
<b>Melanoma of skin</b>	86	1.18	284	1.09	168	1.10	36	0.87	574	528.00	1.09	0.60
<b>Eye, orbit</b>	5	1.02	22	1.36	10	1.19	1	0.52	38	31.47	1.21	0.08
<b>Brain, central nervous system</b>	22	0.73	94	0.94	57	1.13	9	0.78	182	191.63	0.95	-0.12
<b>Thyroid</b>	16	1.84*	30	1.08	17	1.32	3	0.99	66	52.32	1.26	0.18
<b>Lymphatic, hematopoietic</b>	285	0.96	933	0.92*	555	1.00	124	0.85	1,897	2,007.72	0.94*	-1.43
Hodgkin lymphoma	8	1.19	13	0.61	10	0.98	1	0.44	32	40.55	0.79	-0.11
Non-Hodgkin lymphoma	127	1.08	390	0.94	203	0.88	60	1.01	780	821.24	0.95	-0.53
Myeloma	56	1.04	172	0.95	118	1.21*	13	0.52*	359	357.93	1.00	0.01
Leukemia	94	0.80*	358	0.90	224	1.04	50	0.85	726	788.00	0.92*	-0.80
Acute lymphocytic	3	1.07	8	0.89	8	1.78	0	0.00	19	17.49	1.09	0.02
Chronic lymphocytic	36	0.77	110	0.71*	86	1.03	19	0.82	251	308.62	0.81*	-0.75
Acute non-lymphocytic	30	0.76	141	1.05	84	1.15	19	0.99	274	266.54	1.03	0.10
Chronic myeloid	13	0.82	56	1.03	31	1.01	5	0.60	105	109.35	0.96	-0.06

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Prostate**  
**Males, Radiotherapy**

**Table 10.1.7:** Risk of subsequent primary cancers after cancer of the prostate gland, males, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	90,538		81,681		44,522		13,657		90,538			
<b>Person-years in interval</b>	71,646		247,334		138,888		50,767		508,635			
<b>All subsequent cancers</b>	1,055	0.57*	4,350	0.63*	2,920	0.68*	1,155	0.69*	9,480	14,724.07	0.64*	-103.10
All excluding same site	1,054	0.87*	4,347	0.96*	2,915	1.02	1,155	1.03	9,471	9,744.29	0.97*	-5.37
<b>Buccal cavity, pharynx</b>	34	0.70*	133	0.78*	90	0.92	31	0.87	288	351.95	0.82*	-1.26
Lip	3	0.36	30	0.97	16	0.84	5	0.67	54	65.72	0.82	-0.23
Tongue	3	0.32*	22	0.67	13	0.72	7	1.10	45	67.05	0.67*	-0.43
Salivary gland	2	0.51	17	1.11	14	1.31	4	0.87	37	34.58	1.07	0.05
Mouth	16	1.41	25	0.64*	16	0.73	6	0.76	63	80.37	0.78	-0.34
Nasopharynx	0	0.00	1	0.17*	4	1.30	1	0.96	6	11.62	0.52	-0.11
Tonsil	4	0.89	11	0.73	11	1.42	3	1.17	29	29.92	0.97	-0.02
Oropharynx	1	0.66	3	0.59	2	0.75	0	0.00	6	10.20	0.59	-0.08
Hypopharynx	5	0.87	18	0.93	10	0.98	3	0.88	36	38.80	0.93	-0.06
<b>Digestive system</b>	284	0.75*	1,406	0.98	885	0.96	356	0.97	2,931	3,107.99	0.94*	-3.48
Esophagus	16	0.64	79	0.87	50	0.92	11	0.54*	156	190.58	0.82*	-0.68
Stomach	37	0.85	136	0.83*	95	0.91	41	0.99	309	353.16	0.87*	-0.87
Small intestine	3	0.55	28	1.35	16	1.21	8	1.55	55	44.51	1.24	0.21
Colon	137	0.85	650	1.04	403	0.97	164	0.97	1,354	1,376.37	0.98	-0.44
Rectum, rectosigmoid junction	42	0.63*	241	0.98	161	1.07	65	1.13	509	520.80	0.98	-0.23
Anus, anal canal	7	2.90*	7	0.80	7	1.35	6	3.03*	27	18.38	1.47	0.17
Liver	3	0.18*	60	0.98	23	0.62*	12	0.86	98	128.61	0.76*	-0.60
Gallbladder	2	0.65	5	0.42*	5	0.61	3	0.89	15	26.65	0.56*	-0.23
Bile ducts, other biliary	2	0.25*	24	0.74	22	0.95	12	1.21	60	73.77	0.81	-0.27
Pancreas	34	0.79	165	1.01	86	0.83	33	0.80	318	351.63	0.90	-0.66
<b>Respiratory system</b>	249	0.70*	1,121	0.86*	710	0.92*	262	0.92	2,342	2,707.89	0.86*	-7.19
Nose, nasal cavity, ear	3	1.21	9	0.97	3	0.51	3	1.31	18	19.88	0.91	-0.04
Larynx	23	0.86	97	1.05	42	0.84	12	0.69	174	186.93	0.93	-0.25
Lung, bronchus	222	0.69*	1,010	0.85*	663	0.93	247	0.93	2,142	2,495.22	0.86*	-6.94
<b>Male breast</b>	1	0.30	10	0.79	13	1.57	4	1.22	28	27.60	1.01	0.01
<b>Male genital system</b>	3	0.00*	17	0.01*	15	0.01*	7	0.01*	42	5,014.40	0.01*	-97.76
Prostate	1	0.00*	3	0.00*	5	0.00*	0	0.00*	9	4,979.78	0.00*	-97.73
Testis	0	0.00	3	0.99	2	1.37	0	0.00	5	5.93	0.84	-0.02
<b>Urinary system</b>	227	1.33*	747	1.13*	537	1.24*	233	1.34*	1,744	1,434.40	1.22*	6.09
Urinary bladder	118	0.96	581	1.21*	444	1.38*	201	1.53*	1,344	1,057.63	1.27*	5.63
Kidney parenchyma	93	2.44*	136	0.96	77	0.90	23	0.71	329	297.34	1.11	0.62
Renal pelvis, other urinary	16	1.67	30	0.82	16	0.67	9	0.95	71	79.43	0.89	-0.17
Ureter	4	1.22	5	0.40*	5	0.62	1	0.32	15	26.89	0.56*	-0.23
<b>Bone, joints</b>	1	0.78	5	1.10	2	0.75	2	1.95	10	9.52	1.05	0.01
<b>Soft tissue including heart</b>	8	1.27	32	1.32	36	2.22*	15	2.26*	91	53.44	1.70*	0.74
<b>Kaposi sarcoma</b>	2	1.31	3	0.53	2	0.53	1	0.60	8	12.58	0.64	-0.09
<b>Melanoma of skin</b>	64	1.68*	159	1.08	105	1.07	52	1.30	380	322.70	1.18*	1.13
<b>Eye, orbit</b>	2	0.88	12	1.41	3	0.56	2	0.99	19	18.14	1.05	0.02
<b>Brain, central nervous system</b>	11	0.68	66	1.12	44	1.25	15	1.14	136	122.98	1.11	0.26
<b>Thyroid</b>	10	1.97	21	1.20	12	1.24	7	2.00	50	35.81	1.40*	0.28
<b>Lymphatic, hematopoietic</b>	126	1.00	480	0.99	363	1.13*	127	0.98	1,096	1,062.07	1.03	0.67
Hodgkin lymphoma	2	0.60	7	0.59	10	1.49	1	0.41	20	24.33	0.82	-0.09
Non-Hodgkin lymphoma	58	1.07	214	1.02	155	1.12	55	0.99	482	458.22	1.05	0.47
Myeloma	17	0.74	89	1.01	62	1.09	25	1.10	193	190.90	1.01	0.04
Leukemia	49	1.07	170	0.96	136	1.16	46	0.95	401	388.62	1.03	0.24
Acute lymphocytic	0	0.00	6	1.45	9	3.60*	0	0.00	15	8.75	1.72	0.12
Chronic lymphocytic	26	1.40	34	0.48*	52	1.13	19	1.01	131	154.64	0.85	-0.46
Acute non-lymphocytic	15	0.97	83	1.37*	50	1.23	15	0.91	163	133.21	1.22*	0.59
Chronic myeloid	3	0.49	28	1.16	14	0.85	8	1.18	53	53.32	0.99	-0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.1.8:** Risk of subsequent primary cancers after cancer of the prostate gland, males, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,714	0.66*	8,274	0.57*	4,786	0.56*	1,902	0.55*	17,676	30,518.73	0.58*	-120.97
All excluding same site	2,711	0.99	8,264	0.86*	4,775	0.84*	1,891	0.81*	17,641	20,313.26	0.87*	-25.17
<b>Buccal cavity, pharynx</b>	84	0.78*	288	0.80*	153	0.78*	54	0.74*	579	734.57	0.79*	-1.47
Lip	18	0.84	62	0.88	37	0.94	16	1.02	133	147.52	0.90	-0.14
Tongue	15	0.76	49	0.74*	26	0.72	9	0.70	99	135.19	0.73*	-0.34
Salivary gland	9	0.95	34	1.00	21	0.98	13	1.35	77	74.69	1.03	0.02
Mouth	20	0.80	52	0.63*	37	0.85	5	0.31*	114	166.82	0.68*	-0.50
Nasopharynx	3	0.83	8	0.68	6	0.99	4	1.89	21	23.61	0.89	-0.02
Tonsil	6	0.63	29	0.94	3	0.19*	3	0.58	41	61.22	0.67*	-0.19
Oropharynx	2	0.66	12	1.19	2	0.38	0	0.00	16	20.21	0.79	-0.04
Hypopharynx	9	0.76	33	0.85	14	0.70	4	0.58	60	77.76	0.77*	-0.17
<b>Digestive system</b>	924	1.03	2,861	0.92*	1,589	0.85*	624	0.81*	5,998	6,654.65	0.90*	-6.19
Esophagus	62	1.17	153	0.83*	83	0.78*	42	1.01	340	385.04	0.88*	-0.42
Stomach	107	0.99	291	0.79*	152	0.71*	62	0.69*	612	782.42	0.78*	-1.61
Small intestine	22	1.89*	46	1.10	38	1.49*	13	1.22	119	89.56	1.33*	0.28
Colon	376	0.96	1,344	0.97	712	0.85*	273	0.76*	2,705	2,973.18	0.91*	-2.53
Rectum, rectosigmoid junction	145	0.94	502	0.95	291	0.96	78	0.65*	1,016	1,108.78	0.92*	-0.87
Anus, anal canal	7	1.31	11	0.59	10	0.93	9	2.19	37	38.84	0.95	-0.02
Liver	25	0.73	66	0.54*	53	0.73*	27	0.94	171	257.15	0.66*	-0.81
Gallbladder	6	0.74	19	0.68	14	0.83	4	0.56	43	60.27	0.71*	-0.16
Bile ducts, other biliary	21	1.09	61	0.86	44	0.96	18	0.87	144	156.49	0.92	-0.12
Pancreas	145	1.42*	338	0.95	182	0.87	89	1.04	754	751.45	1.00	0.02
<b>Respiratory system</b>	593	0.79*	1,954	0.75*	1,155	0.77*	435	0.75*	4,137	5,448.11	0.76*	-12.35
Nose, nasal cavity, ear	7	1.21	14	0.70	8	0.69	4	0.85	33	42.01	0.79	-0.08
Larynx	39	0.70*	156	0.84*	78	0.79*	32	0.91	305	374.99	0.81*	-0.66
Lung, bronchus	546	0.79*	1,783	0.74*	1,066	0.77*	397	0.73*	3,792	5,018.08	0.76*	-11.55
<b>Male breast</b>	12	1.57	26	0.97	16	0.99	8	1.18	62	57.58	1.08	0.04
<b>Male genital system</b>	15	0.01*	30	0.01*	28	0.01*	19	0.02*	92	10,281.90	0.01*	-95.98
Prostate	3	0.00*	10	0.00*	11	0.00*	11	0.01*	35	10,205.47	0.00*	-95.80
Testis	2	0.88	3	0.44	0	0.00	1	1.08	6	13.11	0.46*	-0.07
<b>Urinary system</b>	522	1.35*	1,316	0.95	711	0.83*	309	0.87*	2,858	2,983.89	0.96*	-1.19
Urinary bladder	330	1.16*	979	0.96	531	0.83*	228	0.84*	2,068	2,219.11	0.93*	-1.42
Kidney parenchyma	162	2.02*	236	0.83*	126	0.75*	61	0.93	585	596.83	0.98	-0.11
Renal pelvis, other urinary	30	1.33	101	1.28*	54	1.15	20	1.02	205	167.95	1.22*	0.35
Ureter	6	0.79	22	0.83	25	1.59*	7	1.09	60	56.20	1.07	0.04
<b>Bone, joints</b>	4	1.40	10	1.03	12	2.19*	4	1.86	30	20.22	1.48*	0.09
<b>Soft tissue including heart</b>	14	0.96	43	0.83	38	1.19	10	0.73	105	112.18	0.94	-0.07
<b>Kaposi sarcoma</b>	2	0.46	12	0.84	1	0.12*	4	1.09	19	30.62	0.62*	-0.11
<b>Melanoma of skin</b>	89	1.13	335	1.13*	225	1.19*	71	0.89	720	643.60	1.12*	0.72
<b>Eye, orbit</b>	4	0.79	20	1.13	11	1.06	3	0.74	38	37.26	1.02	0.01
<b>Brain, central nervous system</b>	35	1.05	121	1.04	61	0.90	25	0.95	242	244.00	0.99	-0.02
<b>Thyroid</b>	17	1.57	35	0.96	22	1.12	9	1.27	83	74.23	1.12	0.08
<b>Lymphatic, hematopoietic</b>	307	1.06	936	0.91*	595	0.94	252	0.94	2,090	2,224.56	0.94*	-1.27
Hodgkin lymphoma	13	1.68	16	0.63	9	0.66	3	0.60	41	51.64	0.79	-0.10
Non-Hodgkin lymphoma	152	1.29*	375	0.88*	241	0.90	106	0.94	874	927.57	0.94	-0.50
Myeloma	57	1.08	176	0.94	125	1.11	39	0.82	397	399.15	0.99	-0.02
Leukemia	85	0.76*	369	0.94	220	0.92	104	1.03	778	846.19	0.92*	-0.64
Acute lymphocytic	4	1.42	6	0.63	5	0.93	2	0.95	17	19.82	0.86	-0.03
Chronic lymphocytic	34	0.75	126	0.80*	90	0.95	51	1.28	301	338.64	0.89*	-0.35
Acute non-lymphocytic	25	0.68	129	0.98	75	0.93	30	0.87	259	283.07	0.91	-0.23
Chronic myeloid	13	0.86	66	1.24	34	1.04	10	0.70	123	115.56	1.06	0.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Prostate

## Males, Long-term Follow-up, Radiotherapy

**Table 10.1.9:** Risk of subsequent primary cancers after cancer of the prostate gland, males, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	90,538		13,657		3,750		888		90,538			
<b>Person-years in interval</b>	457,868		38,421		10,353		1,993		508,635			
<b>All subsequent cancers</b>	8,325	0.64*	838	0.67*	252	0.72*	65	0.98	9,480	14,724.07	0.64*	-103.10
All excluding same site	8,316	0.96*	838	1.00	252	1.07	65	1.39*	9,471	9,744.29	0.97*	-5.37
<b>Buccal cavity, pharynx</b>	257	0.81*	26	0.96	4	0.55	1	0.73	288	351.95	0.82*	-1.26
Lip	49	0.84	3	0.53	1	0.65	1	3.43	54	65.72	0.82	-0.23
Tongue	38	0.63*	6	1.23	1	0.78	0	0.00	45	67.05	0.67*	-0.43
Salivary gland	33	1.10	4	1.19	0	0.00	0	0.00	37	34.58	1.07	0.05
Mouth	57	0.79	5	0.83	1	0.63	0	0.00	63	80.37	0.78	-0.34
Nasopharynx	5	0.47	1	1.26	0	0.00	0	0.00	6	11.62	0.52	-0.11
Tonsil	26	0.95	3	1.52	0	0.00	0	0.00	29	29.92	0.97	-0.02
Oropharynx	6	0.65	0	0.00	0	0.00	0	0.00	6	10.20	0.59	-0.08
Hypopharynx	33	0.93	3	1.13	0	0.00	0	0.00	36	38.80	0.93	-0.06
<b>Digestive system</b>	2,575	0.94*	264	0.96	73	0.95	19	1.23	2,931	3,107.99	0.94*	-3.48
Esophagus	145	0.85	10	0.65	1	0.24	0	0.00	156	190.58	0.82*	-0.68
Stomach	268	0.86*	30	0.97	8	0.92	3	1.71	309	353.16	0.87*	-0.87
Small intestine	47	1.19	7	1.82	1	0.92	0	0.00	55	44.51	1.24	0.21
Colon	1,190	0.99	120	0.95	33	0.92	11	1.52	1,354	1,376.37	0.98	-0.44
Rectum, rectosigmoid junction	444	0.96	49	1.12	14	1.19	2	0.88	509	520.80	0.98	-0.23
Anus, anal canal	21	1.28	5	3.37*	1	2.40	0	0.00	27	18.38	1.47	0.17
Liver	86	0.75*	8	0.76	3	1.02	1	1.71	98	128.61	0.76*	-0.60
Gallbladder	12	0.52*	2	0.80	0	0.00	1	6.60	15	26.65	0.56*	-0.23
Bile ducts, other biliary	48	0.75*	10	1.38	2	0.92	0	0.00	60	73.77	0.81	-0.27
Pancreas	285	0.92	23	0.75	10	1.16	0	0.00	318	351.63	0.90	-0.66
<b>Respiratory system</b>	2,080	0.86*	196	0.90	53	0.91	13	1.18	2,342	2,707.89	0.86*	-7.19
Nose, nasal cavity, ear	15	0.85	2	1.17	0	0.00	1	10.19	18	19.88	0.91	-0.04
Larynx	162	0.96	8	0.60	4	1.18	0	0.00	174	186.93	0.93	-0.25
Lung, bronchus	1,895	0.85*	186	0.93	49	0.90	12	1.16	2,142	2,495.22	0.86*	-6.94
<b>Male breast</b>	24	0.99	3	1.24	1	1.44	0	0.00	28	27.60	1.01	0.01
<b>Male genital system</b>	35	0.01*	4	0.01*	2	0.02*	1	0.05*	42	5,014.40	0.01*	-97.76
Prostate	9	0.00*	0	0.00*	0	0.00*	0	0.00*	9	4,979.78	0.00*	-97.73
Testis	5	0.91	0	0.00	0	0.00	0	0.00	5	5.93	0.84	-0.02
<b>Urinary system</b>	1,511	1.20*	156	1.21*	64	1.74*	13	1.74	1,744	1,434.40	1.22*	6.09
Urinary bladder	1,143	1.23*	132	1.35*	57	2.03*	12	2.09*	1,344	1,057.63	1.27*	5.63
Kidney parenchyma	306	1.15*	18	0.74	4	0.59	1	0.76	329	297.34	1.11	0.62
Renal pelvis, other urinary	62	0.89	6	0.85	3	1.50	0	0.00	71	79.43	0.89	-0.17
Ureter	14	0.59*	1	0.42	0	0.00	0	0.00	15	26.89	0.56*	-0.23
<b>Bone, joints</b>	8	0.94	2	2.60	0	0.00	0	0.00	10	9.52	1.05	0.01
<b>Soft tissue including heart</b>	76	1.62*	9	1.84	6	4.15*	0	0.00	91	53.44	1.70*	0.74
<b>Kaposi sarcoma</b>	7	0.64	1	0.82	0	0.00	0	0.00	8	12.58	0.64	-0.09
<b>Melanoma of skin</b>	328	1.16*	36	1.23	10	1.14	6	3.22*	380	322.70	1.18*	1.13
<b>Eye, orbit</b>	17	1.05	2	1.31	0	0.00	0	0.00	19	18.14	1.05	0.02
<b>Brain, central nervous system</b>	121	1.10	12	1.21	3	1.11	0	0.00	136	122.98	1.11	0.26
<b>Thyroid</b>	43	1.33	6	2.25	1	1.42	0	0.00	50	35.81	1.40*	0.28
<b>Lymphatic, hematopoietic</b>	969	1.04	96	1.00	25	0.91	6	1.07	1,096	1,062.07	1.03	0.67
Hodgkin lymphoma	19	0.87	1	0.54	0	0.00	0	0.00	20	24.33	0.82	-0.09
Non-Hodgkin lymphoma	427	1.06	43	1.04	11	0.92	1	0.41	482	458.22	1.05	0.47
Myeloma	168	1.00	17	1.01	4	0.83	4	4.11*	193	190.90	1.01	0.04
Leukemia	355	1.04	35	0.98	10	0.97	1	0.48	401	388.62	1.03	0.24
Acute lymphocytic	15	1.93*	0	0.00	0	0.00	0	0.00	15	8.75	1.72	0.12
Chronic lymphocytic	112	0.82*	12	0.85	6	1.51	1	1.25	131	154.64	0.85	-0.46
Acute non-lymphocytic	148	1.27*	14	1.14	1	0.28	0	0.00	163	133.21	1.22*	0.59
Chronic myeloid	45	0.97	5	1.00	3	2.06	0	0.00	53	53.32	0.99	-0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.1.10:** Risk of subsequent primary cancers after cancer of the prostate gland, males, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	15,774	0.58*	1,400	0.54*	413	0.56*	89	0.54*	17,676	30,518.73	0.58*	-120.97
All excluding same site	15,750	0.88*	1,393	0.81*	410	0.83*	88	0.76*	17,641	20,313.26	0.87*	-25.17
<b>Buccal cavity, pharynx</b>	525	0.79*	38	0.69*	13	0.87	3	0.89	579	734.57	0.79*	-1.47
Lip	117	0.89	13	1.11	2	0.61	1	1.36	133	147.52	0.90	-0.14
Tongue	90	0.74*	7	0.72	2	0.78	0	0.00	99	135.19	0.73*	-0.34
Salivary gland	64	0.98	8	1.16	5	2.33	0	0.00	77	74.69	1.03	0.02
Mouth	109	0.72*	2	0.16*	1	0.31	2	2.73	114	166.82	0.68*	-0.50
Nasopharynx	17	0.79	2	1.25	2	4.69	0	0.00	21	23.61	0.89	-0.02
Tonsil	38	0.68*	2	0.50	1	1.02	0	0.00	41	61.22	0.67*	-0.19
Oropharynx	16	0.87	0	0.00	0	0.00	0	0.00	16	20.21	0.79	-0.04
Hypopharynx	56	0.79	4	0.75	0	0.00	0	0.00	60	77.76	0.77*	-0.17
<b>Digestive system</b>	5,374	0.91*	464	0.82*	136	0.83*	24	0.62*	5,998	6,654.65	0.90*	-6.19
Esophagus	298	0.87*	33	1.07	8	0.92	1	0.50	340	385.04	0.88*	-0.42
Stomach	550	0.79*	38	0.58*	23	1.20	1	0.22	612	782.42	0.78*	-1.61
Small intestine	106	1.34*	8	1.02	5	2.18	0	0.00	119	89.56	1.33*	0.28
Colon	2,432	0.93*	215	0.82*	46	0.60*	12	0.66	2,705	2,973.18	0.91*	-2.53
Rectum, rectosigmoid junction	938	0.95	57	0.64*	19	0.77	2	0.35	1,016	1,108.78	0.92*	-0.87
Anus, anal canal	28	0.81	6	1.97	3	3.44	0	0.00	37	38.84	0.95	-0.02
Liver	144	0.63*	21	1.00	4	0.66	2	1.40	171	257.15	0.66*	-0.81
Gallbladder	39	0.73	2	0.38	1	0.65	1	2.57	43	60.27	0.71*	-0.16
Bile ducts, other biliary	126	0.93	12	0.81	5	1.07	1	0.84	144	156.49	0.92	-0.12
Pancreas	665	1.00	67	1.06	19	1.04	3	0.69	754	751.45	1.00	0.02
<b>Respiratory system</b>	3,702	0.76*	326	0.75*	90	0.75*	19	0.71	4,137	5,448.11	0.76*	-12.35
Nose, nasal cavity, ear	29	0.78	4	1.16	0	0.00	0	0.00	33	42.01	0.79	-0.08
Larynx	273	0.80*	23	0.86	7	1.01	2	1.40	305	374.99	0.81*	-0.66
Lung, bronchus	3,395	0.76*	297	0.74*	83	0.74*	17	0.68	3,792	5,018.08	0.76*	-11.55
<b>Male breast</b>	54	1.06	6	1.21	1	0.67	1	2.84	62	57.58	1.08	0.04
<b>Male genital system</b>	73	0.01*	10	0.01*	6	0.02*	3	0.06*	92	10,281.90	0.01*	-95.98
Prostate	24	0.00*	7	0.01*	3	0.01*	1	0.02*	35	10,205.47	0.00*	-95.80
Testis	5	0.41*	0	0.00	1	5.89	0	0.00	6	13.11	0.46*	-0.07
<b>Urinary system</b>	2,549	0.97	218	0.83*	77	1.01	14	0.76	2,858	2,983.89	0.96*	-1.19
Urinary bladder	1,840	0.94*	165	0.83*	52	0.89	11	0.77	2,068	2,219.11	0.93*	-1.42
Kidney parenchyma	524	0.99	40	0.82	19	1.38	2	0.63	585	596.83	0.98	-0.11
Renal pelvis, other urinary	185	1.25*	13	0.91	6	1.43	1	0.96	205	167.95	1.22*	0.35
Ureter	53	1.06	5	1.05	2	1.49	0	0.00	60	56.20	1.07	0.04
<b>Bone, joints</b>	26	1.44	2	1.27	1	2.16	1	9.60	30	20.22	1.48*	0.09
<b>Soft tissue including heart</b>	95	0.96	7	0.70	2	0.66	1	1.33	105	112.18	0.94	-0.07
<b>Kaposi sarcoma</b>	15	0.56*	3	1.13	1	1.21	0	0.00	19	30.62	0.62*	-0.11
<b>Melanoma of skin</b>	649	1.15*	53	0.92	14	0.80	4	0.88	720	643.60	1.12*	0.72
<b>Eye, orbit</b>	35	1.05	1	0.33	2	2.36	0	0.00	38	37.26	1.02	0.01
<b>Brain, central nervous system</b>	217	1.00	19	0.97	6	1.10	0	0.00	242	244.00	0.99	-0.02
<b>Thyroid</b>	74	1.10	8	1.50	0	0.00	1	3.11	83	74.23	1.12	0.08
<b>Lymphatic, hematopoietic</b>	1,838	0.94*	182	0.93	53	0.92	17	1.21	2,090	2,224.56	0.94*	-1.27
Hodgkin lymphoma	38	0.81	3	0.79	0	0.00	0	0.00	41	51.64	0.79	-0.10
Non-Hodgkin lymphoma	768	0.94	81	0.98	21	0.85	4	0.66	874	927.57	0.94	-0.50
Myeloma	358	1.02	26	0.75	6	0.58	7	2.88*	397	399.15	0.99	-0.02
Leukemia	674	0.90*	72	0.97	26	1.19	6	1.13	778	846.19	0.92*	-0.64
Acute lymphocytic	15	0.85	1	0.62	0	0.00	1	12.30	17	19.82	0.86	-0.03
Chronic lymphocytic	250	0.84*	36	1.23	12	1.41	3	1.48	301	338.64	0.89*	-0.35
Acute non-lymphocytic	229	0.92	22	0.88	6	0.81	2	1.08	259	283.07	0.91	-0.23
Chronic myeloid	113	1.11	6	0.58	4	1.30	0	0.00	123	115.56	1.06	0.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



**Table 10.2.1:** Characteristics of patients with an initial cancer of the testis, males, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	14,984	100.0	—	—	14,984	100.0
<b>Initial treatment</b>						
Any radiation	6,751	45.1	—	—	6,751	45.1
With surgery	6,658	44.4	—	—	6,658	44.4
Without surgery	93	0.6	—	—	93	0.6
No radiation	8,233	54.9	—	—	8,233	54.9
With surgery	7,884	52.6	—	—	7,884	52.6
Without surgery	349	2.3	—	—	349	2.3
<b>Race</b>						
White	13,979	93.3	—	—	13,979	93.3
Black	317	2.1	—	—	317	2.1
Other	580	3.9	—	—	580	3.9
Unknown	108	0.7	—	—	108	0.7
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	5,893	39.3	—	—	5,893	39.3
30–49	7,822	52.2	—	—	7,822	52.2
50–69	1,113	7.4	—	—	1,113	7.4
70–79	120	0.8	—	—	120	0.8
≥ 80	36	0.2	—	—	36	0.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	14,246	95.1	—	—	14,246	95.1
1st and 2nd cancers	679	4.5	—	—	679	4.5
1st, 2nd, and 3rd cancers	54	0.4	—	—	54	0.4
1st, 2nd, 3rd, and additional cancers	5	0.0	—	—	5	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	32.6	—	—	—	32.6	—
Median year of 1st cancer diagnosis	1989.6	—	—	—	1989.6	—
Median person-years at risk	8.4	—	—	—	8.4	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	98.0	—	—	—	98.0
1st, 2nd, and additional cancers	—	97.4	—	—	—	97.4
1st cancer only	—	1.6	—	—	—	1.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 10.2.2:** Risk of subsequent primary cancers after cancer of the testis, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	56	2.58*	208	2.07*	197	1.59*	342	1.38*	803	494.61	1.62*	21.38
All excluding same site	44	2.15*	127	1.33*	141	1.18	308	1.26*	620	480.99	1.29*	9.64
<b>Buccal cavity, pharynx</b>	2	2.21	1	0.24	6	1.15	16	1.70	25	19.74	1.27	0.36
Lip	0	0.00	0	0.00	1	1.33	2	1.66	3	2.78	1.08	0.02
Tongue	1	5.21	1	1.09	1	0.86	4	1.80	7	4.50	1.56	0.17
Salivary gland	0	0.00	0	0.00	1	2.40	2	2.67	3	1.61	1.87	0.10
Mouth	1	5.03	0	0.00	2	1.73	3	1.47	6	4.32	1.39	0.12
Nasopharynx	0	0.00	0	0.00	0	0.00	1	2.20	1	1.08	0.92	-0.01
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	2.65	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	1	3.76	1	0.52	1.91	0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	3	3.49	3	1.72	1.75	0.09
<b>Digestive system</b>	4	1.07	29	1.65*	24	1.07	69	1.50*	126	89.74	1.40*	2.51
Esophagus	0	0.00	3	2.61	2	1.29	6	1.73	11	6.41	1.72	0.32
Stomach	1	2.28	2	1.00	1	0.41	7	1.51	11	9.53	1.15	0.10
Small intestine	0	0.00	2	5.58	0	0.00	1	1.07	3	1.83	1.64	0.08
Colon	1	0.69	9	1.33	7	0.81	18	1.02	35	34.47	1.02	0.04
Rectum, rectosigmoid junction	1	1.34	8	2.27	7	1.55	12	1.32	28	17.84	1.57*	0.70
Anus, anal canal	0	0.00	0	0.00	1	2.84	1	1.53	2	1.34	1.49	0.05
Liver	0	0.00	1	1.17	1	0.87	4	1.55	6	4.76	1.26	0.09
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.04
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	2	1.96	2	1.92	1.04	0.01
Pancreas	0	0.00	3	1.52	5	1.98	17	3.25*	25	10.14	2.47*	1.03
<b>Respiratory system</b>	3	0.88	13	0.81	21	1.02	56	1.34*	93	82.01	1.13	0.76
Nose, nasal cavity, ear	0	0.00	1	4.52	0	0.00	1	2.16	2	0.99	2.01	0.07
Larynx	0	0.00	0	0.00	2	0.95	5	1.24	7	8.16	0.86	-0.08
Lung, bronchus	3	1.01	12	0.86	19	1.05	50	1.34	84	72.37	1.16	0.81
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.01	0.00	-0.07
<b>Male genital system</b>	21	4.67*	102	4.83*	91	3.28*	91	1.29*	305	124.15	2.46*	12.54
Prostate	9	2.80*	20	1.25	35	1.50*	56	0.84	120	109.54	1.10	0.73
Testis	12	9.73*	81	16.53*	56	13.61*	34	10.10*	183	13.62	13.44*	11.75
<b>Urinary system</b>	9	4.87*	13	1.48	13	1.14	42	1.76*	77	45.92	1.68*	2.16
Urinary bladder	3	2.53	7	1.24	10	1.37	27	1.75*	47	29.51	1.59*	1.21
Kidney parenchyma	6	10.57*	6	2.19	3	0.83	10	1.34	25	14.36	1.74*	0.74
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	5	4.91*	5	2.04	2.45	0.20
Ureter	0	0.00	0	0.00	0	0.00	2	6.24	2	0.63	3.19	0.10
<b>Bone, joints</b>	0	0.00	1	2.61	0	0.00	0	0.00	1	1.25	0.80	-0.02
<b>Soft tissue including heart</b>	0	0.00	1	1.03	4	3.96*	3	1.97	8	3.73	2.15	0.30
<b>Kaposi sarcoma</b>	4	4.13*	3	0.68	3	0.66	3	0.74	13	13.94	0.93	-0.06
<b>Melanoma of skin</b>	5	3.33*	13	1.88*	6	0.75	13	0.98	37	29.73	1.24	0.50
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.13	0.00	-0.08
<b>Brain, central nervous system</b>	3	4.67	4	1.44	4	1.35	7	1.61	18	10.72	1.68	0.50
<b>Thyroid</b>	0	0.00	4	2.48	3	1.78	5	2.09	12	6.06	1.98*	0.41
<b>Lymphatic, hematopoietic</b>	5	1.76	22	1.75*	19	1.35	25	1.07	71	52.86	1.34*	1.26
Hodgkin lymphoma	0	0.00	0	0.00	3	1.77	2	1.19	5	5.94	0.84	-0.07
Non-Hodgkin lymphoma	4	2.98	8	1.29	8	1.09	11	0.90	31	27.14	1.14	0.27
Myeloma	0	0.00	0	0.00	0	0.00	5	1.79	5	5.29	0.95	-0.02
Leukemia	1	1.33	14	4.24*	8	2.12	7	1.05	30	14.49	2.07*	1.08
Acute lymphocytic	0	0.00	1	3.03	0	0.00	0	0.00	1	1.05	0.95	0.00
Chronic lymphocytic	1	5.33	2	2.23	1	0.85	2	0.82	6	4.72	1.27	0.09
Acute non-lymphocytic	0	0.00	10	8.88*	6	4.86*	3	1.40	19	4.76	3.99*	0.99
Chronic myeloid	0	0.00	0	0.00	1	1.55	0	0.00	1	2.39	0.42	-0.10

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Testis

## Males, Long-term Follow-up

**Table 10.2.3:** Risk of subsequent primary cancers after cancer of the testis, males, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	461	1.87*	147	1.32*	119	1.39*	76	1.47*	803	494.61	1.62*	21.38
All excluding same site	312	1.32*	119	1.09	115	1.36*	74	1.44*	620	480.99	1.29*	9.64
<b>Buccal cavity, pharynx</b>	9	0.87	7	1.56	5	1.57	4	2.30	25	19.74	1.27	0.36
Lip	1	0.63	2	3.36	0	0.00	0	0.00	3	2.78	1.08	0.02
Tongue	3	1.32	1	0.96	2	2.64	1	2.35	7	4.50	1.56	0.17
Salivary gland	1	1.17	1	2.81	1	3.98	0	0.00	3	1.61	1.87	0.10
Mouth	3	1.31	1	1.02	1	1.46	1	2.73	6	4.32	1.39	0.12
Nasopharynx	0	0.00	0	0.00	1	6.73	0	0.00	1	1.08	0.92	-0.01
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	2.65	0.00	-0.18
Oropharynx	0	0.00	1	8.09	0	0.00	0	0.00	1	0.52	1.91	0.03
Hypopharynx	0	0.00	1	2.47	0	0.00	2	12.43*	3	1.72	1.75	0.09
<b>Digestive system</b>	57	1.30	27	1.31	26	1.65*	16	1.66	126	89.74	1.40*	2.51
Esophagus	5	1.70	1	0.67	2	1.65	3	3.94	11	6.41	1.72	0.32
Stomach	4	0.82	3	1.40	3	1.92	1	1.09	11	9.53	1.15	0.10
Small intestine	2	2.23	1	2.36	0	0.00	0	0.00	3	1.83	1.64	0.08
Colon	17	1.01	8	1.02	4	0.66	6	1.61	35	34.47	1.02	0.04
Rectum, rectosigmoid junction	16	1.82*	4	0.97	6	1.94	2	1.08	28	17.84	1.57*	0.70
Anus, anal canal	1	1.45	1	3.23	0	0.00	0	0.00	2	1.34	1.49	0.05
Liver	2	0.92	3	2.71	1	1.11	0	0.00	6	4.76	1.26	0.09
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.04
Bile ducts, other biliary	0	0.00	0	0.00	2	5.68	0	0.00	2	1.92	1.04	0.01
Pancreas	8	1.63	6	2.60	8	4.45*	3	2.69	25	10.14	2.47*	1.03
<b>Respiratory system</b>	37	0.92	20	1.06	28	1.95*	8	0.92	93	82.01	1.13	0.76
Nose, nasal cavity, ear	1	1.88	0	0.00	1	6.45	0	0.00	2	0.99	2.01	0.07
Larynx	2	0.48	2	1.06	2	1.46	1	1.28	7	8.16	0.86	-0.08
Lung, bronchus	34	0.97	18	1.08	25	1.95*	7	0.90	84	72.37	1.16	0.81
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.01	0.00	-0.07
<b>Male genital system</b>	214	4.01*	42	1.47*	25	0.98	24	1.44	305	124.15	2.46*	12.54
Prostate	64	1.50*	13	0.50*	21	0.86	22	1.34	120	109.54	1.10	0.73
Testis	149	14.54*	28	12.73*	4	4.42*	2	7.66	183	13.62	13.44*	11.75
<b>Urinary system</b>	35	1.59*	19	1.80*	10	1.22	13	2.55*	77	45.92	1.68*	2.16
Urinary bladder	20	1.42	11	1.63	6	1.13	10	2.98*	47	29.51	1.59*	1.21
Kidney parenchyma	15	2.17*	6	1.79	2	0.78	2	1.32	25	14.36	1.74*	0.74
Renal pelvis, other urinary	0	0.00	2	4.38	2	5.77	1	4.65	5	2.04	2.45	0.20
Ureter	0	0.00	1	7.12	1	9.16	0	0.00	2	0.63	3.19	0.10
<b>Bone, joints</b>	1	1.21	0	0.00	0	0.00	0	0.00	1	1.25	0.80	-0.02
<b>Soft tissue including heart</b>	5	2.27	3	3.93	0	0.00	0	0.00	8	3.73	2.15	0.30
<b>Kaposi sarcoma</b>	10	1.01	2	0.71	0	0.00	1	5.15	13	13.94	0.93	-0.06
<b>Melanoma of skin</b>	24	1.46	7	1.08	5	1.13	1	0.42	37	29.73	1.24	0.50
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.13	0.00	-0.08
<b>Brain, central nervous system</b>	11	1.72	4	1.80	2	1.42	1	1.39	18	10.72	1.68	0.50
<b>Thyroid</b>	7	1.91	1	0.80	4	5.18*	0	0.00	12	6.06	1.98*	0.41
<b>Lymphatic, hematopoietic</b>	46	1.56*	10	0.88	10	1.29	5	1.17	71	52.86	1.34*	1.26
Hodgkin lymphoma	3	0.70	1	1.02	0	0.00	1	5.00	5	5.94	0.84	-0.07
Non-Hodgkin lymphoma	20	1.34	5	0.83	4	0.99	2	0.92	31	27.14	1.14	0.27
Myeloma	0	0.00	2	1.64	3	3.10	0	0.00	5	5.29	0.95	-0.02
Leukemia	23	2.94*	2	0.64	3	1.34	2	1.54	30	14.49	2.07*	1.08
Acute lymphocytic	1	1.42	0	0.00	0	0.00	0	0.00	1	1.05	0.95	0.00
Chronic lymphocytic	4	1.76	0	0.00	1	1.19	1	1.97	6	4.72	1.27	0.09
Acute non-lymphocytic	16	6.10*	1	1.01	2	2.79	0	0.00	19	4.76	3.99*	0.99
Chronic myeloid	1	0.72	0	0.00	0	0.00	0	0.00	1	2.39	0.42	-0.10

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.2.4:** Risk of subsequent primary cancers after cancer of the testis, males, <35 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	17	4.27*	80	4.14*	71	2.90*	124	2.19*	292	104.47	2.80*	20.70
All excluding same site	9	2.87*	20	1.27	26	1.23	95	1.77*	150	93.83	1.60*	6.20
<b>Buccal cavity, pharynx</b>	0	0.00	1	1.92	1	1.17	7	2.40	9	4.39	2.05	0.51
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.07
Tongue	0	0.00	1	8.13	1	4.76	2	2.64	4	1.11	3.60	0.32
Salivary gland	0	0.00	0	0.00	0	0.00	2	8.07	2	0.47	4.24	0.17
Mouth	0	0.00	0	0.00	0	0.00	1	1.83	1	0.76	1.31	0.03
Nasopharynx	0	0.00	0	0.00	0	0.00	1	5.38	1	0.37	2.73	0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.08
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	1	5.68	1	0.20	4.95	0.09
<b>Digestive system</b>	1	4.08	2	1.39	4	1.57	22	2.34*	29	13.64	2.13*	1.70
Esophagus	0	0.00	0	0.00	0	0.00	2	2.74	2	0.92	2.18	0.12
Stomach	0	0.00	0	0.00	0	0.00	3	3.08	3	1.47	2.04	0.17
Small intestine	0	0.00	0	0.00	0	0.00	1	3.61	1	0.43	2.32	0.06
Colon	0	0.00	1	1.81	1	1.11	4	1.31	6	4.61	1.30	0.15
Rectum, rectosigmoid junction	1	23.17	0	0.00	1	2.09	4	2.06	6	2.72	2.20	0.36
Anus, anal canal	0	0.00	0	0.00	1	9.37	1	3.61	2	0.45	4.40	0.17
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.11
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.03
Pancreas	0	0.00	0	0.00	1	4.12	6	5.73*	7	1.42	4.94*	0.62
<b>Respiratory system</b>	0	0.00	0	0.00	1	0.73	11	1.68	12	8.68	1.38	0.37
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.03
Larynx	0	0.00	0	0.00	0	0.00	2	2.37	2	1.10	1.82	0.10
Lung, bronchus	0	0.00	0	0.00	1	0.93	9	1.64	10	7.06	1.42	0.32
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.02
<b>Male genital system</b>	8	9.35*	60	16.49*	45	12.84*	40	4.46*	153	16.96	9.02*	15.02
Prostate	0	0.00	0	0.00	0	0.00	10	1.69	10	6.12	1.63	0.43
Testis	8	9.45*	60	16.73*	45	13.66*	29	9.95*	142	10.64	13.34*	14.50
<b>Urinary system</b>	2	14.98*	1	1.28	3	2.15	16	3.15*	22	7.39	2.98*	1.61
Urinary bladder	0	0.00	0	0.00	2	2.58	6	2.20	8	4.06	1.97	0.44
Kidney parenchyma	2	44.09*	1	3.46	1	1.75	6	2.76*	10	3.08	3.25*	0.76
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	4	24.25*	4	0.25	16.08*	0.41
Ureter	0	0.00	0	0.00	0	0.00	2	55.04*	2	0.05	37.38*	0.21
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	1	2.44	3	6.92*	1	1.46	5	1.62	3.08	0.37
<b>Kaposi sarcoma</b>	2	4.11	2	0.74	2	0.58	3	0.87	9	10.05	0.90	-0.12
<b>Melanoma of skin</b>	1	2.14	5	2.09	2	0.63	4	0.66	12	12.03	1.00	0.00
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.04
<b>Brain, central nervous system</b>	1	4.01	1	0.90	2	1.64	6	3.18*	10	4.46	2.24*	0.61
<b>Thyroid</b>	0	0.00	2	2.76	2	2.40	2	1.51	6	3.03	1.98	0.33
<b>Lymphatic, hematopoietic</b>	2	2.10	5	1.16	6	1.21	7	0.82	20	18.81	1.06	0.13
Hodgkin lymphoma	0	0.00	0	0.00	1	0.89	2	1.83	3	3.92	0.76	-0.10
Non-Hodgkin lymphoma	2	5.21	0	0.00	3	1.10	1	0.20	6	10.10	0.59	-0.45
Myeloma	0	0.00	0	0.00	0	0.00	1	1.70	1	0.80	1.25	0.02
Leukemia	0	0.00	5	5.56*	2	2.03	3	1.59	10	3.99	2.51*	0.66
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.07
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	2.10	1	0.62	1.61	0.04
Acute non-lymphocytic	0	0.00	5	13.97*	2	5.38	1	1.63	8	1.43	5.60*	0.73
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	0.00	-0.10

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Testis

## Males, ≥35 Years of Age

**Table 10.2.5:** Risk of subsequent primary cancers after cancer of the testis, males, ≥35 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	39	2.20*	128	1.58*	126	1.27*	218	1.14	511	390.14	1.31*	22.54
All excluding same site	35	2.02*	107	1.34*	115	1.17	213	1.11	470	387.17	1.21*	15.45
<b>Buccal cavity, pharynx</b>	2	2.47	0	0.00*	5	1.15	9	1.38	16	15.36	1.04	0.12
Lip	0	0.00	0	0.00	1	1.68	2	2.27	3	2.17	1.38	0.15
Tongue	1	5.84	0	0.00	0	0.00	2	1.37	3	3.39	0.89	-0.07
Salivary gland	0	0.00	0	0.00	1	3.29	0	0.00	1	1.14	0.88	-0.03
Mouth	1	5.37	0	0.00	2	1.95	2	1.34	5	3.56	1.41	0.27
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.13
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.95	0.00	-0.36
Oropharynx	0	0.00	0	0.00	0	0.00	1	5.04	1	0.44	2.25	0.10
Hypopharynx	0	0.00	0	0.00	0	0.00	2	2.93	2	1.51	1.32	0.09
<b>Digestive system</b>	3	0.86	27	1.67*	20	1.00	47	1.29	97	76.10	1.27*	3.90
Esophagus	0	0.00	3	2.74	2	1.40	4	1.46	9	5.50	1.64	0.65
Stomach	1	2.44	2	1.09	1	0.46	4	1.10	8	8.06	0.99	-0.01
Small intestine	0	0.00	2	6.58	0	0.00	0	0.00	2	1.40	1.43	0.11
Colon	1	0.74	8	1.29	6	0.78	14	0.96	29	29.86	0.97	-0.16
Rectum, rectosigmoid junction	0	0.00	8	2.46*	6	1.49	8	1.12	22	15.12	1.45	1.28
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	0.00	-0.17
Liver	0	0.00	1	1.28	1	1.01	4	2.18	6	3.78	1.59	0.41
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.09
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	2	2.48	2	1.61	1.24	0.07
Pancreas	0	0.00	3	1.61	4	1.75	11	2.63*	18	8.72	2.06*	1.73
<b>Respiratory system</b>	3	0.91	13	0.84	20	1.04	45	1.27	81	73.33	1.10	1.43
Nose, nasal cavity, ear	0	0.00	1	5.66	0	0.00	1	3.19	2	0.73	2.74	0.24
Larynx	0	0.00	0	0.00	2	1.03	3	0.94	5	7.07	0.71	-0.39
Lung, bronchus	3	1.04	12	0.89	18	1.06	41	1.29	74	65.31	1.13	1.62
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.15
<b>Male genital system</b>	13	3.57*	42	2.40*	46	1.90*	51	0.82	152	107.19	1.42*	8.36
Prostate	9	2.80*	20	1.25	35	1.51*	46	0.75	110	103.42	1.06	1.23
Testis	4	10.37*	21	15.96*	11	13.38*	5	11.06*	41	2.98	13.78*	7.09
<b>Urinary system</b>	7	4.09*	12	1.50	10	1.00	26	1.38	55	38.53	1.43*	3.07
Urinary bladder	3	2.71	7	1.36	8	1.23	21	1.66*	39	25.46	1.53*	2.53
Kidney parenchyma	4	7.66*	5	2.04	2	0.66	4	0.76	15	11.28	1.33	0.69
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	1.17	1	1.79	0.56	-0.15
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.11
<b>Bone, joints</b>	0	0.00	1	6.33	0	0.00	0	0.00	1	0.54	1.84	0.09
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	1.73	2	2.39	3	2.10	1.43	0.17
<b>Kaposi sarcoma</b>	2	4.16	1	0.59	1	0.90	0	0.00	4	3.89	1.03	0.02
<b>Melanoma of skin</b>	4	3.87*	8	1.77	4	0.82	9	1.24	25	17.71	1.41	1.36
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.15
<b>Brain, central nervous system</b>	2	5.08	3	1.79	2	1.15	1	0.41	8	6.26	1.28	0.32
<b>Thyroid</b>	0	0.00	2	2.26	1	1.17	3	2.81	6	3.02	1.98	0.56
<b>Lymphatic, hematopoietic</b>	3	1.60	17	2.07*	13	1.43	18	1.21	51	34.05	1.50*	3.16
Hodgkin lymphoma	0	0.00	0	0.00	2	3.51	0	0.00	2	2.02	0.99	0.00
Non-Hodgkin lymphoma	2	2.09	8	1.90	5	1.08	10	1.38	25	17.04	1.47	1.48
Myeloma	0	0.00	0	0.00	0	0.00	4	1.81	4	4.48	0.89	-0.09
Leukemia	1	1.84	9	3.74*	6	2.16	4	0.84	20	10.50	1.90*	1.77
Acute lymphocytic	0	0.00	1	8.08	0	0.00	0	0.00	1	0.45	2.23	0.10
Chronic lymphocytic	1	5.49	2	2.34	1	0.92	1	0.51	5	4.10	1.22	0.17
Acute non-lymphocytic	0	0.00	5	6.51*	4	4.63*	2	1.31	11	3.33	3.30*	1.43
Chronic myeloid	0	0.00	0	0.00	1	2.53	0	0.00	1	1.50	0.67	-0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.2.6:** Risk of subsequent primary cancers after cancer of the testis, males, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	31	2.60*	126	2.19*	119	1.61*	227	1.47*	503	297.77	1.69*	29.88
All excluding same site	25	2.20*	71	1.28*	93	1.29*	212	1.39*	401	292.02	1.37*	15.87
<b>Buccal cavity, pharynx</b>	0	0.00	1	0.39	5	1.56	5	0.87	11	12.07	0.91	-0.16
Lip	0	0.00	0	0.00	1	2.19	0	0.00	1	1.68	0.59	-0.10
Tongue	0	0.00	1	1.82	0	0.00	2	1.48	3	2.72	1.10	0.04
Salivary gland	0	0.00	0	0.00	1	4.13	0	0.00	1	0.94	1.07	0.01
Mouth	0	0.00	0	0.00	2	2.74	1	0.79	3	2.70	1.11	0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-0.23
Oropharynx	0	0.00	0	0.00	0	0.00	1	5.95	1	0.33	3.01	0.10
Hypopharynx	0	0.00	0	0.00	0	0.00	1	1.82	1	1.10	0.91	-0.01
<b>Digestive system</b>	4	1.87	17	1.61	15	1.07	48	1.67*	84	55.43	1.52*	4.16
Esophagus	0	0.00	2	2.86	1	1.03	5	2.28	8	4.01	2.00	0.58
Stomach	1	4.02	2	1.67	0	0.00	6	2.09	9	5.84	1.54	0.46
Small intestine	0	0.00	2	9.48*	0	0.00	0	0.00	2	1.11	1.81	0.13
Colon	1	1.22	6	1.49	3	0.56	12	1.08	22	21.34	1.03	0.10
Rectum, rectosigmoid junction	1	2.31	4	1.87	6	2.12	7	1.23	18	11.09	1.62	1.01
Anus, anal canal	0	0.00	0	0.00	1	4.94	1	2.67	2	0.77	2.60	0.18
Liver	0	0.00	0	0.00	1	1.40	3	1.88	4	2.92	1.37	0.16
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.05
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	2	3.16	2	1.18	1.70	0.12
Pancreas	0	0.00	1	0.84	3	1.90	11	3.35*	15	6.30	2.38*	1.27
<b>Respiratory system</b>	0	0.00	6	0.60	18	1.36	45	1.67*	69	52.14	1.32*	2.45
Nose, nasal cavity, ear	0	0.00	1	7.80	0	0.00	1	3.58	2	0.59	3.39	0.21
Larynx	0	0.00	0	0.00	2	1.48	5	1.95	7	5.18	1.35	0.26
Lung, bronchus	0	0.00	5	0.57	16	1.37	39	1.63*	60	46.13	1.30	2.02
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.09
<b>Male genital system</b>	11	4.66*	69	5.84*	51	3.05*	57	1.25	188	76.37	2.46*	16.25
Prostate	5	2.80	14	1.47	25	1.68*	41	0.94	85	70.01	1.21	2.18
Testis	6	10.93*	55	25.69*	26	15.27*	15	10.99*	102	5.76	17.72*	14.01
<b>Urinary system</b>	6	5.66*	7	1.32	9	1.27	26	1.74*	48	28.43	1.69*	2.85
Urinary bladder	2	2.95	6	1.77	7	1.54	17	1.74*	32	18.36	1.74*	1.99
Kidney parenchyma	4	12.13*	1	0.60	2	0.90	5	1.09	12	8.79	1.37	0.47
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	4	6.19*	4	1.28	3.13	0.40
Ureter	0	0.00	0	0.00	0	0.00	2	9.71*	2	0.40	5.05	0.23
<b>Bone, joints</b>	0	0.00	1	5.70	0	0.00	0	0.00	1	0.60	1.65	0.06
<b>Soft tissue including heart</b>	0	0.00	0	0.00	3	5.56*	1	1.17	4	2.00	2.00	0.29
<b>Kaposi sarcoma</b>	3	6.19*	1	0.47	0	0.00	2	1.09	6	6.49	0.92	-0.07
<b>Melanoma of skin</b>	3	3.73	8	2.12	5	1.13	7	0.93	23	16.54	1.39	0.94
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.10
<b>Brain, central nervous system</b>	1	3.03	3	2.04	3	1.87	4	1.62	11	5.88	1.87	0.75
<b>Thyroid</b>	0	0.00	1	1.19	1	1.14	4	3.11	6	3.20	1.88	0.41
<b>Lymphatic, hematopoietic</b>	3	2.05	12	1.79	8	1.02	20	1.47	43	29.63	1.45*	1.95
Hodgkin lymphoma	0	0.00	0	0.00	1	1.30	1	1.22	2	2.73	0.73	-0.11
Non-Hodgkin lymphoma	3	4.17	6	1.77	3	0.74	10	1.42	22	15.22	1.45	0.99
Myeloma	0	0.00	0	0.00	0	0.00	3	1.71	3	3.27	0.92	-0.04
Leukemia	0	0.00	6	3.30*	4	1.83	6	1.49	16	8.41	1.90*	1.10
Acute lymphocytic	0	0.00	1	7.18	0	0.00	0	0.00	1	0.49	2.02	0.07
Chronic lymphocytic	0	0.00	1	1.83	1	1.34	1	0.65	3	2.95	1.02	0.01
Acute non-lymphocytic	0	0.00	3	4.93	2	2.85	3	2.35	8	2.72	2.94*	0.77
Chronic myeloid	0	0.00	0	0.00	1	2.83	0	0.00	1	1.33	0.75	-0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Testis Males, No Radiotherapy

**Table 10.2.7:** Risk of subsequent primary cancers after cancer of the testis, males, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	25	2.55*	82	1.91*	78	1.56*	115	1.22*	300	196.84	1.52*	13.66
All excluding same site	19	2.08*	56	1.40*	48	1.01	96	1.04	219	188.98	1.16*	3.97
<b>Buccal cavity, pharynx</b>	2	5.31	0	0.00	1	0.50	11	3.02*	14	7.67	1.82	0.84
Lip	0	0.00	0	0.00	0	0.00	2	4.26	2	1.10	1.82	0.12
Tongue	1	12.44	0	0.00	1	2.20	2	2.29	4	1.77	2.25	0.29
Salivary gland	0	0.00	0	0.00	0	0.00	2	6.62	2	0.67	2.99	0.18
Mouth	1	12.41	0	0.00	0	0.00	2	2.62	3	1.62	1.85	0.18
Nasopharynx	0	0.00	0	0.00	0	0.00	1	5.53	1	0.44	2.30	0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.14
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	2	6.47	2	0.62	3.23	0.18
<b>Digestive system</b>	0	0.00	12	1.70	9	1.06	21	1.22	42	34.31	1.22	1.02
Esophagus	0	0.00	1	2.23	1	1.73	1	0.78	3	2.41	1.25	0.08
Stomach	0	0.00	0	0.00	1	1.07	1	0.57	2	3.69	0.54	-0.22
Small intestine	0	0.00	0	0.00	0	0.00	1	2.75	1	0.73	1.38	0.04
Colon	0	0.00	3	1.10	4	1.23	6	0.92	13	13.13	0.99	-0.02
Rectum, rectosigmoid junction	0	0.00	4	2.89	1	0.59	5	1.48	10	6.75	1.48	0.43
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.08
Liver	0	0.00	1	2.93	0	0.00	1	1.02	2	1.84	1.09	0.02
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.03
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.10
Pancreas	0	0.00	2	2.58	2	2.13	6	3.09*	10	3.83	2.61*	0.82
<b>Respiratory system</b>	3	2.16	7	1.15	3	0.40	11	0.73	24	29.87	0.80	-0.78
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.05
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.98	0.00	-0.39
Lung, bronchus	3	2.48	7	1.33	3	0.46	11	0.83	24	26.25	0.91	-0.30
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.05
<b>Male genital system</b>	10	4.68*	33	3.54*	40	3.64*	34	1.34	117	47.78	2.45*	9.16
Prostate	4	2.79	6	0.93	10	1.18	15	0.65	35	39.53	0.89	-0.60
Testis	6	8.77*	26	9.42*	30	12.43*	19	9.49*	81	7.86	10.31*	9.68
<b>Urinary system</b>	3	3.82	6	1.72	4	0.93	16	1.80*	29	17.49	1.66*	1.52
Urinary bladder	1	1.96	1	0.44	3	1.10	10	1.77	15	11.15	1.35	0.51
Kidney parenchyma	2	8.41	5	4.60*	1	0.72	5	1.75	13	5.57	2.33*	0.98
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	2.69	1	0.77	1.31	0.03
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.03
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	1	2.14	1	2.12	2	2.99	4	1.72	2.32	0.30
<b>Kaposi sarcoma</b>	1	2.07	2	0.88	3	1.20	1	0.45	7	7.45	0.94	-0.06
<b>Melanoma of skin</b>	2	2.88	5	1.60	1	0.28	6	1.04	14	13.19	1.06	0.11
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.06
<b>Brain, central nervous system</b>	2	6.39	1	0.76	1	0.74	3	1.60	7	4.85	1.44	0.29
<b>Thyroid</b>	0	0.00	3	3.90	2	2.48	1	0.90	6	2.86	2.10	0.42
<b>Lymphatic, hematopoietic</b>	2	1.46	10	1.72	11	1.75	5	0.51	28	23.22	1.21	0.63
Hodgkin lymphoma	0	0.00	0	0.00	2	2.16	1	1.17	3	3.22	0.93	-0.03
Non-Hodgkin lymphoma	1	1.60	2	0.71	5	1.52	1	0.19	9	11.92	0.76	-0.39
Myeloma	0	0.00	0	0.00	0	0.00	2	1.92	2	2.01	0.99	0.00
Leukemia	1	2.78	8	5.38*	4	2.53	1	0.38	14	6.07	2.30*	1.05
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.07
Chronic lymphocytic	1	12.69	1	2.84	0	0.00	1	1.11	3	1.77	1.70	0.16
Acute non-lymphocytic	0	0.00	7	13.53*	4	7.50*	0	0.00	11	2.03	5.41*	1.19
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.06	0.00	-0.14

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.2.8:** Risk of subsequent primary cancers after cancer of the testis, males, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	276	1.92*	85	1.24	91	1.70*	51	1.58*	503	297.77	1.69*	29.88
All excluding same site	189	1.36*	75	1.11	88	1.65*	49	1.52*	401	292.02	1.37*	15.87
<b>Buccal cavity, pharynx</b>	6	0.95	2	0.73	1	0.51	2	1.86	11	12.07	0.91	-0.16
Lip	1	1.05	0	0.00	0	0.00	0	0.00	1	1.68	0.59	-0.10
Tongue	1	0.73	0	0.00	1	2.20	1	3.83	3	2.72	1.10	0.04
Salivary gland	1	2.05	0	0.00	0	0.00	0	0.00	1	0.94	1.07	0.01
Mouth	2	1.40	1	1.62	0	0.00	0	0.00	3	2.70	1.11	0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-0.23
Oropharynx	0	0.00	1	12.74	0	0.00	0	0.00	1	0.33	3.01	0.10
Hypopharynx	0	0.00	0	0.00	0	0.00	1	9.84	1	1.10	0.91	-0.01
<b>Digestive system</b>	36	1.35	16	1.25	20	2.02*	12	1.99*	84	55.43	1.52*	4.16
Esophagus	3	1.66	1	1.05	1	1.31	3	6.26*	8	4.01	2.00	0.58
Stomach	3	1.01	2	1.51	3	3.08	1	1.75	9	5.84	1.54	0.46
Small intestine	2	3.76	0	0.00	0	0.00	0	0.00	2	1.11	1.81	0.13
Colon	10	0.98	3	0.61	4	1.04	5	2.14	22	21.34	1.03	0.10
Rectum, rectosigmoid junction	11	2.04*	3	1.16	3	1.54	1	0.86	18	11.09	1.62	1.01
Anus, anal canal	1	2.53	1	5.69	0	0.00	0	0.00	2	0.77	2.60	0.18
Liver	1	0.75	2	2.93	1	1.80	0	0.00	4	2.92	1.37	0.16
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.05
Bile ducts, other biliary	0	0.00	0	0.00	2	9.04*	0	0.00	2	1.18	1.70	0.12
Pancreas	4	1.32	4	2.76	6	5.29*	1	1.43	15	6.30	2.38*	1.27
<b>Respiratory system</b>	24	0.95	15	1.24	23	2.48*	7	1.27	69	52.14	1.32*	2.45
Nose, nasal cavity, ear	1	3.22	0	0.00	1	10.64	0	0.00	2	0.59	3.39	0.21
Larynx	2	0.77	2	1.66	2	2.29	1	2.03	7	5.18	1.35	0.26
Lung, bronchus	21	0.95	13	1.21	20	2.42*	6	1.21	60	46.13	1.30	2.02
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.09
<b>Male genital system</b>	131	4.24*	21	1.16	20	1.20	16	1.50	188	76.37	2.46*	16.25
Prostate	44	1.68*	10	0.58	17	1.05	14	1.34	85	70.01	1.21	2.18
Testis	87	19.81*	10	11.42*	3	8.12*	2	16.71*	102	5.76	17.72*	14.01
<b>Urinary system</b>	22	1.63*	9	1.36	9	1.73	8	2.51*	48	28.43	1.69*	2.85
Urinary bladder	15	1.74	5	1.18	5	1.48	7	3.32*	32	18.36	1.74*	1.99
Kidney parenchyma	7	1.66	2	0.97	2	1.27	1	1.06	12	8.79	1.37	0.47
Renal pelvis, other urinary	0	0.00	2	6.92	2	8.99*	0	0.00	4	1.28	3.13	0.40
Ureter	0	0.00	1	11.15	1	13.99	0	0.00	2	0.40	5.05	0.23
<b>Bone, joints</b>	1	2.61	0	0.00	0	0.00	0	0.00	1	0.60	1.65	0.06
<b>Soft tissue including heart</b>	3	2.60	1	2.41	0	0.00	0	0.00	4	2.00	2.00	0.29
<b>Kaposi sarcoma</b>	4	0.86	1	0.79	0	0.00	1	10.28	6	6.49	0.92	-0.07
<b>Melanoma of skin</b>	16	1.78*	5	1.39	2	0.79	0	0.00	23	16.54	1.39	0.94
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.10
<b>Brain, central nervous system</b>	7	2.05	2	1.63	1	1.24	1	2.32	11	5.88	1.87	0.75
<b>Thyroid</b>	2	1.05	0	0.00	4	9.61*	0	0.00	6	3.20	1.88	0.41
<b>Lymphatic, hematopoietic</b>	23	1.44	9	1.39	8	1.74	3	1.16	43	29.63	1.45*	1.95
Hodgkin lymphoma	1	0.52	1	2.16	0	0.00	0	0.00	2	2.73	0.73	-0.11
Non-Hodgkin lymphoma	12	1.47	4	1.18	4	1.69	2	1.52	22	15.22	1.45	0.99
Myeloma	0	0.00	2	2.62	1	1.64	0	0.00	3	3.27	0.92	-0.04
Leukemia	10	2.28*	2	1.08	3	2.19	1	1.26	16	8.41	1.90*	1.10
Acute lymphocytic	1	3.23	0	0.00	0	0.00	0	0.00	1	0.49	2.02	0.07
Chronic lymphocytic	2	1.43	0	0.00	1	1.87	0	0.00	3	2.95	1.02	0.01
Acute non-lymphocytic	5	3.46*	1	1.72	2	4.58	0	0.00	8	2.72	2.94*	0.77
Chronic myeloid	1	1.34	0	0.00	0	0.00	0	0.00	1	1.33	0.75	-0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Testis

### Males, Long-term Follow-up, No Radiotherapy

**Table 10.2.9:** Risk of subsequent primary cancers after cancer of the testis, males, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	8,233		3,468		1,903		815		8,233			
<b>Person-years in interval</b>	53,190		13,273		6,649		2,419		75,532			
<b>All subsequent cancers</b>	185	1.80*	62	1.44*	28	0.88	25	1.30	300	196.84	1.52*	13.66
All excluding same site	123	1.27*	44	1.05	27	0.86	25	1.31	219	188.98	1.16*	3.97
<b>Buccal cavity, pharynx</b>	3	0.74	5	2.89	4	3.21	2	3.00	14	7.67	1.82	0.84
Lip	0	0.00	2	8.53	0	0.00	0	0.00	2	1.10	1.82	0.12
Tongue	2	2.22	1	2.46	1	3.30	0	0.00	4	1.77	2.25	0.29
Salivary gland	0	0.00	1	6.83	1	10.00	0	0.00	2	0.67	2.99	0.18
Mouth	1	1.16	0	0.00	1	3.87	1	7.26	3	1.62	1.85	0.18
Nasopharynx	0	0.00	0	0.00	1	16.84	0	0.00	1	0.44	2.30	0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.14
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.03
Hypopharynx	0	0.00	1	6.99	0	0.00	1	16.88	2	0.62	3.23	0.18
<b>Digestive system</b>	21	1.22	11	1.42	6	1.03	4	1.11	42	34.31	1.22	1.02
Esophagus	2	1.78	0	0.00	1	2.24	0	0.00	3	2.41	1.25	0.08
Stomach	1	0.52	1	1.22	0	0.00	0	0.00	2	3.69	0.54	-0.22
Small intestine	0	0.00	1	6.01	0	0.00	0	0.00	1	0.73	1.38	0.04
Colon	7	1.06	5	1.70	0	0.00	1	0.71	13	13.13	0.99	-0.02
Rectum, rectosigmoid junction	5	1.48	1	0.66	3	2.61	1	1.43	10	6.75	1.48	0.43
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.08
Liver	1	1.17	1	2.35	0	0.00	0	0.00	2	1.84	1.09	0.02
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.03
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.10
Pancreas	4	2.11	2	2.33	2	3.02	2	4.77	10	3.83	2.61*	0.82
<b>Respiratory system</b>	13	0.87	5	0.74	5	0.98	1	0.31	24	29.87	0.80	-0.78
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.05
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.98	0.00	-0.39
Lung, bronchus	13	1.00	5	0.85	5	1.11	1	0.35	24	26.25	0.91	-0.30
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.05
<b>Male genital system</b>	83	3.70*	21	2.03*	5	0.56	8	1.32	117	47.78	2.45*	9.16
Prostate	20	1.22	3	0.34*	4	0.48	8	1.36	35	39.53	0.89	-0.60
Testis	62	10.58*	18	13.60*	1	1.86	0	0.00	81	7.86	10.31*	9.68
<b>Urinary system</b>	13	1.51	10	2.53*	1	0.33	5	2.62	29	17.49	1.66*	1.52
Urinary bladder	5	0.91	6	2.40	1	0.52	3	2.40	15	11.15	1.35	0.51
Kidney parenchyma	8	2.95*	4	3.09	0	0.00	1	1.74	13	5.57	2.33*	0.98
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	12.46	1	0.77	1.31	0.03
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.03
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.08
<b>Soft tissue including heart</b>	2	1.90	2	5.74	0	0.00	0	0.00	4	1.72	2.32	0.30
<b>Kaposi sarcoma</b>	6	1.14	1	0.64	0	0.00	0	0.00	7	7.45	0.94	-0.06
<b>Melanoma of skin</b>	8	1.08	2	0.69	3	1.58	1	1.04	14	13.19	1.06	0.11
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.06
<b>Brain, central nervous system</b>	4	1.34	2	2.02	1	1.68	0	0.00	7	4.85	1.44	0.29
<b>Thyroid</b>	5	2.85	1	1.68	0	0.00	0	0.00	6	2.86	2.10	0.42
<b>Lymphatic, hematopoietic</b>	23	1.71*	1	0.20	2	0.63	2	1.20	28	23.22	1.21	0.63
Hodgkin lymphoma	2	0.85	0	0.00	0	0.00	1	11.13	3	3.22	0.93	-0.03
Non-Hodgkin lymphoma	8	1.19	1	0.38	0	0.00	0	0.00	9	11.92	0.76	-0.39
Myeloma	0	0.00	0	0.00	2	5.60	0	0.00	2	2.01	0.99	0.00
Leukemia	13	3.79*	0	0.00	0	0.00	1	2.00	14	6.07	2.30*	1.05
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.07
Chronic lymphocytic	2	2.31	0	0.00	0	0.00	1	5.23	3	1.77	1.70	0.16
Acute non-lymphocytic	11	9.34*	0	0.00	0	0.00	0	0.00	11	2.03	5.41*	1.19
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.06	0.00	-0.14

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.2.10:** Risk of subsequent primary cancers after seminoma of the testis, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	8,108		7,525		5,522		3,554		8,108			
<b>Person-years in interval</b>	6,490		25,836		22,554		23,417		78,297			
<b>All subsequent cancers</b>	41	2.70*	142	1.96*	135	1.50*	242	1.39*	560	351.71	1.59*	26.60
All excluding same site	35	2.41*	88	1.26*	110	1.25*	225	1.30*	458	345.12	1.33*	14.42
<b>Buccal cavity, pharynx</b>	2	3.02	1	0.32	4	1.04	6	0.94	13	14.04	0.93	-0.13
Lip	0	0.00	0	0.00	1	1.84	1	1.21	2	1.97	1.01	0.00
Tongue	1	7.15	1	1.47	0	0.00	2	1.34	4	3.16	1.26	0.11
Salivary gland	0	0.00	0	0.00	1	3.44	0	0.00	1	1.10	0.91	-0.01
Mouth	1	6.76	0	0.00	2	2.31	1	0.71	4	3.13	1.28	0.11
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.85	0.00	-0.24
Oropharynx	0	0.00	0	0.00	0	0.00	1	5.36	1	0.39	2.59	0.08
Hypopharynx	0	0.00	0	0.00	0	0.00	1	1.63	1	1.28	0.78	-0.04
<b>Digestive system</b>	4	1.45	23	1.72*	20	1.17	51	1.56*	98	65.85	1.49*	4.11
Esophagus	0	0.00	3	3.40	2	1.68	5	2.02	10	4.73	2.12*	0.67
Stomach	1	3.11	2	1.31	1	0.54	7	2.14	11	6.97	1.58	0.51
Small intestine	0	0.00	2	7.59	0	0.00	0	0.00	2	1.29	1.55	0.09
Colon	1	0.94	6	1.16	4	0.61	12	0.94	23	25.48	0.90	-0.32
Rectum, rectosigmoid junction	1	1.80	7	2.60*	6	1.75	8	1.25	22	13.10	1.68*	1.14
Anus, anal canal	0	0.00	0	0.00	1	4.08	1	2.41	2	0.90	2.21	0.14
Liver	0	0.00	0	0.00	1	1.16	4	2.24	5	3.43	1.46	0.20
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.05
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	2	2.76	2	1.40	1.42	0.08
Pancreas	0	0.00	3	1.98	5	2.60	11	2.95*	19	7.48	2.54*	1.47
<b>Respiratory system</b>	2	0.78	9	0.72	19	1.19	47	1.54*	77	61.42	1.25	1.99
Nose, nasal cavity, ear	0	0.00	1	6.29	0	0.00	1	3.22	2	0.69	2.90	0.17
Larynx	0	0.00	0	0.00	2	1.24	5	1.74	7	6.04	1.16	0.12
Lung, bronchus	2	0.90	8	0.73	17	1.21	41	1.51*	68	54.42	1.25	1.73
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.09
<b>Male genital system</b>	11	3.55*	69	4.50*	53	2.54*	61	1.17	194	91.32	2.12*	13.11
Prostate	5	2.08	15	1.19	28	1.50	44	0.87	92	84.02	1.10	1.02
Testis	6	9.03*	54	21.12*	25	12.76*	17	12.04*	102	6.59	15.47*	12.19
<b>Urinary system</b>	7	5.14*	9	1.35	12	1.39	31	1.83*	59	33.59	1.76*	3.25
Urinary bladder	2	2.28	7	1.63	9	1.62	21	1.89*	39	21.81	1.79*	2.20
Kidney parenchyma	5	11.97*	2	0.97	3	1.12	5	0.98	15	10.26	1.46	0.61
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	5	6.78*	5	1.52	3.29*	0.44
Ureter	0	0.00	0	0.00	0	0.00	2	8.45	2	0.47	4.23	0.20
<b>Bone, joints</b>	0	0.00	1	4.77	0	0.00	0	0.00	1	0.69	1.44	0.04
<b>Soft tissue including heart</b>	0	0.00	0	0.00	3	4.69	2	2.12	5	2.33	2.14	0.34
<b>Kaposi sarcoma</b>	4	6.57*	1	0.38	2	0.84	2	1.09	9	7.44	1.21	0.20
<b>Melanoma of skin</b>	4	4.00*	8	1.73	5	0.95	7	0.84	24	19.17	1.25	0.62
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.10
<b>Brain, central nervous system</b>	2	4.94	3	1.68	3	1.59	4	1.48	12	6.79	1.77	0.67
<b>Thyroid</b>	0	0.00	1	0.98	2	1.93	4	2.87	7	3.69	1.90	0.42
<b>Lymphatic, hematopoietic</b>	5	2.73	16	1.92*	10	1.07	20	1.32	51	34.71	1.47*	2.08
Hodgkin lymphoma	0	0.00	0	0.00	2	2.27	1	1.15	3	3.11	0.97	-0.01
Non-Hodgkin lymphoma	4	4.42*	8	1.89	5	1.03	10	1.28	27	17.79	1.52	1.18
Myeloma	0	0.00	0	0.00	0	0.00	3	1.51	3	3.88	0.77	-0.11
Leukemia	1	2.02	8	3.53*	3	1.14	6	1.32	18	9.92	1.81*	1.03
Acute lymphocytic	0	0.00	1	5.98	0	0.00	0	0.00	1	0.57	1.76	0.06
Chronic lymphocytic	1	7.09	1	1.44	1	1.10	1	0.57	4	3.50	1.14	0.06
Acute non-lymphocytic	0	0.00	5	6.63*	1	1.18	3	2.08	9	3.21	2.80*	0.74
Chronic myeloid	0	0.00	0	0.00	1	2.37	0	0.00	1	1.56	0.64	-0.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Testis

## Testicular Non-seminoma, Males

**Table 10.2.11:** Risk of subsequent primary cancers after non-seminoma of the testis, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	6,459		5,893		4,270		2,932		6,459			
<b>Person-years in interval</b>	5,125		19,805		17,906		20,042		62,878			
<b>All subsequent cancers</b>	9	1.78	54	2.35*	58	1.95*	93	1.35*	214	126.59	1.69*	13.90
All excluding same site	3	0.67	29	1.40	27	0.98	77	1.15	136	119.80	1.14	2.58
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	2	1.62	10	3.51*	12	5.19	2.31*	1.08
Lip	0	0.00	0	0.00	0	0.00	1	2.83	1	0.72	1.39	0.04
Tongue	0	0.00	0	0.00	1	3.49	2	2.87	3	1.23	2.45	0.28
Salivary gland	0	0.00	0	0.00	0	0.00	2	8.57	2	0.46	4.32	0.24
Mouth	0	0.00	0	0.00	0	0.00	2	3.39	2	1.07	1.86	0.15
Nasopharynx	0	0.00	0	0.00	0	0.00	1	6.75	1	0.32	3.15	0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.12
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.02
Hypopharynx	0	0.00	0	0.00	0	0.00	2	8.64	2	0.39	5.15	0.26
<b>Digestive system</b>	0	0.00	5	1.57	4	0.87	18	1.48	27	20.61	1.31	1.02
Esophagus	0	0.00	0	0.00	0	0.00	1	1.08	1	1.48	0.67	-0.08
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	2.19	0.00	-0.35
Small intestine	0	0.00	0	0.00	0	0.00	1	3.60	1	0.48	2.06	0.08
Colon	0	0.00	3	2.53	3	1.77	6	1.34	12	7.60	1.58	0.70
Rectum, rectosigmoid junction	0	0.00	1	1.58	1	1.08	4	1.63	6	4.14	1.45	0.30
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.06
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-0.19
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.02
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.07
Pancreas	0	0.00	0	0.00	0	0.00	6	4.37*	6	2.29	2.62	0.59
<b>Respiratory system</b>	0	0.00	1	0.37	1	0.25	9	0.86	11	17.78	0.62	-1.08
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.04
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.89	0.00	-0.30
Lung, bronchus	0	0.00	1	0.43	1	0.30	9	0.97	11	15.42	0.71	-0.70
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.04
<b>Male genital system</b>	7	7.13*	28	6.45*	35	6.28*	27	1.57*	97	28.06	3.46*	10.96
Prostate	1	2.34	3	1.47	4	1.17	10	0.66	18	21.02	0.86	-0.48
Testis	6	11.00*	25	11.06*	31	14.81*	16	8.46*	78	6.79	11.49*	11.33
<b>Urinary system</b>	1	2.88	4	2.43	1	0.42	9	1.41	15	10.75	1.39	0.68
Urinary bladder	0	0.00	0	0.00	1	0.69	5	1.27	6	6.60	0.91	-0.10
Kidney parenchyma	1	8.64	4	7.13*	0	0.00	4	1.82	9	3.71	2.43*	0.84
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.07
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.02
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	1	3.07	1	2.89	1	1.82	3	1.30	2.31	0.27
<b>Kaposi sarcoma</b>	0	0.00	2	1.18	1	0.47	1	0.47	4	6.28	0.64	-0.36
<b>Melanoma of skin</b>	0	0.00	5	2.39	1	0.39	6	1.25	12	9.93	1.21	0.33
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.05
<b>Brain, central nervous system</b>	1	4.64	1	1.09	1	1.00	2	1.29	5	3.69	1.36	0.21
<b>Thyroid</b>	0	0.00	1	1.80	1	1.62	1	1.04	3	2.26	1.33	0.12
<b>Lymphatic, hematopoietic</b>	0	0.00	6	1.59	9	2.08	5	0.65	20	16.66	1.20	0.53
Hodgkin lymphoma	0	0.00	0	0.00	1	1.28	1	1.30	2	2.71	0.74	-0.11
Non-Hodgkin lymphoma	0	0.00	0	0.00	3	1.31	1	0.24	4	8.64	0.46	-0.74
Myeloma	0	0.00	0	0.00	0	0.00	2	2.70	2	1.21	1.65	0.12
Leukemia	0	0.00	6	6.76*	5	4.95*	1	0.51	12	4.09	2.94*	1.26
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.07
Chronic lymphocytic	0	0.00	1	6.65	0	0.00	1	1.56	2	1.05	1.90	0.15
Acute non-lymphocytic	0	0.00	5	15.50*	5	14.31*	0	0.00	10	1.39	7.21*	1.37
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 10.3.1:** Characteristics of patients with an initial cancer of the penis, males, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	1,808	100.0	—	—	1,808	100.0
<b>Initial treatment</b>						
Any radiation	212	11.7	—	—	212	11.7
With surgery	157	8.7	—	—	157	8.7
Without surgery	55	3.0	—	—	55	3.0
No radiation	1,596	88.3	—	—	1,596	88.3
With surgery	1,517	83.9	—	—	1,517	83.9
Without surgery	79	4.4	—	—	79	4.4
<b>Race</b>						
White	1,547	85.6	—	—	1,547	85.6
Black	174	9.6	—	—	174	9.6
Other	72	4.0	—	—	72	4.0
Unknown	15	0.8	—	—	15	0.8
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	13	0.7	—	—	13	0.7
30–49	241	13.3	—	—	241	13.3
50–69	816	45.1	—	—	816	45.1
70–79	480	26.5	—	—	480	26.5
≥ 80	258	14.3	—	—	258	14.3
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	1,545	85.5	—	—	1,545	85.5
1st and 2nd cancers	233	12.9	—	—	233	12.9
1st, 2nd, and 3rd cancers	30	1.7	—	—	30	1.7
1st, 2nd, 3rd, and additional cancers	0	0.0	—	—	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	66.8	—	—	—	66.8	—
Median year of 1st cancer diagnosis	1986.6	—	—	—	1986.6	—
Median person-years at risk	4.6	—	—	—	4.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	92.8	—	—	—	92.8
1st, 2nd, and additional cancers	—	92.8	—	—	—	92.8
1st cancer only	—	4.9	—	—	—	4.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



**Table 10.3.2:** Risk of subsequent primary cancers after cancer of the penis, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	1,808		1,511		887		447		1,808			
<b>Person-years in interval</b>	1,371		4,513		3,218		2,799		11,901			
<b>All subsequent cancers</b>	52	1.94*	96	1.02	78	1.07	67	0.98	293	262.20	1.12	25.88
All excluding same site	51	1.91*	94	1.00	78	1.07	66	0.96	289	261.78	1.10	22.87
<b>Buccal cavity, pharynx</b>	4	4.85*	4	1.45	6	3.01*	3	1.73	17	7.31	2.33*	8.14
Lip	0	0.00	0	0.00	1	2.59	0	0.00	1	1.41	0.71	-0.35
Tongue	1	6.67	2	3.96	1	2.68	1	2.99	5	1.36	3.67*	3.06
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.54
Mouth	1	5.08	1	1.53	1	2.14	1	2.53	4	1.71	2.34	1.92
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.21
Tonsil	0	0.00	0	0.00	2	11.13*	0	0.00	2	0.66	3.02	1.12
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.17
Hypopharynx	1	10.99	0	0.00	1	4.55	0	0.00	2	0.80	2.49	1.01
<b>Digestive system</b>	7	1.15	19	0.91	15	0.94	18	1.27	59	57.15	1.03	1.55
Esophagus	0	0.00	2	1.61	0	0.00	2	2.23	4	3.44	1.16	0.47
Stomach	0	0.00	0	0.00	2	1.09	2	1.29	4	6.61	0.61	-2.19
Small intestine	0	0.00	0	0.00	1	4.65	0	0.00	1	0.77	1.29	0.19
Colon	5	1.90	11	1.20	4	0.56	5	0.79	25	25.17	0.99	-0.15
Rectum, rectosigmoid junction	1	0.91	3	0.80	2	0.72	5	2.08	11	9.99	1.10	0.85
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.30
Liver	0	0.00	0	0.00	2	3.44	2	3.47	4	2.14	1.87	1.57
Gallbladder	0	0.00	0	0.00	2	14.42*	0	0.00	2	0.50	4.03	1.26
Bile ducts, other biliary	0	0.00	0	0.00	1	2.88	0	0.00	1	1.25	0.80	-0.21
Pancreas	1	1.43	3	1.26	1	0.55	1	0.63	6	6.49	0.93	-0.41
<b>Respiratory system</b>	13	2.46*	30	1.64*	24	1.74*	18	1.47	85	49.55	1.72*	29.79
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.32
Larynx	2	4.79	1	0.71	2	1.94	1	1.13	6	3.75	1.60	1.89
Lung, bronchus	11	2.29*	29	1.74*	22	1.74*	17	1.51	79	45.30	1.74*	28.32
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.42
<b>Male genital system</b>	15	1.87*	25	0.87	14	0.60	20	0.86	74	83.46	0.89	-7.95
Prostate	13	1.64	23	0.81	14	0.60	19	0.82	69	82.66	0.83	-11.48
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.20
<b>Urinary system</b>	6	2.29	6	0.65	5	0.70	4	0.59	21	25.76	0.82	-4.00
Urinary bladder	2	1.04	5	0.74	2	0.38	4	0.81	13	18.92	0.69	-4.98
Kidney parenchyma	4	7.39*	1	0.53	1	0.67	0	0.00	6	5.38	1.12	0.52
Renal pelvis, other urinary	0	0.00	0	0.00	2	4.92	0	0.00	2	1.46	1.37	0.45
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.41
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.17
<b>Soft tissue including heart</b>	1	9.74	0	0.00	0	0.00	0	0.00	1	0.99	1.01	0.01
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	8.65	0	0.00	1	0.41	2.43	0.49
<b>Melanoma of skin</b>	1	1.87	3	1.54	2	1.25	1	0.58	7	5.80	1.21	1.01
<b>Eye, orbit</b>	0	0.00	0	0.00	1	10.21	0	0.00	1	0.35	2.83	0.54
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.39	0.00	-2.01
<b>Thyroid</b>	1	12.31	1	3.61	0	0.00	0	0.00	2	0.75	2.65	1.05
<b>Lymphatic, hematopoietic</b>	3	1.53	5	0.73	8	1.49	2	0.40	18	19.27	0.93	-1.06
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.47
Non-Hodgkin lymphoma	1	1.27	3	1.07	4	1.78	0	0.00	8	8.04	0.99	-0.04
Myeloma	0	0.00	1	0.83	0	0.00	1	1.14	2	3.37	0.59	-1.15
Leukemia	2	2.61	1	0.38	4	1.96	1	0.54	8	7.29	1.10	0.59
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.15
Chronic lymphocytic	1	3.20	0	0.00	2	2.41	0	0.00	3	2.97	1.01	0.03
Acute non-lymphocytic	0	0.00	1	1.16	2	2.99	0	0.00	3	2.39	1.26	0.52
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	3.94	1	0.99	1.01	0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Chapter 11

## New Malignancies Following Cancer of the Urinary Tract

Robin Taylor Wilson, Debra T. Silverman, Joseph F. Fraumeni Jr., Rochelle E. Curtis

### Synopsis

The risk of subsequent primary cancer was assessed in 137,571 patients with a first primary cancer of the urinary tract diagnosed during 1973-2000. Overall risk of new malignancy was significantly increased among patients with an initial cancer of the bladder (O/E=1.17,<sup>1</sup> O=14,568, EAR=34 per 10,000 person-years), kidney (O/E=1.13, O=3,570, EAR=23), and renal pelvis/ureter (O/E=1.29,<sup>1</sup> O=935, EAR=55). Patients with cancers of the urinary bladder and renal pelvis/ureter had elevated risks of subsequent cancers of the respiratory tract, probably related to tobacco smoking, and pronounced excesses of tumors of the urinary tract due to the multifocal nature of transitional cell carcinomas. Bladder cancer was also associated with significant excesses of cancers of the pancreas, prostate, vagina, and kidney, as well as acute leukemia. Some of these cancers may be related to increased medical surveillance (e.g., prostate, kidney) or a rare consequence of treatment (e.g., leukemia). Patients with an initial cancer of the kidney parenchyma were at increased risk for a variety of subsequent primary cancers, including cancers of the kidney, ureter, bladder, prostate, and thyroid, as well as melanoma and leukemia. Increased medical and urologic surveillance, and shared risk factors, including genetic predisposition, may contribute in various degrees to these patterns. Patients with renal pelvis/ureter cancers were also prone to develop cancers of the breast and colon. The excess of colon tumors was concentrated among younger patients in a pattern suggesting the syndrome of hereditary nonpolyposis colorectal cancer.

### Bladder Cancer

Cancers of the urinary bladder (including both invasive and *in situ* tumors) constitute nearly 5% of all incident cancers and 2% of cancer deaths, with approximately 63,000 new cases diagnosed annually in the U.S. (Jemal et al, 2005). Bladder cancer occurs about 3 times more fre-

quently among men than women and is the fourth most commonly diagnosed cancer among men. The overall 5-year and 10-year relative survival rates are 81.6% and 76.5%, with higher survival rates in men compared with women, and among whites compared with blacks. Standard initial treatment for superficial lesions is a complete cystoscopic resection (Herr et al, 2001). Intravesical treatments with chemotherapeutic or immunologic agents are frequently used to prevent recurrences. Typical therapy for muscle-infiltrating tumors is radical cystectomy, which may be combined with chemotherapy or radiation in selected cases.

The overwhelming majority of cancers of the bladder and renal pelvis/ureter are transitional cell carcinomas. Multifocal cancers tend to develop along the transitional epithelial lining, with new tumors sometimes occurring several decades after the initial cancer diagnosis (Sharir and Jewett, 1999; Rabbani et al, 2001). SEER rules prohibit reporting of a subsequent bladder cancer following a diagnosis of an initial bladder cancer (with the exception of invasive bladder cancer following *in situ* bladder cancer), but subsequent tumors of the renal pelvis or ureter following an initial bladder cancer are recorded in the SEER database. Because assessment of subsequent cancer risk is complicated by the different methods of recording multifocal tumors, we present the overall O/E ratios for bladder cancer and cancers of the renal pelvis/ureter excluding the observed and expected numbers of subsequent primary cancers of the renal pelvis, ureter, bladder, urethra, and other urinary organs (except kidney parenchyma).

Tobacco smoking and occupational exposure to aromatic amines are the main risk factors for bladder cancer (Silverman et al, 1999). Tobacco use accounts for the greatest share of cases—approximately 50% to 65% among men and 20% to 30% among women. Much less common risk factors include cyclophosphamide chemotherapy, phenacetin-containing analgesics, ionizing radiation, and high levels of inorganic arsenic in drinking water.

### Results and Discussion

A total of 14,568 subsequent primary cancers (excluding cancers of the renal pelvis/ureter, bladder, and other

<sup>1</sup>Observed-to-expected ratios for patients with cancers of the renal pelvis/ureter and urinary bladder exclude subsequent primary cancers of the renal pelvis, ureter, bladder, urethra, and other and unspecified urinary organs.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

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urinary organs) were observed among 94,383 patients who had survived 2 months or more after an invasive or *in situ* bladder cancer (O/E=1.17, 95% CI=1.15-1.19, EAR=34 per 10,000 person-years). The cumulative incidence of all second cancers combined was 22.6% at 25 years (competing risk analyses, 95% CI=22.2%-23.0%), with a 1.1% incidence seen for new cancers of the renal pelvis/ureter and other urinary organs. Subsequent cancer risks were significantly elevated during the first 10 years of follow-up but then decreased among long-term survivors. Risks were somewhat higher among blacks (O/E=1.31, EAR=66) than whites (O/E=1.17, EAR=33) but were similar among males and females. Although relative risks were greater for those diagnosed at ages less than 50 years compared with patients age 70 years or older (O/E=1.30 versus 1.11), excess absolute risks were lower (EAR=16 versus 31). In addition to the pronounced excesses seen for subsequent cancers of the renal pelvis/ureter, we found significantly increased risks for subsequent cancers of the pancreas, larynx, lung, vagina, prostate, and kidney, as well as for acute non-lymphocytic leukemia (ANLL). Significant deficits of subsequent non-Hodgkin lymphoma and bladder cancer were seen, the latter reflecting SEER rules for reporting multiple tumors of the bladder. These results are generally consistent with previous studies (Jensen et al, 1985; Kantor and McLaughlin, 1985; Greven et al, 1992; Salminen et al, 1994; Crocetti et al, 2001; Dong and Hemminki, 2001; Rabbani et al, 2001), including previous SEER analyses (Ahsan et al, 1995; Neugut et al, 1995).

It is not surprising that the cancer risks were significantly elevated for several smoking-related sites, such as the lung, larynx, pancreas, and kidney. New tumors of the respiratory tract constituted 67% of the excess cancers outside the urinary tract, with risks for lung cancer being significantly increased for more than 2 decades following initial diagnosis of bladder cancer ( $\geq 20$  years, O/E=1.57). Consistent with previous reports, we found higher relative risks for subsequent cancers of the lung among women compared with men (Teppo et al, 1985; Salminen et al, 1994; Crocetti et al, 2001), but risks were similar when measured on an absolute scale. Differences in the relative risk by gender may be due to the historically lower smoking rates among women and consequent lower baseline risks for respiratory tract cancers in the female population.

A total of 838 subsequent tumors of the renal pelvis, ureter, urethra, and other urinary organs were reported following cancer of the bladder, with increased risks persisting at a high level for more than 20 years. The well-known tendency to develop multifocal tumors affecting the renal pelvis, ureter, and bladder has been attributed to smoking-related field defects of the transitional cell epithelium (Sharir and Jewett, 1999), although several molecular studies have implicated the seeding and implantation of a single transformed epithelial cell clone (Muto et al, 2000; Vriesema et al, 2001). In addition, close medical surveillance may have contributed to the ele-

vated risks seen for subsequent kidney cancer and other cancers of the urinary tract.

Increased risk for ANLL following bladder cancer is consistent with reports implicating cisplatin-based chemotherapy combined with radiotherapy (Theodore et al, 2002). Increased medical surveillance may explain the 3-fold risk of subsequent prostate cancer seen in the first year of follow-up, which declined to below-normal levels in later time intervals. The reasons for the elevated risk of subsequent vaginal cancer are unclear; risk rose over time to reach 3- to 4-fold among survivors of 5 or more years, but the excess did not appear to be associated with initial treatment.

## Cancer of the Kidney Parenchyma

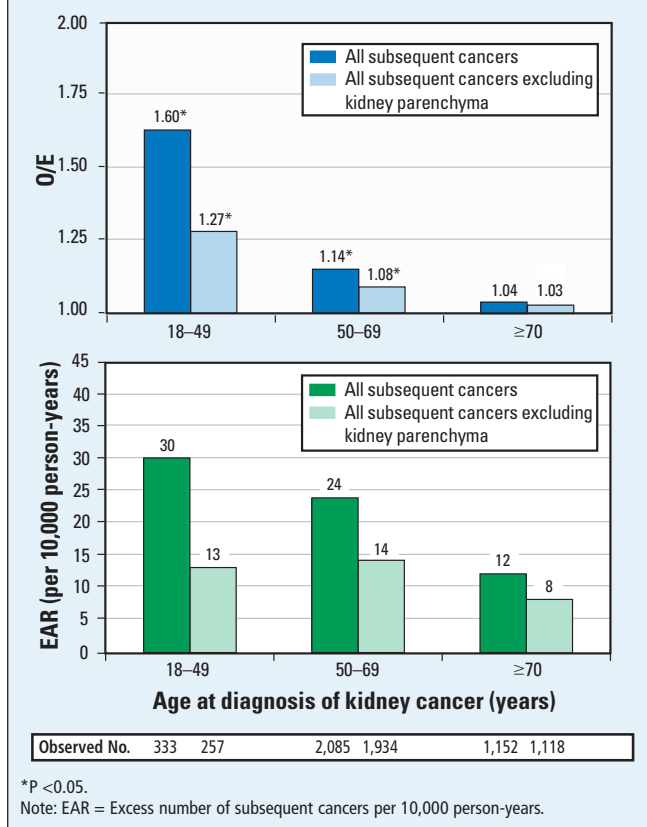
Cancers of the kidney parenchyma are the most fatal of adult cancers of the urinary tract. Incidence rates have been increasing over the last 30 years in the U.S., particularly among blacks (Chow et al, 1999). Kidney cancer patients represent about 2% of all cancer diagnoses and 2% of cancer deaths (Jemal et al, 2005). Excluding Wilms tumor and other childhood tumors of the kidney, discussed elsewhere in this volume, the 5-year relative survival rate for patients with cancers of the kidney parenchyma is 64.6%. Nearly all cancers originating in the kidney parenchyma are renal cell carcinomas (RCC). An estimated 85% of RCC are classified as the clear cell type, and another 10% are papillary (Linehan et al, 2001). Radical nephrectomy is standard treatment for renal cancer (Linehan et al, 2001). RCC is generally considered resistant to most chemotherapeutic agents; however, biologic therapy (interferon, interleukin-2) is widely used, particularly in the treatment of metastatic disease. Radiotherapy is infrequently used as an initial treatment (12% in SEER).

The major risk factors for RCC include smoking, obesity, and hypertension (McLaughlin et al, 1995, 1996; Benichou et al, 1998; Chow et al, 2000). An estimated 20% to 40% of RCC among men and 10% to 20% among women are caused by tobacco smoking, while an estimated 20% are attributable to excess weight. Although an uncommon risk factor, dialysis has been associated with a 3- to 26-fold excess risk compared with the general population (Stewart et al, 2003). Several heritable syndromes account for approximately 5% of cases of RCC, most notably von Hippel-Lindau (VHL) syndrome; nearly half of VHL patients develop multifocal or bilateral RCC in addition to a constellation of other tumors and cystic lesions (Linehan et al, 2003).

## Results and Discussion

Overall, 3,570 subsequent primary cancers were observed among 36,835 patients who survived 2 months or more after cancer of the kidney parenchyma (excluding childhood cancers, ages <18 years), reflecting an overall 13% elevated risk compared with the general population (O/E=1.13, 95% CI=1.10-1.17, EAR=23). This

**Figure 11.1:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after cancer of the kidney parenchyma, both sexes, SEER 1973-2000.

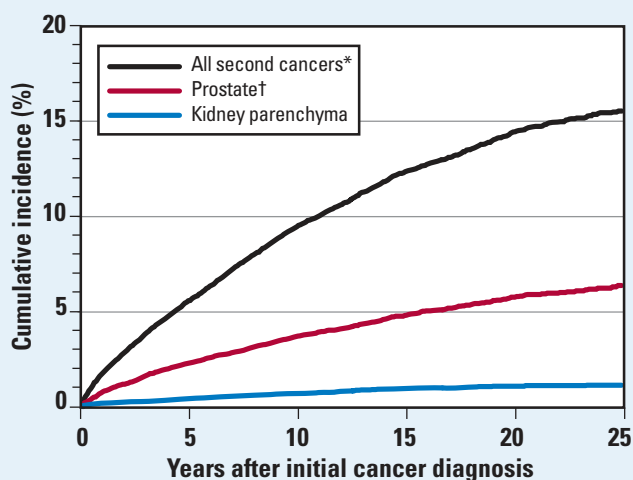


overall risk decreased after subsequent cancers of the kidney parenchyma were excluded (O/E=1.07, 95% CI=1.04-1.11, EAR=12), and an increased risk of only 5% was seen when the index cancer was limited to RCC (O/E=1.05 excluding subsequent kidney cancers, 95% CI=1.01-1.09, EAR=8). Relative risks were highest among those diagnosed with kidney cancer from ages 18 to 49 years for all new malignancies (O/E=1.60) and for all cancers excluding kidney cancer (O/E=1.27), although excess risks on an absolute scale were similar across age groups (excluding subsequent kidney cancer) (Figure 11.1). Overall risks of new malignancies were not substantially different by gender, but risks were slightly higher for blacks compared with whites (O/E=1.17 versus 1.06, excluding subsequent kidney cancer). The cumulative incidence of developing any subsequent cancer following cancer of the kidney parenchyma was 15.3% at 25 years (95% CI=14.7%-15.9%), including a 1.1% incidence of second kidney cancer (Figure 11.2). Our results are similar to previous studies indicating an elevated risk of subsequent cancers of the prostate, bladder, kidney, ureter, and thyroid, as well as melanoma, and overall deficits of cancers of the oral cavity and pharynx, larynx, and ovary (Jensen et al, 1985; Kantor and McLaughlin, 1985; Teppo et al, 1985; Kantor et al, 1986; Begg et al, 1995; McCredie et al, 1996; Rabbani et al, 1998, 2000), including an earlier SEER report (Rabbani et al, 2002).

Subsequent cancers of the kidney parenchyma accounted for the largest excess of new malignancies among patients with an initial kidney cancer. Risks of new malignancies of the kidney, including the contralateral kidney, were substantially higher among blacks (O/E=9.85, EAR=30) than whites (O/E=3.49, EAR=9), a finding attributed in earlier studies to the higher prevalence of obesity, hypertension, and end-stage renal disease among blacks than whites (Martins et al, 2002; Rabbani et al, 2002). Patients diagnosed with kidney cancer at ages 18 to 49 were particularly prone to develop a new kidney cancer (O/E=13.25), suggesting the influence of genetic susceptibility (Linehan et al, 2003). Among all patients combined, the risk of developing a new kidney cancer was greatest in the first year of follow-up (more than 7-fold), presumably related to heightened screening, but the increased risk remained elevated (3- to 4-fold) for more than 20 years after initial diagnosis. Increased urologic surveillance may have contributed to the excess of cancers of the bladder and ureter, because elevated risks were limited to the early years of follow-up.

Kidney cancer patients experienced a 3-fold elevated risk of subsequent thyroid cancer, consistent with a previous survey (Teppo et al, 1985). Heightened medical surveillance may be involved, since 20% of the thyroid tumors were first diagnosed at autopsy. In addition, risk was increased, especially in the first year of follow-up (O/E=7.57, O=15), then decreased to near-normal levels among survivors of 10 years or more. However, reciprocal increases in the risk of subsequent kidney cancer were seen following thyroid cancer in the SEER data (Ronckers et al, 2005) and in other studies (Hemminki and Jiang, 2001; Rubino et al, 2003), suggesting a role of shared risk factors, such as described with the heritable syndrome of papillary thyroid cancer and papillary

**Figure 11.2:** Cumulative incidence of developing a second cancer among patients with cancer of the kidney parenchyma, both sexes, ages ≥18 years, SEER 1973-2000.



\* Cumulative incidence for all second cancers at 25 years is 16.9% for males and 12.3% for females.

† Prostate cancer curve is based on male kidney cancer patients only.



RCC (Takahashi et al, 2002). Another consideration is that kidney cancers occasionally metastasize to the thyroid (Koo et al, 2004), even decades after initial RCC diagnosis.

It is difficult to explain the elevated risk for other cancers. Risks for subsequent melanoma of the skin were highest in the first year after kidney cancer diagnosis (O/E=1.89). Although significant excesses of melanoma have not been reported in previous studies of kidney cancer (Jensen et al, 1985; Kantor and McLaughlin, 1985; Levi et al, 1993), a reciprocal excess risk of kidney cancer was seen following melanoma in the SEER data, mainly in the early years of follow-up. In addition, an increased incidence of subsequent leukemia was found among patients with RCC, especially 1-4 years after initial diagnosis (O/E=1.63, O=45), but the risks were related to several subtypes of leukemia. The excess of prostate cancer was mainly in the first year of follow-up, consistent with urologic surveillance and detection of early-stage tumors.

The decreased risk of subsequent ovarian cancers we observed among kidney cancer patients has been reported in previous surveys, although based on small numbers (Jensen et al, 1985; Kantor et al, 1986; McCredie et al, 1996). Epidemiologic studies linking RCC to hormonal factors are inconclusive, but a small excess of renal cell cancer has been associated in some studies with increased parity (Chow et al, 1995), which reduces the risk of ovarian cancer. We also found deficits of several smoking-related cancers (e.g., buccal cavity and larynx) following kidney cancer, as seen in earlier studies (Jensen et al, 1985; Teppo et al, 1985; Kantor et al, 1986; McCredie et al, 1996). These results are surprising because smoking increases the risk of kidney cancer, although the relative risk is less than that seen for cancers of the bladder and renal pelvis.

## Cancers of the Renal Pelvis and Ureter

Cancers of the renal pelvis and ureter are rare, constituting only 5% to 7% of urinary tract cancers in SEER. About 90% of cancers of the renal pelvis/ureter arise from the transitional cell epithelium. Incidence is 2.5 times higher in men than women and is greater among whites than blacks. The 5-year relative survival rate is 55.3%. Because of the recurrent and multifocal nature of these tumors, nephroureterectomy (excision of the kidney, renal pelvis, and ureter) with bladder cuff excision is considered standard treatment (Kirkali and Tuzel, 2003). Chemotherapy and radiotherapy are used less frequently.

Established risk factors for renal pelvis cancer include tobacco use and heavy use of phenacetin-containing analgesics (McLaughlin et al, 1996). Smoking is thought to explain 70% to 80% of cases in men and 40% to 60% in women. Moreover, ionizing radiation has been shown to induce cancers of the renal pelvis and ureter (Boice et al, 1989).

## Results and Discussion

Among 6,353 patients who survived 2 months or more following diagnosis of cancers of the renal pelvis or ureter, 935 subsequent primary cancers (excluding cancers of the renal pelvis/ureter, bladder, and other urinary organs) were observed (O/E=1.29, 95% CI=1.21-1.38, EAR=55). The cumulative incidence of developing any second cancer at 25 years was 31.1% (95% CI=29.8%-32.5%), with a 16.2% incidence attributable to new tumors of the bladder and other urinary organs. Observed-to-expected ratios of subsequent cancers remained elevated over 15 years of follow-up and then decreased. Blacks appeared to be more prone to develop new malignancies than whites (O/E=2.06 versus 1.27), and females had slightly greater risks than males (O/E=1.44 versus 1.23). Relative risks were somewhat higher among those diagnosed at ages less than 60 years, although excess absolute risks of subsequent cancers were not appreciably different. Significantly increased risks were seen for new cancers of the colon, lung, and female breast, in addition to exceptionally high risks for subsequent tumors of the bladder and other urinary tract organs—a pattern generally consistent with previous reports (Kantor et al, 1986; McCredie et al, 1996).

The 2-fold increased risk of subsequent lung cancer following cancers of the renal pelvis/ureter can be attributed to cigarette smoking, a potent risk factor for both cancer sites (Kantor et al, 1986). The excess lung cancer risk did not decrease with time and persisted among long-term survivors ( $\geq 10$  years, O/E=2.11).

The elevated risk for subsequent cancers of the renal pelvis, ureter, and bladder varied from 19- to 27-fold, consistent with the multicentric nature of urothelial tumors. The relative risk of subsequent bladder cancer was higher among females than males (O/E=46.81 versus 15.31), a finding resembling other studies (Kirkali and Tuzel, 2003), whereas the excess absolute risks were similar (EAR=223 for females and 251 for males).

The excess of subsequent colon cancer was greater among renal pelvis/ureter patients diagnosed at less than 60 years of age (O/E=3.06, EAR=19), as compared with those at older ages (O/E=1.32, EAR=9). Reciprocally increased risks of renal pelvis/ureter cancer were also seen among younger colon cancer patients in SEER (ages <60 years, O/E=3.63), and similar elevations in risk have been reported in at least one other registry-based study (McCredie et al, 1997). This association is possibly related to the syndrome of hereditary nonpolyposis colon cancer, which predisposes to certain extra-colonic tumors, including cancers of the renal pelvis and ureter (Umar et al, 2004).

In women, risk of breast cancer among renal pelvis/ureter cancer patients was elevated (O/E=1.28, EAR=11), making up 17% of the excess subsequent cancers among women (excluding cancers of the bladder, renal pelvis/ureter, and other urinary organs). This association has not been reported previously. Since

reciprocally elevated risks of renal pelvis/ureter cancer were not seen following breast cancer, this observation may be due to chance.

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**Table 11.1.1:** Characteristics of patients with an initial cancer of the urinary bladder, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	70,354	100.0	24,029	100.0	94,383	100.0
<b>Initial treatment</b>						
Any radiation	6,515	9.3	2,692	11.2	9,207	9.8
With surgery	5,761	8.2	2,272	9.5	8,033	8.5
Without surgery	754	1.1	420	1.7	1,174	1.2
No radiation	63,839	90.7	21,337	88.8	85,176	90.2
With surgery	60,692	86.3	19,963	83.1	80,655	85.5
Without surgery	3,147	4.5	1,374	5.7	4,521	4.8
<b>Race</b>						
White	65,498	93.1	21,885	91.1	87,383	92.6
Black	2,473	3.5	1,319	5.5	3,792	4.0
Other	2,068	2.9	723	3.0	2,791	3.0
Unknown	315	0.4	102	0.4	417	0.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	417	0.6	202	0.8	619	0.7
30–49	5,172	7.4	1,596	6.6	6,768	7.2
50–69	31,687	45.0	9,100	37.9	40,787	43.2
70–79	22,057	31.4	7,287	30.3	29,344	31.1
≥ 80	11,021	15.7	5,844	24.3	16,865	17.9
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	58,790	83.6	21,336	88.8	80,126	84.9
1st and 2nd cancers	10,373	14.7	2,454	10.2	12,827	13.6
1st, 2nd, and 3rd cancers	1,072	1.5	218	0.9	1,290	1.4
1st, 2nd, 3rd, and additional cancers	119	0.2	21	0.1	140	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	69.2	—	71.5	—	69.7	—
Median year of 1st cancer diagnosis	1988.4	—	1988.3	—	1988.4	—
Median person-years at risk	4.8	—	4.6	—	4.8	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.0	—	93.4	—	94.7
1st, 2nd, and additional cancers	—	94.5	—	93.1	—	94.2
1st cancer only	—	4.5	—	6.0	—	4.8

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Bladder Both Sexes

**Table 11.1.2:** Risk of subsequent primary cancers after cancer of the urinary bladder, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,529	1.78*	5,953	1.18*	4,123	1.08*	3,236	1.02	15,841	13,460.89	1.18*	38.33
All excluding same site	2,247	1.71*	5,454	1.17*	3,827	1.08*	3,040	1.03	14,568	12,478.28	1.17*	33.65
<b>Buccal cavity, pharynx</b>	32	0.83	141	1.06	93	0.99	63	0.88	329	336.93	0.98	-0.13
Lip	5	0.66	27	1.05	14	0.78	10	0.76	56	64.30	0.87	-0.13
Tongue	2	0.28	18	0.72	21	1.17	18	1.30	59	63.81	0.92	-0.08
Salivary gland	2	0.60	13	1.09	6	0.65	8	1.01	29	32.33	0.90	-0.05
Mouth	7	0.73	41	1.25	24	1.04	15	0.87	87	82.59	1.05	0.07
Nasopharynx	1	0.77	6	1.37	3	0.99	4	1.79	14	10.96	1.28	0.05
Tonsil	1	0.30	15	1.32	8	1.02	3	0.52	27	28.25	0.96	-0.02
Oropharynx	3	2.91	3	0.85	5	1.98	1	0.52	12	9.02	1.33	0.05
Hypopharynx	6	1.52	14	1.03	10	1.06	2	0.30	32	33.74	0.95	-0.03
<b>Digestive system</b>	384	1.19*	1,172	1.03	854	1.00	678	0.98	3,088	3,003.90	1.03	1.35
Esophagus	14	0.86	45	0.78	41	0.95	43	1.19	143	152.94	0.93	-0.16
Stomach	48	1.35	145	1.19*	79	0.89	67	0.96	339	315.71	1.07	0.38
Small intestine	8	1.97	11	0.76	12	1.06	12	1.21	43	39.82	1.08	0.05
Colon	170	1.16	506	0.98	418	1.06	316	0.98	1,410	1,379.00	1.02	0.50
Rectum, rectosigmoid junction	51	0.89	215	1.08	126	0.87	103	0.91	495	514.99	0.96	-0.32
Anus, anal canal	1	0.43	12	1.45	7	1.12	6	1.15	26	22.10	1.18	0.06
Liver	15	1.41	44	1.17	21	0.73	20	0.80	100	102.28	0.98	-0.04
Gallbladder	5	1.29	10	0.76	11	1.13	7	0.90	33	34.60	0.95	-0.03
Bile ducts, other biliary	8	1.16	24	0.97	24	1.23	15	0.85	71	68.81	1.03	0.04
Pancreas	58	1.54*	147	1.12	111	1.13	81	1.00	397	347.71	1.14*	0.79
<b>Respiratory system</b>	333	1.30*	1,448	1.61*	1,081	1.62*	899	1.68*	3,761	2,359.11	1.59*	22.58
Nose, nasal cavity, ear	3	1.43	5	0.68	8	1.48	6	1.36	22	19.23	1.14	0.04
Larynx	23	1.26	83	1.32*	59	1.32*	44	1.34	209	158.34	1.32*	0.82
Lung, bronchus	306	1.31*	1,357	1.64*	1,013	1.64*	848	1.70*	3,524	2,175.69	1.62*	21.71
<b>Female breast</b>	68	1.04	217	0.96	168	0.95	154	0.98	607	625.24	0.97	-1.16
<b>Female genital system</b>	39	1.30	94	0.93	65	0.86	69	1.08	267	270.39	0.99	-0.22
Cervix uteri	4	1.25	5	0.49	4	0.58	3	0.59	16	25.20	0.63	-0.58
Corpus uteri	20	1.31	45	0.87	24	0.63*	38	1.20	127	136.63	0.93	-0.61
Ovary	12	1.37	30	1.00	22	0.96	17	0.85	81	81.79	0.99	-0.05
Vagina	0	0.00	3	1.75	5	3.87*	4	3.59	12	4.63	2.59*	0.47
Vulva	1	0.64	7	1.29	8	1.84	5	1.22	21	15.44	1.36	0.35
<b>Male genital system</b>	1,083	3.01*	1,459	1.11*	901	0.88*	638	0.73*	4,081	3,567.57	1.14*	11.08
Prostate	1,079	3.03*	1,444	1.11*	891	0.87*	634	0.73*	4,048	3,536.05	1.14*	11.05
Testis	2	1.78	5	1.35	3	1.27	2	1.31	12	8.73	1.37	0.07
<b>Urinary system</b>	360	2.76*	653	1.41*	380	1.07	277	0.93	1,670	1,246.06	1.34*	6.83
Urinary bladder	118	1.24*	186	0.55*	71	0.27*	60	0.28*	435	909.02	0.48*	-7.63
Kidney parenchyma	78	2.84*	154	1.57*	84	1.12	81	1.29*	397	263.45	1.51*	2.15
Renal pelvis, other urinary	164	20.45*	313	11.15*	225	10.82*	136	8.14*	838	73.59	11.39*	12.31
Ureter	62	22.77*	118	12.35*	104	14.68*	55	9.83*	339	24.96	13.58*	5.06
<b>Bone, joints</b>	4	3.45	7	1.75	3	1.04	1	0.44	15	10.32	1.45	0.08
<b>Soft tissue including heart</b>	6	1.12	12	0.64	17	1.18	26	2.09*	61	50.97	1.20	0.16
<b>Kaposi sarcoma</b>	3	1.71	2	0.32	1	0.22	4	1.16	10	15.97	0.63	-0.10
<b>Melanoma of skin</b>	27	0.91	111	1.02	80	0.92	69	0.88	287	303.23	0.95	-0.26
<b>Eye, orbit</b>	2	0.97	7	0.98	4	0.76	4	0.94	17	18.77	0.91	-0.03
<b>Brain, central nervous system</b>	13	0.97	54	1.14	37	1.05	19	0.67	123	124.43	0.99	-0.02
<b>Thyroid</b>	9	1.72	16	0.89	11	0.84	9	0.85	45	47.03	0.96	-0.03
<b>Lymphatic, hematopoietic</b>	112	1.06	369	0.98	282	0.97	226	0.92	989	1,017.03	0.97	-0.45
Hodgkin lymphoma	5	1.55	13	1.20	14	1.86*	5	0.88	37	27.26	1.36	0.16
Non-Hodgkin lymphoma	48	1.07	153	0.95	112	0.88	89	0.80*	402	443.90	0.91*	-0.67
Myeloma	14	0.78	55	0.87	44	0.91	39	0.96	152	169.87	0.89	-0.29
Leukemia	45	1.12	148	1.05	112	1.05	93	1.06	398	376.01	1.06	0.35
Acute lymphocytic	0	0.00	1	0.28	3	1.11	5	2.38	9	9.41	0.96	-0.01
Chronic lymphocytic	17	1.04	50	0.87	33	0.76	30	0.86	130	151.84	0.86	-0.35
Acute non-lymphocytic	17	1.29	57	1.22	49	1.38*	36	1.20	159	125.23	1.27*	0.54
Chronic myeloid	5	0.93	22	1.17	17	1.19	14	1.16	58	50.60	1.15	0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 157,730 PYR and for male cancers on 463,222 PYR.

**Table 11.1.3:** Risk of subsequent primary cancers after cancer of the urinary bladder, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	400	1.63*	1,086	1.28*	779	1.18*	689	1.16*	2,954	2,341.29	1.26*	38.85
All excluding same site	328	1.39*	994	1.22*	730	1.15*	655	1.15*	2,707	2,257.40	1.20*	28.50
<b>Buccal cavity, pharynx</b>	3	0.69	14	0.94	13	1.15	9	0.92	39	40.18	0.97	-0.07
Lip	0	0.00	1	0.88	2	2.20	2	2.35	5	3.23	1.55	0.11
Tongue	1	1.06	3	0.93	3	1.21	1	0.47	8	8.81	0.91	-0.05
Salivary gland	0	0.00	1	0.60	0	0.00	1	0.86	2	4.60	0.43	-0.16
Mouth	2	1.30	5	0.95	5	1.24	3	0.85	15	14.35	1.05	0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	1	3.08	1	1.39	0.72	-0.02
Tonsil	0	0.00	3	2.56	1	1.18	0	0.00	4	3.02	1.32	0.06
Oropharynx	0	0.00	1	2.80	0	0.00	0	0.00	1	0.94	1.07	0.00
Hypopharynx	0	0.00	0	0.00	2	2.89	0	0.00	2	2.46	0.81	-0.03
<b>Digestive system</b>	94	1.48*	242	1.12	175	1.04	141	0.94	652	599.15	1.09*	3.35
Esophagus	0	0.00	3	0.55	6	1.40	6	1.54	15	15.31	0.98	-0.02
Stomach	10	1.92	25	1.45	8	0.62	10	0.90	53	46.48	1.14	0.41
Small intestine	1	1.27	2	0.73	5	2.25	6	2.81*	14	7.89	1.78	0.39
Colon	47	1.46*	111	1.01	97	1.12	72	0.92	327	307.17	1.06	1.26
Rectum, rectosigmoid junction	19	1.94*	35	1.05	20	0.80	13	0.61	87	89.36	0.97	-0.15
Rectum	11	1.71	24	1.10	16	0.97	10	0.70	61	58.93	1.04	0.13
Anus, anal canal	1	1.34	5	1.93	2	0.99	3	1.65	11	7.19	1.53	0.24
Liver	0	0.00	4	0.94	3	0.89	2	0.63	9	12.08	0.74	-0.20
Gallbladder	2	1.31	4	0.78	5	1.31	3	0.96	14	13.58	1.03	0.03
Bile ducts, other biliary	1	0.73	6	1.26	3	0.78	2	0.53	12	13.80	0.87	-0.11
Pancreas	12	1.46	43	1.53*	25	1.13	20	0.99	100	78.75	1.27*	1.35
<b>Respiratory system</b>	60	2.00*	240	2.25*	189	2.20*	175	2.16*	664	303.64	2.19*	22.85
Nose, nasal cavity, ear	0	0.00	0	0.00	2	2.19	2	2.41	4	3.25	1.23	0.05
Larynx	2	2.16	8	2.51*	6	2.50	4	2.01	20	8.50	2.35*	0.73
Lung, bronchus	58	2.02*	232	2.27*	180	2.18*	168	2.16*	638	291.12	2.19*	21.99
<b>Female breast</b>	68	1.04	217	0.96	168	0.95	154	0.98	607	625.24	0.97	-1.16
<b>Female genital system</b>	39	1.30	94	0.93	65	0.86	69	1.08	267	270.39	0.99	-0.22
Cervix uteri	4	1.25	5	0.49	4	0.58	3	0.59	16	25.20	0.63	-0.58
Corpus uteri	20	1.31	45	0.87	24	0.63*	38	1.20	127	136.63	0.93	-0.61
Ovary	12	1.37	30	1.00	22	0.96	17	0.85	81	81.79	0.99	-0.05
Vagina	0	0.00	3	1.75	5	3.87*	4	3.59	12	4.63	2.59*	0.47
Vulva	1	0.64	7	1.29	8	1.84	5	1.22	21	15.44	1.36	0.35
<b>Urinary system</b>	84	6.79*	114	2.66*	59	1.74*	47	1.51*	304	120.16	2.53*	11.66
Urinary bladder	22	2.88*	28	1.07	13	0.63	11	0.58	74	73.70	1.00	0.02
Kidney parenchyma	12	3.27*	22	1.72*	10	0.98	13	1.36	57	36.28	1.57*	1.31
Renal pelvis, other urinary	50	46.53*	64	17.36*	36	12.58*	23	8.97*	173	10.19	16.98*	10.32
Ureter	16	47.23*	32	27.46*	19	21.05*	10	12.57*	77	3.20	24.05*	4.68
<b>Bone, joints</b>	2	8.90	3	3.94	0	0.00	0	0.00	5	2.04	2.45	0.19
<b>Soft tissue including heart</b>	0	0.00	2	0.61	1	0.39	6	2.50	9	9.21	0.98	-0.01
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	2	6.56	2	1.16	1.73	0.05
<b>Melanoma of skin</b>	2	0.47	20	1.32	12	1.00	10	0.87	44	42.91	1.03	0.07
<b>Eye, orbit</b>	1	2.70	2	1.59	0	0.00	0	0.00	3	3.37	0.89	-0.02
<b>Brain, central nervous system</b>	4	1.68	6	0.72	9	1.40	3	0.53	22	22.69	0.97	-0.04
<b>Thyroid</b>	2	1.12	7	1.16	5	1.12	3	0.79	17	16.06	1.06	0.06
<b>Lymphatic, hematopoietic</b>	28	1.43	79	1.16	52	0.96	48	0.96	207	191.47	1.08	0.98
Hodgkin lymphoma	1	1.82	3	1.63	2	1.47	1	0.88	7	4.89	1.43	0.13
Non-Hodgkin lymphoma	12	1.32	30	0.94	25	0.97	17	0.69	84	91.34	0.92	-0.47
Myeloma	1	0.29	14	1.20	6	0.66	10	1.22	31	32.39	0.96	-0.09
Leukemia	14	2.13*	32	1.42	19	1.08	20	1.24	85	62.86	1.35*	1.40
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	2.34	1	1.68	0.60	-0.04
Chronic lymphocytic	4	1.54	13	1.46	7	1.01	5	0.80	29	24.67	1.18	0.27
Acute non-lymphocytic	6	2.65	16	2.06*	5	0.82	8	1.41	35	21.82	1.60*	0.84
Chronic myeloid	3	3.36	2	0.66	4	1.67	3	1.37	12	8.53	1.41	0.22

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Bladder Males

**Table 11.1.4:** Risk of subsequent primary cancers after cancer of the urinary bladder, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,129	1.82*	4,867	1.16*	3,344	1.05*	2,547	0.98	12,887	11,119.60	1.16*	38.15
All excluding same site	1,919	1.78*	4,460	1.16*	3,097	1.06*	2,385	1.00	11,861	10,220.88	1.16*	35.41
<b>Buccal cavity, pharynx</b>	29	0.85	127	1.08	80	0.96	54	0.88	290	296.75	0.98	-0.15
Lip	5	0.69	26	1.06	12	0.70	8	0.65	51	61.07	0.84	-0.22
Tongue	1	0.16*	15	0.69	18	1.17	17	1.46	51	55.01	0.93	-0.09
Salivary gland	2	0.70	12	1.17	6	0.76	7	1.04	27	27.73	0.97	-0.02
Mouth	5	0.62	36	1.31	19	1.00	12	0.87	72	68.24	1.06	0.08
Nasopharynx	1	0.88	6	1.55	3	1.13	3	1.57	13	9.57	1.36	0.07
Tonsil	1	0.34	12	1.18	7	1.00	3	0.59	23	25.23	0.91	-0.05
Oropharynx	3	3.23	2	0.63	5	2.21	1	0.59	11	8.08	1.36	0.06
Hypopharynx	6	1.63	14	1.11	8	0.91	2	0.32	30	31.28	0.96	-0.03
<b>Digestive system</b>	290	1.11	930	1.01	679	0.99	537	0.99	2,436	2,404.76	1.01	0.67
Esophagus	14	0.95	42	0.81	35	0.90	37	1.15	128	137.63	0.93	-0.21
Stomach	38	1.25	120	1.15	71	0.94	57	0.97	286	269.23	1.06	0.36
Small intestine	7	2.13	9	0.76	7	0.77	6	0.77	29	31.93	0.91	-0.06
Colon	123	1.08	395	0.97	321	1.05	244	0.99	1,083	1,071.83	1.01	0.24
Rectum, rectosigmoid junction	32	0.67*	180	1.09	106	0.88	90	0.98	408	425.63	0.96	-0.38
Anus, anal canal	0	0.00	7	1.23	5	1.18	3	0.88	15	14.91	1.01	0.00
Liver	15	1.60	40	1.20	18	0.70	18	0.83	91	90.20	1.01	0.02
Gallbladder	3	1.28	6	0.74	6	1.01	4	0.86	19	21.03	0.90	-0.04
Bile ducts, other biliary	7	1.26	18	0.90	21	1.34	13	0.94	59	55.01	1.07	0.09
Pancreas	46	1.56*	104	1.01	86	1.13	61	1.01	297	268.96	1.10	0.61
<b>Respiratory system</b>	273	1.21*	1,208	1.53*	892	1.53*	724	1.59*	3,097	2,055.47	1.51*	22.48
Nose, nasal cavity, ear	3	1.71	5	0.81	6	1.33	4	1.12	18	15.99	1.13	0.04
Larynx	21	1.21	75	1.26	53	1.26	40	1.30	189	149.84	1.26*	0.85
Lung, bronchus	248	1.21*	1,125	1.55*	833	1.56*	680	1.62*	2,886	1,884.57	1.53*	21.62
<b>Male breast</b>	2	0.91	10	1.30	7	1.20	1	0.21	20	20.59	0.97	-0.01
<b>Male genital system</b>	1,083	3.01*	1,459	1.11*	901	0.88*	638	0.73*	4,081	3,567.57	1.14*	11.08
Prostate	1,079	3.03*	1,444	1.11*	891	0.87*	634	0.73*	4,048	3,536.05	1.14*	11.05
Testis	2	1.78	5	1.35	3	1.27	2	1.31	12	8.73	1.37	0.07
<b>Urinary system</b>	276	2.34*	539	1.28*	321	1.00	230	0.87*	1,366	1,125.90	1.21*	5.18
Urinary bladder	96	1.10	158	0.51*	58	0.24*	49	0.25*	361	835.32	0.43*	-10.24
Kidney parenchyma	66	2.77*	132	1.55*	74	1.14	68	1.27	340	227.17	1.50*	2.44
Renal pelvis, other urinary	114	16.41*	249	10.21*	189	10.54*	113	7.99*	665	63.40	10.49*	12.99
Ureter	46	19.29*	86	10.25*	85	13.75*	45	9.38*	262	21.75	12.04*	5.19
<b>Bone, joints</b>	2	2.14	4	1.23	3	1.30	1	0.56	10	8.27	1.21	0.04
<b>Soft tissue including heart</b>	6	1.37	10	0.64	16	1.36	20	1.99*	52	41.76	1.25	0.22
<b>Kaposi sarcoma</b>	3	1.83	2	0.35	1	0.24	2	0.64	8	14.81	0.54	-0.15
<b>Melanoma of skin</b>	25	0.99	91	0.98	68	0.91	59	0.88	243	260.32	0.93	-0.37
<b>Eye, orbit</b>	1	0.59	5	0.84	4	0.92	4	1.17	14	15.40	0.91	-0.03
<b>Brain, central nervous system</b>	9	0.82	48	1.23	28	0.97	16	0.70	101	101.74	0.99	-0.02
<b>Thyroid</b>	7	2.03	9	0.75	6	0.69	6	0.88	28	30.98	0.90	-0.06
<b>Lymphatic, hematopoietic</b>	84	0.97	290	0.94	230	0.98	178	0.91	782	825.56	0.95	-0.94
Hodgkin lymphoma	4	1.49	10	1.11	12	1.95*	4	0.89	30	22.37	1.34	0.16
Non-Hodgkin lymphoma	36	1.01	123	0.95	87	0.86	72	0.83	318	352.56	0.90	-0.75
Myeloma	13	0.90	41	0.80	38	0.97	29	0.89	121	137.47	0.88	-0.36
Leukemia	31	0.93	116	0.98	93	1.04	73	1.01	313	313.15	1.00	0.00
Acute lymphocytic	0	0.00	1	0.34	3	1.35	4	2.39	8	7.73	1.03	0.01
Chronic lymphocytic	13	0.95	37	0.77	26	0.72	25	0.87	101	127.17	0.79*	-0.56
Acute non-lymphocytic	11	1.01	41	1.06	44	1.50*	28	1.15	124	103.42	1.20	0.44
Chronic myeloid	2	0.45	20	1.27	13	1.09	11	1.11	46	42.08	1.09	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 11.1.5:** Risk of subsequent primary cancers after cancer of the urinary bladder, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	69	5.28*	117	1.76*	126	1.33*	313	1.14*	625	448.72	1.39*	22.84
All excluding same site	56	4.49*	99	1.56*	109	1.22	287	1.11	551	424.29	1.30*	16.42
<b>Buccal cavity, pharynx</b>	2	3.13	1	0.30	5	1.13	5	0.55	13	17.36	0.75	-0.57
Lip	1	11.94	0	0.00	2	4.20	1	0.98	4	1.97	2.03	0.26
Tongue	1	7.13	1	1.37	0	0.00	2	0.97	4	3.93	1.02	0.01
Salivary gland	0	0.00	0	0.00	0	0.00	1	1.46	1	1.30	0.77	-0.04
Mouth	0	0.00	0	0.00	1	0.90	0	0.00	1	4.27	0.23	-0.42
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.87	0.00	-0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	2.28	0.00	-0.30
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.51	0.00	-0.07
Hypopharynx	0	0.00	0	0.00	2	4.72	0	0.00	2	1.69	1.19	0.04
<b>Digestive system</b>	5	2.47	17	1.55	16	0.96	56	1.15	94	78.30	1.20	2.03
Esophagus	0	0.00	0	0.00	2	1.65	4	1.12	6	5.69	1.05	0.04
Stomach	1	4.20	0	0.00	0	0.00	7	1.55	8	7.71	1.04	0.04
Small intestine	0	0.00	1	3.68	0	0.00	0	0.00	1	1.64	0.61	-0.08
Colon	1	1.40	7	1.78	12	1.96*	29	1.51*	49	30.00	1.63*	2.46
Rectum, rectosigmoid junction	0	0.00	3	1.32	2	0.57	7	0.72	12	15.93	0.75	-0.51
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	1.54	1	1.21	0.83	-0.03
Liver	0	0.00	4	7.08*	0	0.00	2	0.85	6	3.86	1.56	0.28
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.08
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.59	0.00	-0.21
Pancreas	3	12.87*	2	1.54	0	0.00	6	1.05	11	9.20	1.20	0.23
<b>Respiratory system</b>	8	4.25*	21	1.96*	34	2.00*	89	1.79*	152	79.43	1.91*	9.40
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	2.30	1	0.83	1.20	0.02
Larynx	0	0.00	1	0.82	3	1.63	5	1.15	9	7.61	1.18	0.18
Lung, bronchus	8	4.95*	20	2.15*	31	2.08*	83	1.85*	142	70.73	2.01*	9.23
<b>Female breast</b>	2	1.13	6	0.72	4	0.40	19	0.96	31	39.82	0.78	-4.71
<b>Female genital system</b>	1	1.41	3	0.89	1	0.25	5	0.63	10	16.08	0.62	-3.25
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	2.73	0.00	-1.46
Corpus uteri	1	4.16	1	0.76	0	0.00	3	0.73	5	7.49	0.67	-1.33
Ovary	0	0.00	2	1.93	0	0.00	1	0.41	3	4.94	0.61	-1.04
Vagina	0	0.00	0	0.00	1	27.31	0	0.00	1	0.15	6.47	0.45
Vulva	0	0.00	0	0.00	0	0.00	1	4.02	1	0.47	2.14	0.28
<b>Male genital system</b>	25	28.05*	18	3.16*	18	1.46	52	0.74*	113	88.79	1.27*	4.14
Prostate	25	47.53*	16	3.68*	17	1.51	51	0.74*	109	84.89	1.28*	4.12
Testis	0	0.00	2	1.62	1	1.11	1	1.38	4	3.19	1.25	0.14
<b>Urinary system</b>	15	15.27*	21	3.98*	20	2.54*	37	1.61*	93	37.17	2.50*	7.23
Urinary bladder	8	14.85*	7	2.36	4	0.87	5	0.34*	24	22.81	1.05	0.15
Kidney parenchyma	2	4.99	3	1.43	3	1.02	11	1.51	19	12.74	1.49	0.81
Renal pelvis, other urinary	5	118.70*	11	50.42*	13	40.59*	21	20.30*	50	1.62	30.96*	6.27
Ureter	3	357.71*	5	103.14*	3	35.85*	9	27.07*	20	0.47	42.29*	2.53
<b>Bone, joints</b>	0	0.00	1	5.79	0	0.00	0	0.00	1	0.70	1.44	0.04
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	1.59	2	1.67	3	2.52	1.19	0.06
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	1	1.04	1	4.00	0.25	-0.39
<b>Melanoma of skin</b>	4	3.83*	7	1.48	5	0.93	14	1.35	30	21.54	1.39	1.10
<b>Eye, orbit</b>	0	0.00	0	0.00	1	4.39	0	0.00	1	0.92	1.08	0.01
<b>Brain, central nervous system</b>	2	5.45	6	3.57*	4	2.08	1	0.28	13	7.58	1.71	0.70
<b>Thyroid</b>	1	2.93	2	1.38	3	2.08	3	1.36	9	5.43	1.66	0.46
<b>Lymphatic, hematopoietic</b>	4	2.70	8	1.14	11	1.26	22	1.08	45	37.53	1.20	0.97
Hodgkin lymphoma	0	0.00	3	3.80	1	1.41	1	1.10	5	2.61	1.92	0.31
Non-Hodgkin lymphoma	3	3.81	2	0.54	6	1.32	8	0.78	19	19.33	0.98	-0.04
Myeloma	0	0.00	1	1.51	0	0.00	6	2.01	7	4.78	1.46	0.29
Leukemia	1	2.64	2	1.07	4	1.65	7	1.14	14	10.81	1.29	0.41
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	4.11	1	0.56	1.78	0.06
Chronic lymphocytic	1	10.74	1	1.83	1	1.13	3	1.19	6	4.05	1.48	0.25
Acute non-lymphocytic	0	0.00	1	1.61	2	2.65	3	1.52	6	3.49	1.72	0.33
Chronic myeloid	0	0.00	0	0.00	1	2.67	0	0.00	1	1.61	0.62	-0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 18,715 PYR and for male cancers on 58,464 PYR.



## Bladder Both Sexes, 50-69 Years of Age

**Table 11.1.6:** Risk of subsequent primary cancers after cancer of the urinary bladder, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	992	2.22*	2,593	1.31*	2,352	1.13*	2,328	1.02	8,265	6,790.48	1.22*	44.13
All excluding same site	887	2.12*	2,378	1.28*	2,173	1.12*	2,190	1.04	7,628	6,323.91	1.21*	39.03
<b>Buccal cavity, pharynx</b>	18	1.10	67	1.03	47	0.83	45	0.90	177	188.30	0.94	-0.34
Lip	2	0.82	9	0.90	4	0.43	6	0.66	21	30.86	0.68	-0.30
Tongue	0	0.00	9	0.68	14	1.22	13	1.31	36	37.80	0.95	-0.05
Salivary gland	1	0.99	7	1.61	4	0.91	5	0.96	17	14.95	1.14	0.06
Mouth	3	0.72	19	1.16	12	0.86	11	0.91	45	46.46	0.97	-0.04
Nasopharynx	1	1.53	5	2.03	1	0.51	4	2.60	11	6.61	1.66	0.13
Tonsil	1	0.58	4	0.61	5	0.94	3	0.74	13	17.66	0.74	-0.14
Oropharynx	2	3.82	2	0.98	3	1.73	1	0.71	8	5.72	1.40	0.07
Hypopharynx	4	2.07	10	1.30	4	0.61	1	0.20	19	21.25	0.89	-0.07
<b>Digestive system</b>	126	1.39*	402	1.00	412	0.98	460	0.96	1,400	1,388.82	1.01	0.33
Esophagus	5	0.82	25	0.97	23	0.91	33	1.26	86	83.31	1.03	0.08
Stomach	11	1.15	45	1.09	41	0.97	40	0.85	137	140.29	0.98	-0.10
Small intestine	2	1.51	6	1.02	6	0.98	8	1.15	22	20.31	1.08	0.05
Colon	58	1.57*	160	0.96	190	1.04	202	0.92	610	606.78	1.01	0.10
Rectum, rectosigmoid junction	18	0.98	80	1.01	62	0.79	72	0.90	232	255.51	0.91	-0.70
Anus, anal canal	1	1.15	4	1.09	3	0.85	5	1.42	13	11.59	1.12	0.04
Liver	5	1.42	14	0.91	12	0.74	16	0.88	47	53.32	0.88	-0.19
Gallbladder	0	0.00	1	0.27	3	0.73	5	0.99	9	13.71	0.66	-0.14
Bile ducts, other biliary	3	1.77	7	0.91	11	1.27	10	0.86	31	29.71	1.04	0.04
Pancreas	22	2.03*	55	1.16	59	1.21	62	1.11	198	162.59	1.22*	1.06
<b>Respiratory system</b>	131	1.38*	717	1.76*	660	1.64*	667	1.66*	2,175	1,306.63	1.66*	25.99
Nose, nasal cavity, ear	1	1.35	2	0.67	3	1.06	5	1.65	11	9.60	1.15	0.04
Larynx	11	1.29	50	1.47*	40	1.35	36	1.47*	137	96.61	1.42*	1.21
Lung, bronchus	119	1.39*	664	1.79*	617	1.67*	625	1.68*	2,025	1,197.43	1.69*	24.77
<b>Female breast</b>	29	1.23	105	1.10	101	1.08	101	0.98	336	316.56	1.06	2.49
<b>Female genital system</b>	14	1.18	45	0.97	35	0.83	50	1.18	144	142.32	1.01	0.21
Cervix uteri	0	0.00	1	0.22	2	0.56	1	0.33	4	12.41	0.32*	-1.08
Corpus uteri	7	1.05	21	0.81	16	0.69	29	1.31	73	77.68	0.94	-0.60
Ovary	5	1.55	16	1.23	10	0.81	12	0.91	43	41.71	1.03	0.17
Vagina	0	0.00	2	3.72	2	3.61	4	5.78*	8	1.92	4.18*	0.78
Vulva	1	3.09	2	1.39	4	2.45	3	1.25	10	5.78	1.73	0.54
<b>Male genital system</b>	458	4.45*	645	1.28*	546	0.93	491	0.75*	2,140	1,846.13	1.16*	11.47
Prostate	455	4.48*	637	1.28*	538	0.93	489	0.75*	2,119	1,831.71	1.16*	11.22
Testis	2	4.02	1	0.61	2	1.85	1	1.39	6	3.94	1.52	0.08
<b>Urinary system</b>	141	3.60*	288	1.65*	231	1.25*	198	0.94	858	610.93	1.40*	7.39
Urinary bladder	40	1.51*	63	0.52*	31	0.24*	41	0.27*	175	431.41	0.41*	-7.67
Kidney parenchyma	36	3.46*	73	1.64*	52	1.18	60	1.32*	221	144.35	1.53*	2.29
Renal pelvis, other urinary	65	28.68*	152	14.83*	148	13.79*	97	8.14*	462	35.16	13.14*	12.77
Ureter	19	24.91*	58	16.59*	73	19.64*	38	9.35*	188	12.04	15.61*	5.27
<b>Bone, joints</b>	1	2.32	3	1.69	1	0.61	1	0.65	6	5.39	1.11	0.02
<b>Soft tissue including heart</b>	3	1.79	4	0.57	9	1.26	18	2.14*	34	24.28	1.40	0.29
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	0.66	1	0.63	2	5.33	0.38	-0.10
<b>Melanoma of skin</b>	11	0.96	45	0.93	40	0.83	43	0.80	139	162.18	0.86	-0.69
<b>Eye, orbit</b>	1	1.33	2	0.64	1	0.34	3	1.00	7	9.88	0.71	-0.09
<b>Brain, central nervous system</b>	4	0.71	28	1.22	24	1.13	15	0.73	71	70.30	1.01	0.02
<b>Thyroid</b>	5	2.12	8	0.88	5	0.64	5	0.72	23	26.33	0.87	-0.10
<b>Lymphatic, hematopoietic</b>	35	1.12	155	1.13	153	1.05	168	0.98	511	484.79	1.05	0.78
Hodgkin lymphoma	3	2.35	7	1.43	7	1.68	4	1.04	21	14.17	1.48	0.20
Non-Hodgkin lymphoma	15	1.06	61	0.98	63	0.96	65	0.83	204	220.35	0.93	-0.49
Myeloma	5	0.97	23	1.00	21	0.86	26	0.90	75	81.38	0.92	-0.19
Leukemia	12	1.13	64	1.35*	62	1.22	73	1.22	211	168.89	1.25*	1.26
Acute lymphocytic	0	0.00	1	0.76	2	1.53	2	1.47	5	4.30	1.16	0.02
Chronic lymphocytic	4	0.87	22	1.08	21	0.98	23	0.96	70	70.27	1.00	-0.01
Acute non-lymphocytic	7	2.10	24	1.56*	27	1.58*	29	1.39	87	56.56	1.54*	0.91
Chronic myeloid	1	0.73	11	1.83	8	1.24	12	1.48	32	21.97	1.46	0.30

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 77,985 PYR and for male cancers on 256,160 PYR.

**Table 11.1.7:** Risk of subsequent primary cancers after cancer of the urinary bladder, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,468	1.53*	3,243	1.09*	1,645	0.99	595	0.95	6,951	6,221.69	1.12*	34.79
All excluding same site	1,304	1.47*	2,977	1.09*	1,545	1.01	563	0.97	6,389	5,730.08	1.11*	31.43
<b>Buccal cavity, pharynx</b>	12	0.56*	73	1.14	41	1.23	13	1.07	139	131.27	1.06	0.37
Lip	2	0.40	18	1.18	8	0.98	3	1.01	31	31.47	0.99	-0.02
Tongue	1	0.27	8	0.73	7	1.27	3	1.60	19	22.09	0.86	-0.15
Salivary gland	1	0.44	6	0.82	2	0.45	2	0.99	11	16.08	0.68	-0.24
Mouth	4	0.76	22	1.42	11	1.36	4	1.32	41	31.86	1.29	0.44
Nasopharynx	0	0.00	1	0.58	2	2.38	0	0.00	3	3.48	0.86	-0.02
Tonsil	0	0.00	11	2.57*	3	1.54	0	0.00	14	8.31	1.68	0.27
Oropharynx	1	2.03	1	0.71	2	2.99	0	0.00	4	2.79	1.43	0.06
Hypopharynx	2	1.02	4	0.72	4	1.60	1	1.35	11	10.80	1.02	0.01
<b>Digestive system</b>	253	1.10	753	1.04	426	1.02	162	0.97	1,594	1,536.78	1.04	2.73
Esophagus	9	0.89	20	0.65	16	0.96	6	0.95	51	63.94	0.80	-0.62
Stomach	36	1.40	100	1.26*	38	0.85	20	1.11	194	167.72	1.16	1.25
Small intestine	6	2.23	4	0.48	6	1.24	4	2.05	20	17.87	1.12	0.10
Colon	111	1.02	339	0.98	216	1.06	85	1.01	751	742.22	1.01	0.42
Rectum, rectosigmoid junction	33	0.86	132	1.12	62	0.97	24	1.02	251	243.55	1.03	0.36
Anus, anal canal	0	0.00	8	1.83	4	1.63	0	0.00	12	9.30	1.29	0.13
Liver	10	1.43	26	1.20	9	0.75	2	0.45	47	45.10	1.04	0.09
Gallbladder	5	1.65	9	0.96	8	1.45	2	0.86	24	20.28	1.18	0.18
Bile ducts, other biliary	5	0.96	17	1.01	13	1.23	5	1.02	40	37.51	1.07	0.12
Pancreas	33	1.24	90	1.09	52	1.10	13	0.67	188	175.92	1.07	0.58
<b>Respiratory system</b>	194	1.22*	710	1.48*	387	1.55*	143	1.69*	1,434	973.05	1.47*	21.99
Nose, nasal cavity, ear	2	1.51	3	0.72	5	2.09	0	0.00	10	8.80	1.14	0.06
Larynx	12	1.26	32	1.16	16	1.22	3	0.77	63	54.11	1.16	0.42
Lung, bronchus	179	1.21*	673	1.51*	365	1.56*	140	1.76*	1,357	907.53	1.50*	21.44
<b>Female breast</b>	37	0.92	106	0.86	63	0.87	34	1.02	240	268.86	0.89	-4.73
<b>Female genital system</b>	24	1.37	46	0.89	29	0.99	14	1.06	113	111.99	1.01	0.17
Cervix uteri	4	2.36	4	0.84	2	0.79	2	1.84	12	10.06	1.19	0.32
Corpus uteri	12	1.43	23	0.94	8	0.61	6	1.11	49	51.45	0.95	-0.40
Ovary	7	1.32	12	0.75	12	1.28	4	0.90	35	35.14	1.00	-0.02
Vagina	0	0.00	1	0.87	2	2.85	0	0.00	3	2.56	1.17	0.07
Vulva	0	0.00	5	1.28	4	1.54	1	0.69	10	9.19	1.09	0.13
<b>Male genital system</b>	600	2.34*	796	1.00	337	0.78*	95	0.65*	1,828	1,632.65	1.12*	13.15
Prostate	599	2.36*	791	1.00	336	0.79*	94	0.65*	1,820	1,619.45	1.12*	13.50
Testis	0	0.00	2	2.37	0	0.00	0	0.00	2	1.60	1.25	0.03
<b>Urinary system</b>	204	2.26*	344	1.21*	129	0.80*	42	0.67*	719	597.96	1.20*	5.77
Urinary bladder	70	1.03	116	0.54*	36	0.29*	14	0.29*	236	454.79	0.52*	-10.44
Kidney parenchyma	40	2.40*	78	1.52*	29	1.03	10	0.98	157	106.36	1.48*	2.42
Renal pelvis, other urinary	94	16.46*	150	8.52*	64	6.57*	18	4.80*	326	36.81	8.86*	13.80
Ureter	40	20.49*	55	9.15*	28	8.53*	8	6.70*	131	12.44	10.53*	5.66
<b>Bone, joints</b>	3	4.37	3	1.46	2	1.88	0	0.00	8	4.23	1.89	0.18
<b>Soft tissue including heart</b>	3	0.85	8	0.71	7	1.06	6	2.12	24	24.17	0.99	-0.01
<b>Kaposi sarcoma</b>	3	3.33	2	0.67	0	0.00	2	2.24	7	6.63	1.06	0.02
<b>Melanoma of skin</b>	12	0.70	59	1.07	35	1.06	12	0.84	118	119.51	0.99	-0.07
<b>Eye, orbit</b>	1	0.79	5	1.30	2	0.96	1	1.32	9	7.97	1.13	0.05
<b>Brain, central nervous system</b>	7	0.94	20	0.88	9	0.74	3	0.70	39	46.55	0.84	-0.36
<b>Thyroid</b>	3	1.19	6	0.80	3	0.78	1	0.70	13	15.27	0.85	-0.11
<b>Lymphatic, hematopoietic</b>	73	1.00	206	0.89	118	0.87	36	0.66*	433	494.71	0.88*	-2.94
Hodgkin lymphoma	2	1.14	3	0.58	6	2.27	0	0.00	11	10.48	1.05	0.02
Non-Hodgkin lymphoma	30	1.01	90	0.94	43	0.76	16	0.70	179	204.22	0.88	-1.20
Myeloma	9	0.72	31	0.79	23	1.01	7	0.78	70	83.71	0.84	-0.65
Leukemia	32	1.10	82	0.89	46	0.86	13	0.59	173	196.30	0.88	-1.11
Acute lymphocytic	0	0.00	0	0.00	1	0.80	2	4.05	3	4.55	0.66	-0.07
Chronic lymphocytic	12	1.03	27	0.74	11	0.52*	4	0.46	54	77.51	0.70*	-1.12
Acute non-lymphocytic	10	1.03	32	1.04	20	1.13	4	0.56	66	65.18	1.01	0.04
Chronic myeloid	4	1.02	11	0.88	8	1.07	2	0.64	25	27.02	0.93	-0.10

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 61,031 PYR and for male cancers on 148,597 PYR.

## Kidney Parenchyma

### Both Sexes, ≥18 Years of Age

**Table 11.2.1:** Characteristics of patients with an initial cancer of the kidney parenchyma, both sexes, ≥18 years of age, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	23,211	100.0	13,624	100.0	36,835	100.0
<b>Initial treatment</b>						
Any radiation	3,022	13.0	1,495	11.0	4,517	12.3
With surgery	1,415	6.1	664	4.9	2,079	5.6
Without surgery	1,607	6.9	831	6.1	2,438	6.6
No radiation	20,189	87.0	12,129	89.0	32,318	87.7
With surgery	16,955	73.0	9,794	71.9	26,749	72.6
Without surgery	3,234	13.9	2,335	17.1	5,569	15.1
<b>Race</b>						
White	20,071	86.5	11,685	85.8	31,756	86.2
Black	1,961	8.4	1,320	9.7	3,281	8.9
Other	1,122	4.8	575	4.2	1,697	4.6
Unknown	57	0.2	44	0.3	101	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	163	0.7	182	1.3	345	0.9
30–49	3,779	16.3	2,031	14.9	5,810	15.8
50–69	12,557	54.1	6,288	46.2	18,845	51.2
70–79	5,030	21.7	3,452	25.3	8,482	23.0
≥ 80	1,682	7.2	1,671	12.3	3,353	9.1
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	20,892	90.0	12,701	93.2	33,593	91.2
1st and 2nd cancers	2,107	9.1	839	6.2	2,946	8.0
1st, 2nd, and 3rd cancers	194	0.8	76	0.6	270	0.7
1st, 2nd, 3rd, and additional cancers	18	0.1	8	0.1	26	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	62.8	—	65.7	—	63.8	—
Median year of 1st cancer diagnosis	1990.0	—	1990.5	—	1990.2	—
Median person-years at risk	2.8	—	2.8	—	2.8	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.1	—	94.1	—	94.8
1st, 2nd, and additional cancers	—	94.9	—	94.1	—	94.7
1st cancer only	—	3.1	—	3.9	—	3.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 11.2.2:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, both sexes, ≥18 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	568	1.53*	1,288	1.09*	960	1.11*	754	1.05	3,570	3,145.79	1.13*	22.88
All excluding same site	510	1.40*	1,205	1.04	898	1.06	696	0.99	3,309	3,081.60	1.07*	12.27
<b>Buccal cavity, pharynx</b>	11	1.05	17	0.53*	19	0.87	10	0.61	57	80.82	0.71*	-1.28
Lip	1	0.62	2	0.41	5	1.51	7	2.81*	15	12.25	1.22	0.15
Tongue	3	1.44	3	0.47	2	0.45	0	0.00	8	16.28	0.49*	-0.45
Salivary gland	1	1.18	2	0.74	3	1.53	1	0.60	7	7.17	0.98	-0.01
Mouth	5	1.85	3	0.36	6	1.08	1	0.24	15	20.64	0.73	-0.30
Nasopharynx	1	2.35	3	2.36	0	0.00	0	0.00	4	3.10	1.29	0.05
Tonsil	0	0.00	1	0.32	2	0.97	1	0.68	4	7.68	0.52	-0.20
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.34	0.00	-0.13
Hypopharynx	0	0.00	1	0.30	1	0.44	0	0.00	2	8.40	0.24*	-0.35
<b>Digestive system</b>	77	0.95	227	0.89	220	1.18*	157	1.02	681	678.14	1.00	0.15
Esophagus	5	1.13	10	0.72	6	0.60	4	0.49	25	36.64	0.68	-0.63
Stomach	8	0.94	18	0.68	19	1.01	20	1.32	65	68.85	0.94	-0.21
Small intestine	4	3.45	4	1.08	3	1.09	3	1.28	14	9.97	1.40	0.22
Colon	31	0.86	113	0.99	109	1.29*	68	0.96	321	305.21	1.05	0.85
Rectum, rectosigmoid junction	11	0.77	36	0.81	37	1.17	23	0.92	107	115.80	0.92	-0.47
Anus, anal canal	1	1.36	3	1.29	4	2.41	1	0.74	9	6.06	1.49	0.16
Liver	3	1.02	5	0.53	7	1.03	3	0.52	18	24.89	0.72	-0.37
Gallbladder	1	0.98	3	0.96	3	1.34	2	1.09	9	8.21	1.10	0.04
Bile ducts, other biliary	2	1.18	6	1.10	3	0.72	4	1.07	15	15.10	0.99	-0.01
Pancreas	10	1.03	26	0.85	27	1.22	29	1.57*	92	81.00	1.14	0.59
<b>Respiratory system</b>	53	0.79	192	0.90	146	0.96	121	0.98	512	555.97	0.92	-2.37
Nose, nasal cavity, ear	0	0.00	4	2.29	1	0.81	0	0.00	5	4.54	1.10	0.02
Larynx	1	0.21	9	0.60	9	0.88	5	0.66	24	37.63	0.64*	-0.74
Lung, bronchus	52	0.84	179	0.92	136	0.96	116	1.02	483	512.47	0.94	-1.59
<b>Female breast</b>	27	0.88	77	0.80	75	1.09	48	0.86	227	251.28	0.90	-3.50
<b>Female genital system</b>	18	1.29	42	0.99	28	0.96	17	0.75	105	107.91	0.97	-0.42
Cervix uteri	1	0.61	8	1.69	4	1.35	3	1.49	16	11.33	1.41	0.67
Corpus uteri	11	1.55	26	1.20	16	1.08	10	0.88	63	54.97	1.15	1.16
Ovary	4	0.99	6	0.48	6	0.68	4	0.57	20	32.28	0.62*	-1.77
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	1.68	0.00	-0.24
Vulva	1	1.65	1	0.53	2	1.40	0	0.00	4	5.19	0.77	-0.17
<b>Male genital system</b>	154	1.91*	313	1.17*	213	1.05	189	1.06	869	730.19	1.19*	11.97
Prostate	152	1.91*	312	1.18*	212	1.05	187	1.06	863	723.04	1.19*	12.07
Testis	1	2.29	1	0.81	1	1.49	1	2.70	4	2.71	1.48	0.11
<b>Urinary system</b>	145	4.73*	221	2.25*	118	1.63*	102	1.67*	586	262.61	2.23*	17.44
Urinary bladder	82	3.87*	126	1.85*	52	1.03	42	0.98	302	182.95	1.65*	6.42
Kidney parenchyma	58	7.59*	83	3.41*	62	3.51*	58	3.98*	261	64.20	4.07*	10.61
Renal pelvis, other urinary	5	2.68	12	2.04*	4	0.94	2	0.57	23	15.47	1.49	0.41
Ureter	4	6.50*	6	3.10*	3	2.13	0	0.00	13	5.10	2.55*	0.43
<b>Bone, joints</b>	1	3.02	0	0.00	0	0.00	2	3.72	3	2.59	1.16	0.02
<b>Soft tissue including heart</b>	3	2.05	6	1.31	5	1.51	3	1.08	17	12.16	1.40	0.26
<b>Kaposi sarcoma</b>	0	0.00	2	1.10	1	0.89	0	0.00	3	4.31	0.70	-0.07
<b>Melanoma of skin</b>	16	1.89*	37	1.35	29	1.43	14	0.81	96	73.52	1.31*	1.21
<b>Eye, orbit</b>	0	0.00	1	0.59	1	0.84	1	1.06	3	4.37	0.69	-0.07
<b>Brain, central nervous system</b>	6	1.54	9	0.74	7	0.82	8	1.20	30	31.22	0.96	-0.07
<b>Thyroid</b>	15	7.57*	17	2.80*	8	1.96	5	1.64	45	15.19	2.96*	1.61
<b>Lymphatic, hematopoietic</b>	34	1.23	102	1.16	64	0.99	61	1.12	261	234.03	1.12	1.45
Hodgkin lymphoma	0	0.00	4	1.40	2	1.07	1	0.74	7	7.04	0.99	0.00
Non-Hodgkin lymphoma	16	1.30	35	0.89	26	0.89	31	1.24	108	106.14	1.02	0.10
Myeloma	12	2.53*	17	1.12	14	1.26	8	0.85	51	40.29	1.27	0.58
Leukemia	6	0.63	46	1.52*	22	0.99	21	1.13	95	80.57	1.18	0.78
Acute lymphocytic	0	0.00	1	1.18	1	1.66	2	4.26	4	2.19	1.83	0.10
Chronic lymphocytic	3	0.78	11	0.90	8	0.90	11	1.50	33	32.31	1.02	0.04
Acute non-lymphocytic	3	0.94	16	1.57	6	0.80	4	0.63	29	27.24	1.06	0.09
Chronic myeloid	0	0.00	10	2.44*	3	1.00	1	0.39	14	10.93	1.28	0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 69,480 PYR and for male cancers on 115,924 PYR.

## Kidney Parenchyma

### Both Sexes, Long-term Follow-up, ≥18 Years of Age

**Table 11.2.3:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, both sexes, long-term follow-up, ≥18 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	36,835		6,603		2,894		1,080		36,835			
<b>Person-years in interval</b>	150,259		22,557		9,410		3,177		185,404			
<b>All subsequent cancers</b>	2,816	1.16*	473	1.06	204	1.00	77	1.08	3,570	3,145.79	1.13*	22.88
All excluding same site	2,613	1.10*	431	0.99	193	0.97	72	1.03	3,309	3,081.60	1.07*	12.27
<b>Buccal cavity, pharynx</b>	47	0.73*	7	0.67	2	0.45	1	0.66	57	80.82	0.71*	-1.28
Lip	8	0.82	5	3.17*	1	1.46	1	4.30	15	12.25	1.22	0.15
Tongue	8	0.62	0	0.00	0	0.00	0	0.00	8	16.28	0.49*	-0.45
Salivary gland	6	1.09	1	0.98	0	0.00	0	0.00	7	7.17	0.98	-0.01
Mouth	14	0.85	0	0.00	1	0.90	0	0.00	15	20.64	0.73	-0.30
Nasopharynx	4	1.59	0	0.00	0	0.00	0	0.00	4	3.10	1.29	0.05
Tonsil	3	0.48	1	1.05	0	0.00	0	0.00	4	7.68	0.52	-0.20
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.34	0.00	-0.13
Hypopharynx	2	0.30	0	0.00	0	0.00	0	0.00	2	8.40	0.24*	-0.35
<b>Digestive system</b>	524	1.00	97	1.02	40	0.92	20	1.29	681	678.14	1.00	0.15
Esophagus	21	0.74	2	0.39	1	0.43	1	1.21	25	36.64	0.68	-0.63
Stomach	45	0.84	10	1.06	4	0.94	6	4.03*	65	68.85	0.94	-0.21
Small intestine	11	1.44	2	1.39	0	0.00	1	4.08	14	9.97	1.40	0.22
Colon	253	1.08	47	1.08	14	0.70	7	0.97	321	305.21	1.05	0.85
Rectum, rectosigmoid junction	84	0.93	12	0.76	8	1.16	3	1.24	107	115.80	0.92	-0.47
Anus, anal canal	8	1.70	0	0.00	1	2.66	0	0.00	9	6.06	1.49	0.16
Liver	15	0.79	2	0.57	1	0.60	0	0.00	18	24.89	0.72	-0.37
Gallbladder	7	1.10	1	0.89	1	1.93	0	0.00	9	8.21	1.10	0.04
Bile ducts, other biliary	11	0.97	2	0.89	1	0.91	1	2.41	15	15.10	0.99	-0.01
Pancreas	63	1.01	19	1.67*	9	1.73	1	0.53	92	81.00	1.14	0.59
<b>Respiratory system</b>	391	0.90*	83	1.08	28	0.82	10	0.83	512	555.97	0.92	-2.37
Nose, nasal cavity, ear	5	1.41	0	0.00	0	0.00	0	0.00	5	4.54	1.10	0.02
Larynx	19	0.63*	5	1.03	0	0.00	0	0.00	24	37.63	0.64*	-0.74
Lung, bronchus	367	0.92	78	1.10	28	0.88	10	0.89	483	512.47	0.94	-1.59
<b>Female breast</b>	179	0.91	30	0.86	17	1.10	1	0.18	227	251.28	0.90	-3.50
<b>Female genital system</b>	88	1.03	11	0.77	5	0.80	1	0.47	105	107.91	0.97	-0.42
Cervix uteri	13	1.40	1	0.76	2	3.74	0	0.00	16	11.33	1.41	0.67
Corpus uteri	53	1.22	7	0.97	2	0.64	1	0.93	63	54.97	1.15	1.16
Ovary	16	0.63	3	0.69	1	0.51	0	0.00	20	32.28	0.62*	-1.77
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	1.68	0.00	-0.24
Vulva	4	1.02	0	0.00	0	0.00	0	0.00	4	5.19	0.77	-0.17
<b>Male genital system</b>	680	1.23*	108	0.99	60	1.16	21	1.22	869	730.19	1.19*	11.97
Prostate	676	1.24*	107	0.99	59	1.15	21	1.23	863	723.04	1.19*	12.07
Testis	3	1.29	0	0.00	1	11.22	0	0.00	4	2.71	1.48	0.11
<b>Urinary system</b>	484	2.40*	68	1.82*	24	1.39	10	1.57	586	262.61	2.23*	17.44
Urinary bladder	260	1.86*	25	0.95	12	0.98	5	1.10	302	182.95	1.65*	6.42
Kidney parenchyma	203	4.09*	42	4.66*	11	2.69*	5	3.39*	261	64.20	4.07*	10.61
Renal pelvis, other urinary	21	1.75*	1	0.47	1	1.03	0	0.00	23	15.47	1.49	0.41
Ureter	13	3.28*	0	0.00	0	0.00	0	0.00	13	5.10	2.55*	0.43
<b>Bone, joints</b>	1	0.49	0	0.00	2	13.43*	0	0.00	3	2.59	1.16	0.02
<b>Soft tissue including heart</b>	14	1.49	0	0.00	3	3.78	0	0.00	17	12.16	1.40	0.26
<b>Kaposi sarcoma</b>	3	0.84	0	0.00	0	0.00	0	0.00	3	4.31	0.70	-0.07
<b>Melanoma of skin</b>	82	1.46*	10	0.95	2	0.41	2	1.05	96	73.52	1.31*	1.21
<b>Eye, orbit</b>	2	0.58	1	1.71	0	0.00	0	0.00	3	4.37	0.69	-0.07
<b>Brain, central nervous system</b>	22	0.90	6	1.44	2	1.09	0	0.00	30	31.22	0.96	-0.07
<b>Thyroid</b>	40	3.30*	1	0.52	2	2.41	2	7.00	45	15.19	2.96*	1.61
<b>Lymphatic, hematopoietic</b>	200	1.11	38	1.14	14	0.91	9	1.59	261	234.03	1.12	1.45
Hodgkin lymphoma	6	1.05	1	1.16	0	0.00	0	0.00	7	7.04	0.99	0.00
Non-Hodgkin lymphoma	77	0.95	18	1.18	8	1.12	5	1.87	108	106.14	1.02	0.10
Myeloma	43	1.39*	5	0.87	2	0.75	1	1.05	51	40.29	1.27	0.58
Leukemia	74	1.19	14	1.23	4	0.76	3	1.58	95	80.57	1.18	0.78
Acute lymphocytic	2	1.16	2	6.69	0	0.00	0	0.00	4	2.19	1.83	0.10
Chronic lymphocytic	22	0.88	7	1.54	2	0.97	2	2.74	33	32.31	1.02	0.04
Acute non-lymphocytic	25	1.20	3	0.77	0	0.00	1	1.48	29	27.24	1.06	0.09
Chronic myeloid	13	1.55	1	0.64	0	0.00	0	0.00	14	10.93	1.28	0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 69,480 PYR and for male cancers on 115,924 PYR.

**Table 11.2.4:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, females, ≥18 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	165	1.54*	369	1.11	277	1.14*	204	1.01	1,015	884.60	1.15*	18.77
All excluding same site	152	1.44*	342	1.04	257	1.08	187	0.95	938	870.21	1.08*	9.76
<b>Buccal cavity, pharynx</b>	2	1.04	5	0.84	5	1.19	2	0.60	14	15.40	0.91	-0.20
Lip	0	0.00	0	0.00	0	0.00	1	3.88	1	1.06	0.94	-0.01
Tongue	0	0.00	2	1.53	1	1.07	0	0.00	3	3.41	0.88	-0.06
Salivary gland	1	4.79	1	1.54	2	4.28	0	0.00	4	1.71	2.33	0.33
Mouth	0	0.00	0	0.00	2	1.37	0	0.00	2	5.34	0.37	-0.48
Nasopharynx	1	12.71	2	8.44	0	0.00	0	0.00	3	0.60	5.00*	0.35
Tonsil	0	0.00	0	0.00	0	0.00	1	3.95	1	1.31	0.76	-0.04
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.04	0.00	-0.15
<b>Digestive system</b>	28	1.14	62	0.82	63	1.12	44	0.92	197	204.26	0.96	-1.04
Esophagus	1	1.43	0	0.00	0	0.00	1	0.74	2	5.82	0.34	-0.55
Stomach	4	2.09	2	0.34	5	1.19	5	1.42	16	15.45	1.04	0.08
Small intestine	1	2.82	1	0.89	2	2.36	1	1.35	5	3.06	1.63	0.28
Colon	11	0.90	34	0.90	31	1.10	21	0.87	97	102.43	0.95	-0.78
Rectum, rectosigmoid junction	2	0.52	9	0.76	9	1.06	9	1.31	29	31.12	0.93	-0.31
Rectum	0	0.00	5	0.64	5	0.89	4	0.87	14	20.49	0.68	-0.93
Anus, anal canal	1	3.03	1	0.97	1	1.33	1	1.60	4	2.74	1.46	0.18
Liver	0	0.00	1	0.60	0	0.00	0	0.00	1	4.58	0.22	-0.52
Gallbladder	1	1.81	1	0.60	2	1.66	0	0.00	4	4.39	0.91	-0.06
Bile ducts, other biliary	1	1.91	1	0.60	2	1.57	1	0.86	5	4.62	1.08	0.06
Pancreas	5	1.55	11	1.10	10	1.33	5	0.77	31	27.25	1.14	0.54
<b>Respiratory system</b>	17	1.19	58	1.27	35	1.02	29	1.00	139	123.22	1.13	2.27
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	1.20	0.00	-0.17
Larynx	0	0.00	0	0.00	1	0.97	0	0.00	1	3.74	0.27	-0.39
Lung, bronchus	17	1.24	58	1.33*	34	1.04	29	1.04	138	117.98	1.17	2.88
<b>Female breast</b>	27	0.88	77	0.80	75	1.09	48	0.86	227	251.28	0.90	-3.50
<b>Female genital system</b>	18	1.29	42	0.99	28	0.96	17	0.75	105	107.91	0.97	-0.42
Cervix uteri	1	0.61	8	1.69	4	1.35	3	1.49	16	11.33	1.41	0.67
Corpus uteri	11	1.55	26	1.20	16	1.08	10	0.88	63	54.97	1.15	1.16
Ovary	4	0.99	6	0.48	6	0.68	4	0.57	20	32.28	0.62*	-1.77
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	1.68	0.00	-0.24
Vulva	1	1.65	1	0.53	2	1.40	0	0.00	4	5.19	0.77	-0.17
<b>Urinary system</b>	37	7.26*	56	3.51*	26	2.19*	27	2.64*	146	43.19	3.38*	14.80
Urinary bladder	22	7.39*	27	2.90*	5	0.72	10	1.66	64	25.31	2.53*	5.57
Kidney parenchyma	13	7.65*	27	5.05*	20	5.04*	17	5.04*	77	14.38	5.35*	9.01
Renal pelvis, other urinary	2	4.77	2	1.54	1	1.04	0	0.00	5	3.50	1.43	0.22
Ureter	2	15.67*	1	2.53	0	0.00	0	0.00	3	1.06	2.82	0.28
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	5.88	1	0.79	1.27	0.03
<b>Soft tissue including heart</b>	0	0.00	2	1.51	2	2.08	2	2.46	6	3.52	1.70	0.36
<b>Kaposi sarcoma</b>	0	0.00	1	8.32	0	0.00	0	0.00	1	0.34	2.98	0.10
<b>Melanoma of skin</b>	7	3.37*	10	1.52	6	1.25	2	0.51	25	17.39	1.44	1.10
<b>Eye, orbit</b>	0	0.00	0	0.00	1	2.98	0	0.00	1	1.24	0.81	-0.03
<b>Brain, central nervous system</b>	2	1.80	4	1.16	1	0.41	2	1.03	9	8.95	1.01	0.01
<b>Thyroid</b>	10	10.05*	9	2.96*	2	0.98	2	1.33	23	7.59	3.03*	2.22
<b>Lymphatic, hematopoietic</b>	15	1.85*	32	1.26	25	1.32	23	1.41	95	68.69	1.38*	3.79
Hodgkin lymphoma	0	0.00	2	2.58	0	0.00	0	0.00	2	1.96	1.02	0.01
Non-Hodgkin lymphoma	10	2.58*	11	0.89	13	1.41	13	1.62	47	33.45	1.40*	1.95
Myeloma	5	3.45*	5	1.11	3	0.90	3	1.07	16	12.10	1.32	0.56
Leukemia	0	0.00	14	1.79	9	1.55	7	1.40	30	21.18	1.42	1.27
Acute lymphocytic	0	0.00	0	0.00	1	5.91	1	7.12	2	0.62	3.24	0.20
Chronic lymphocytic	0	0.00	4	1.32	2	0.89	4	2.09	10	8.18	1.22	0.26
Acute non-lymphocytic	0	0.00	5	1.79	2	0.96	1	0.55	8	7.57	1.06	0.06
Chronic myeloid	0	0.00	4	3.71	2	2.51	0	0.00	6	2.91	2.06	0.44

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Kidney Parenchyma

## Males, ≥18 Years of Age

**Table 11.2.5:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, males, ≥18 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	23,211	16,047	17,002	47,880	8,685	30,492	4,080	21,505	23,211	115,924		
<b>All subsequent cancers</b>	403	1.52*	919	1.08*	683	1.09*	550	1.06	2,555	2,261.20	1.13*	25.34
All excluding same site	358	1.38*	863	1.04	641	1.05	509	1.00	2,371	2,211.38	1.07*	13.77
<b>Buccal cavity, pharynx</b>	9	1.05	12	0.46*	14	0.79	8	0.61	43	65.42	0.66*	-1.93
Lip	1	0.68	2	0.45	5	1.65	6	2.68	14	11.19	1.25	0.24
Tongue	3	1.80	1	0.19	1	0.29	0	0.00	5	12.88	0.39*	-0.68
Salivary gland	0	0.00	1	0.49	1	0.67	1	0.79	3	5.45	0.55	-0.21
Mouth	5	2.45	3	0.48	4	0.97	1	0.34	13	15.30	0.85	-0.20
Nasopharynx	0	0.00	1	0.97	0	0.00	0	0.00	1	2.50	0.40	-0.13
Tonsil	0	0.00	1	0.38	2	1.17	0	0.00	3	6.37	0.47	-0.29
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.95	0.00	-0.17
Hypopharynx	0	0.00	1	0.34	1	0.50	0	0.00	2	7.36	0.27*	-0.46
<b>Digestive system</b>	49	0.86	165	0.91	157	1.20*	113	1.06	484	473.88	1.02	0.87
Esophagus	4	1.07	10	0.85	6	0.71	3	0.44	23	30.83	0.75	-0.68
Stomach	4	0.60	16	0.78	14	0.96	15	1.29	49	53.40	0.92	-0.38
Small intestine	3	3.74	3	1.16	1	0.53	2	1.24	9	6.90	1.30	0.18
Colon	20	0.84	79	1.03	78	1.39*	47	1.01	224	202.78	1.10	1.83
Rectum, rectosigmoid junction	9	0.86	27	0.82	28	1.21	14	0.77	78	84.68	0.92	-0.58
Anus, anal canal	0	0.00	2	1.56	3	3.31	0	0.00	5	3.32	1.51	0.15
Liver	3	1.25	4	0.52	7	1.26	3	0.64	17	20.31	0.84	-0.29
Gallbladder	0	0.00	2	1.38	1	0.96	2	2.33	5	3.82	1.31	0.10
Bile ducts, other biliary	1	0.85	5	1.31	1	0.34	3	1.16	10	10.48	0.95	-0.04
Pancreas	5	0.77	15	0.73	17	1.16	24	2.00*	61	53.76	1.13	0.62
<b>Respiratory system</b>	36	0.68*	134	0.80*	111	0.94	92	0.98	373	432.75	0.86*	-5.15
Nose, nasal cavity, ear	0	0.00	4	3.08	1	1.11	0	0.00	5	3.34	1.50	0.14
Larynx	1	0.23	9	0.66	8	0.87	5	0.74	23	33.90	0.68	-0.94
Lung, bronchus	35	0.73	121	0.80*	102	0.94	87	1.01	345	394.49	0.87*	-4.27
<b>Male breast</b>	3	5.90*	2	1.23	1	0.85	1	1.02	7	4.28	1.63	0.23
<b>Male genital system</b>	154	1.91*	313	1.17*	213	1.05	189	1.06	869	730.19	1.19*	11.97
Prostate	152	1.91*	312	1.18*	212	1.05	187	1.06	863	723.04	1.19*	12.07
Testis	1	2.29	1	0.81	1	1.49	1	2.70	4	2.71	1.48	0.11
<b>Urinary system</b>	108	4.22*	165	2.01*	92	1.52*	75	1.47*	440	219.42	2.01*	19.03
Urinary bladder	60	3.30*	99	1.69*	47	1.08	32	0.86	238	157.64	1.51*	6.93
Kidney parenchyma	45	7.58*	56	2.95*	42	3.07*	41	3.66*	184	49.81	3.69*	11.58
Renal pelvis, other urinary	3	2.08	10	2.19*	3	0.91	2	0.75	18	11.97	1.50	0.52
Ureter	2	4.10	5	3.24*	3	2.69	0	0.00	10	4.04	2.48*	0.51
<b>Bone, joints</b>	1	4.31	0	0.00	0	0.00	1	2.72	2	1.80	1.11	0.02
<b>Soft tissue including heart</b>	3	2.90	4	1.22	3	1.28	1	0.51	11	8.63	1.27	0.20
<b>Kaposi sarcoma</b>	0	0.00	1	0.59	1	0.97	0	0.00	2	3.98	0.50	-0.17
<b>Melanoma of skin</b>	9	1.41	27	1.29	23	1.48	12	0.90	71	56.13	1.26	1.28
<b>Eye, orbit</b>	0	0.00	1	0.82	0	0.00	1	1.49	2	3.13	0.64	-0.10
<b>Brain, central nervous system</b>	4	1.43	5	0.57	6	0.99	6	1.27	21	22.27	0.94	-0.11
<b>Thyroid</b>	5	5.07*	8	2.64*	6	2.95*	3	1.95	22	7.60	2.89*	1.24
<b>Lymphatic, hematopoietic</b>	19	0.98	70	1.12	39	0.86	38	1.00	166	165.34	1.00	0.06
Hodgkin lymphoma	0	0.00	2	0.96	2	1.49	1	1.05	5	5.08	0.98	-0.01
Non-Hodgkin lymphoma	6	0.71	24	0.88	13	0.65	18	1.06	61	72.68	0.84	-1.01
Myeloma	7	2.13	12	1.13	11	1.42	5	0.76	35	28.20	1.24	0.59
Leukemia	6	0.85	32	1.43	13	0.79	14	1.03	65	59.38	1.09	0.48
Acute lymphocytic	0	0.00	1	1.63	0	0.00	1	3.04	2	1.57	1.27	0.04
Chronic lymphocytic	3	1.04	7	0.76	6	0.90	7	1.29	23	24.13	0.95	-0.10
Acute non-lymphocytic	3	1.31	11	1.49	4	0.74	3	0.65	21	19.67	1.07	0.11
Chronic myeloid	0	0.00	6	1.99	1	0.45	1	0.54	8	8.02	1.00	0.00

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Kidney Parenchyma Both Sexes, 18-49 Years of Age

**Table 11.2.6:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, both sexes, 18-49 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	38	3.53*	84	1.84*	78	1.51*	133	1.32*	333	208.66	1.60*	30.24
All excluding same site	23	2.20*	59	1.33*	61	1.22	114	1.16	257	202.92	1.27*	13.15
<b>Buccal cavity, pharynx</b>	2	4.16	1	0.49	1	0.46	2	0.62	6	7.91	0.76	-0.46
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.18
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.82	0.00	-0.44
Salivary gland	1	24.13	0	0.00	0	0.00	1	4.03	2	0.61	3.30	0.34
Mouth	1	8.60	0	0.00	0	0.00	0	0.00	1	1.97	0.51	-0.24
Nasopharynx	0	0.00	1	7.52	0	0.00	0	0.00	1	0.44	2.29	0.14
Tonsil	0	0.00	0	0.00	1	3.12	1	2.43	2	1.11	1.80	0.22
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.18
<b>Digestive system</b>	1	0.63	11	1.54	16	1.86*	21	1.20	49	34.90	1.40*	3.43
Esophagus	0	0.00	0	0.00	0	0.00	2	1.56	2	2.59	0.77	-0.14
Stomach	0	0.00	3	3.92	3	3.51	2	1.25	8	3.40	2.35*	1.12
Small intestine	0	0.00	1	5.33	0	0.00	0	0.00	1	0.80	1.24	0.05
Colon	0	0.00	1	0.40	6	1.90	8	1.15	15	13.17	1.14	0.44
Rectum, rectosigmoid junction	0	0.00	3	2.10	2	1.14	4	1.17	9	6.91	1.30	0.51
Anus, anal canal	0	0.00	0	0.00	2	12.03*	0	0.00	2	0.63	3.18	0.33
Liver	1	10.04	2	4.66	1	2.16	1	1.16	5	1.86	2.69	0.76
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.07
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	2.77	1	0.68	1.47	0.08
Pancreas	0	0.00	0	0.00	2	1.96	3	1.43	5	4.12	1.21	0.21
<b>Respiratory system</b>	0	0.00	7	1.07	10	1.18	22	1.24	39	34.16	1.14	1.18
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.09
Larynx	0	0.00	0	0.00	0	0.00	1	0.68	1	3.21	0.31	-0.54
Lung, bronchus	0	0.00	7	1.22	10	1.34	21	1.31	38	30.45	1.25	1.84
<b>Female breast</b>	0	0.00	4	0.49	8	0.98	12	1.03	24	30.17	0.80	-0.02
<b>Female genital system</b>	0	0.00	4	1.26	1	0.32	3	0.65	8	11.75	0.68	-2.44
Cervix uteri	0	0.00	1	1.15	0	0.00	0	0.00	1	2.40	0.42	-0.91
Corpus uteri	0	0.00	3	2.62	1	0.74	2	0.86	6	5.09	1.18	0.59
Ovary	0	0.00	0	0.00	0	0.00	1	0.72	1	3.56	0.28	-1.67
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.23
<b>Male genital system</b>	5	7.92*	3	0.84	10	1.62	29	1.33	47	32.13	1.46*	5.77
Prostate	4	9.85*	2	0.70	9	1.57	28	1.31	43	30.46	1.41*	4.87
Testis	1	4.82	1	1.62	1	2.85	1	4.82	4	1.38	2.89	1.01
<b>Urinary system</b>	21	30.36*	37	12.06*	19	5.16*	25	3.30*	102	15.02	6.79*	21.15
Urinary bladder	6	16.88*	11	6.82*	2	0.98	6	1.29	25	8.65	2.89*	3.98
Kidney parenchyma	15	48.75*	25	18.78*	17	11.41*	19	7.29*	76	5.73	13.25*	17.09
Renal pelvis, other urinary	0	0.00	1	8.14	0	0.00	0	0.00	1	0.64	1.56	0.09
Ureter	0	0.00	1	39.80	0	0.00	0	0.00	1	0.17	5.88	0.20
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	8.93	1	0.33	2.99	0.16
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	3.04	1	2.23	2	1.25	1.60	0.18
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.85	0.00	-0.45
<b>Melanoma of skin</b>	3	3.93	3	1.04	3	1.15	3	0.84	12	9.84	1.22	0.53
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.10
<b>Brain, central nervous system</b>	2	7.73	1	1.02	1	1.09	2	1.56	6	3.44	1.75	0.62
<b>Thyroid</b>	4	12.95*	5	4.56*	2	2.26	2	2.11	13	3.24	4.01*	2.37
<b>Lymphatic, hematopoietic</b>	0	0.00	8	1.82	4	0.92	9	1.24	21	17.11	1.23	0.95
Hodgkin lymphoma	0	0.00	1	2.16	0	0.00	1	3.08	2	1.26	1.58	0.18
Non-Hodgkin lymphoma	0	0.00	2	0.85	1	0.44	5	1.36	8	8.89	0.90	-0.22
Myeloma	0	0.00	2	4.35	2	3.51	0	0.00	4	2.27	1.76	0.42
Leukemia	0	0.00	3	2.66	1	0.85	3	1.42	7	4.70	1.49	0.56
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	11.41	1	0.26	3.78	0.18
Chronic lymphocytic	0	0.00	0	0.00	1	2.41	2	2.37	3	1.64	1.83	0.33
Acute non-lymphocytic	0	0.00	2	5.13	0	0.00	0	0.00	2	1.56	1.28	0.11
Chronic myeloid	0	0.00	1	4.79	0	0.00	0	0.00	1	0.75	1.33	0.06

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 15,346 PYR and for male cancers on 25,775 PYR.

# Kidney Parenchyma

## Both Sexes, 50-69 Years of Age

**Table 11.2.7:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	263	1.60*	696	1.15*	590	1.09*	536	1.02	2,085	1,832.73	1.14*	24.35
All excluding same site	235	1.47*	653	1.11*	549	1.03	497	0.97	1,934	1,793.45	1.08*	13.57
<b>Buccal cavity, pharynx</b>	6	1.04	8	0.42*	13	0.90	7	0.62	34	50.74	0.67*	-1.62
Lip	0	0.00	1	0.41	3	1.48	6	3.35*	10	6.98	1.43	0.29
Tongue	3	2.51	0	0.00*	2	0.67	0	0.00	5	10.45	0.48	-0.53
Salivary gland	0	0.00	0	0.00	3	2.66	0	0.00	3	3.93	0.76	-0.09
Mouth	2	1.33	3	0.61	3	0.82	1	0.35	9	12.93	0.70	-0.38
Nasopharynx	1	3.86	1	1.23	0	0.00	0	0.00	2	2.01	0.99	0.00
Tonsil	0	0.00	1	0.48	1	0.70	0	0.00	2	5.11	0.39	-0.30
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-0.15
Hypopharynx	0	0.00	1	0.45	1	0.60	0	0.00	2	5.77	0.35	-0.36
<b>Digestive system</b>	33	1.01	107	0.90	113	1.04	111	1.01	364	370.26	0.98	-0.60
Esophagus	1	0.44	6	0.76	5	0.75	2	0.33	14	22.82	0.61	-0.85
Stomach	1	0.30	7	0.58	13	1.22	14	1.30	35	36.71	0.95	-0.16
Small intestine	3	5.79*	2	1.06	1	0.60	2	1.20	8	5.76	1.39	0.22
Colon	14	1.06	52	1.05	47	1.00	50	0.99	163	160.09	1.02	0.28
Rectum, rectosigmoid junction	5	0.78	16	0.70	25	1.27	15	0.83	61	66.83	0.91	-0.56
Anus, anal canal	1	2.79	2	1.59	1	0.97	1	1.10	5	3.56	1.40	0.14
Liver	2	1.47	3	0.61	4	0.93	2	0.47	11	14.79	0.74	-0.37
Gallbladder	1	3.02	1	0.81	2	1.69	1	0.79	5	4.02	1.24	0.09
Bile ducts, other biliary	0	0.00	3	1.30	2	0.90	3	1.15	8	7.74	1.03	0.02
Pancreas	4	1.02	14	0.97	12	0.92	21	1.59	51	44.52	1.15	0.63
<b>Respiratory system</b>	34	1.02	116	0.97	100	0.97	88	0.95	338	348.94	0.97	-1.06
Nose, nasal cavity, ear	0	0.00	3	3.30	1	1.35	0	0.00	4	2.61	1.53	0.13
Larynx	1	0.35	6	0.62	5	0.68	4	0.72	16	25.39	0.63	-0.91
Lung, bronchus	33	1.10	107	0.98	94	0.99	84	0.98	318	320.15	0.99	-0.21
<b>Female breast</b>	13	0.90	51	1.03	42	1.03	29	0.80	135	141.43	0.95	-1.77
<b>Female genital system</b>	13	1.88*	17	0.74	16	0.89	12	0.80	58	62.97	0.92	-1.37
Cervix uteri	0	0.00	1	0.41	1	0.61	2	1.73	4	6.03	0.66	-0.56
Corpus uteri	10	2.63*	13	1.03	11	1.12	7	0.90	41	34.11	1.20	1.89
Ovary	2	1.05	2	0.31	3	0.57	3	0.65	10	18.35	0.55	-2.29
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-0.23
Vulva	1	5.24	1	1.41	1	1.48	0	0.00	3	2.38	1.26	0.17
<b>Male genital system</b>	63	1.88*	197	1.44*	145	1.07	134	0.98	539	443.15	1.22*	14.26
Prostate	62	1.88*	197	1.46*	145	1.07	133	0.97	537	439.61	1.22*	14.49
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	1.08	0.00	-0.16
<b>Urinary system</b>	56	4.30*	98	2.03*	73	1.65*	76	1.70*	303	150.20	2.02*	14.75
Urinary bladder	27	3.19*	51	1.60*	31	1.02	35	1.11	144	102.27	1.41*	4.03
Kidney parenchyma	28	7.32*	43	3.18*	41	3.57*	39	3.74*	151	39.28	3.84*	10.78
Renal pelvis, other urinary	1	1.36	4	1.45	1	0.39	2	0.78	8	8.65	0.93	-0.06
Ureter	1	4.22	2	2.21	1	1.16	0	0.00	4	2.86	1.40	0.11
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.49	0.00	-0.14
<b>Soft tissue including heart</b>	1	1.56	4	1.80	3	1.59	2	1.05	10	6.65	1.50	0.32
<b>Kaposi sarcoma</b>	0	0.00	2	3.57	0	0.00	0	0.00	2	1.45	1.38	0.05
<b>Melanoma of skin</b>	10	2.37*	25	1.70*	18	1.46	10	0.86	63	42.88	1.47*	1.94
<b>Eye, orbit</b>	0	0.00	1	1.09	1	1.34	1	1.51	3	2.59	1.16	0.04
<b>Brain, central nervous system</b>	2	0.99	5	0.73	5	0.91	6	1.27	18	19.12	0.94	-0.11
<b>Thyroid</b>	10	9.51*	10	2.96*	5	2.05	3	1.63	28	8.72	3.21*	1.86
<b>Lymphatic, hematopoietic</b>	17	1.50	44	1.06	39	1.04	45	1.17	145	129.14	1.12	1.53
Hodgkin lymphoma	0	0.00	3	2.04	1	0.91	0	0.00	4	3.92	1.02	0.01
Non-Hodgkin lymphoma	11	2.09*	16	0.84	14	0.81	22	1.24	63	59.57	1.06	0.33
Myeloma	3	1.53	6	0.83	7	1.06	7	1.03	23	22.62	1.02	0.04
Leukemia	3	0.81	19	1.39	17	1.35	16	1.22	55	43.02	1.28	1.16
Acute lymphocytic	0	0.00	1	2.47	1	2.95	1	3.24	3	1.17	2.56	0.18
Chronic lymphocytic	1	0.64	4	0.69	6	1.14	9	1.72	20	17.82	1.12	0.21
Acute non-lymphocytic	2	1.71	5	1.13	5	1.18	4	0.87	16	14.46	1.11	0.15
Chronic myeloid	0	0.00	5	2.81	3	1.84	1	0.57	9	5.67	1.59	0.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 36,393 PYR and for male cancers on 67,207 PYR.

**Table 11.2.8:** Risk of subsequent primary cancers after cancer of the kidney parenchyma, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	267	1.35*	508	0.95	292	1.07	85	0.88	1,152	1,104.41	1.04	11.70
All excluding same site	252	1.30*	493	0.93	288	1.07	85	0.89	1,118	1,085.22	1.03	8.06
<b>Buccal cavity, pharynx</b>	3	0.71	8	0.73	5	0.96	1	0.55	17	22.18	0.77	-1.27
Lip	1	1.20	1	0.45	2	1.81	1	2.52	5	4.54	1.10	0.11
Tongue	0	0.00	3	1.49	0	0.00	0	0.00	3	4.02	0.75	-0.25
Salivary gland	0	0.00	2	1.64	0	0.00	0	0.00	2	2.63	0.76	-0.15
Mouth	2	1.85	0	0.00	3	2.21	0	0.00	5	5.73	0.87	-0.18
Nasopharynx	0	0.00	1	3.04	0	0.00	0	0.00	1	0.65	1.53	0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.46	0.00	-0.36
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.12
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.87	0.00	-0.46
<b>Digestive system</b>	43	0.91	109	0.84	91	1.31*	25	0.94	268	272.98	0.98	-1.22
Esophagus	4	1.94	4	0.72	1	0.37	0	0.00	9	11.23	0.80	-0.55
Stomach	7	1.39	8	0.59	3	0.41	4	1.41	22	28.74	0.77	-1.66
Small intestine	1	1.68	1	0.61	2	2.34	1	3.16	5	3.40	1.47	0.39
Colon	17	0.76	60	0.97	56	1.64*	10	0.75	143	131.95	1.08	2.72
Rectum, rectosigmoid junction	6	0.78	17	0.83	10	0.97	4	1.10	37	42.07	0.88	-1.25
Anus, anal canal	0	0.00	1	1.12	1	2.18	0	0.00	2	1.87	1.07	0.03
Liver	0	0.00	0	0.00*	2	0.98	0	0.00	2	8.25	0.24*	-1.54
Gallbladder	0	0.00	2	1.09	1	1.01	1	2.51	4	3.89	1.03	0.03
Bile ducts, other biliary	2	1.89	3	0.98	1	0.56	0	0.00	6	6.68	0.90	-0.17
Pancreas	6	1.07	12	0.78	13	1.59	5	1.58	36	32.36	1.11	0.89
<b>Respiratory system</b>	19	0.58*	69	0.80	36	0.88	11	0.87	135	172.87	0.78*	-9.31
Nose, nasal cavity, ear	0	0.00	1	1.35	0	0.00	0	0.00	1	1.55	0.65	-0.13
Larynx	0	0.00	3	0.64	4	2.02	0	0.00	7	9.03	0.78	-0.50
Lung, bronchus	19	0.62*	65	0.80	32	0.83	11	0.92	127	161.86	0.78*	-8.57
<b>Female breast</b>	14	0.98	22	0.58*	25	1.27	7	0.93	68	79.68	0.85	-6.59
<b>Female genital system</b>	5	0.81	21	1.31	11	1.38	2	0.67	39	33.19	1.17	3.27
Cervix uteri	1	1.75	6	4.23*	3	4.46	1	4.12	11	2.91	3.79*	4.56
Corpus uteri	1	0.33	10	1.28	4	1.09	1	0.80	16	15.78	1.01	0.12
Ovary	2	1.06	4	0.81	3	1.18	0	0.00	9	10.37	0.87	-0.77
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.40
Vulva	0	0.00	0	0.00	1	1.52	0	0.00	1	2.46	0.41	-0.82
<b>Male genital system</b>	86	1.84*	113	0.88	58	0.95	26	1.35	283	254.90	1.11	12.25
Prostate	86	1.86*	113	0.89	58	0.95	26	1.37	283	252.97	1.12	13.09
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.10
<b>Urinary system</b>	68	4.01*	86	1.83*	26	1.06	1	0.11*	181	97.39	1.86*	20.55
Urinary bladder	49	3.97*	64	1.85*	19	1.03	1	0.15*	133	72.03	1.85*	14.99
Kidney parenchyma	15	4.28*	15	1.59	4	0.86	0	0.00	34	19.19	1.77*	3.64
Renal pelvis, other urinary	4	3.63	7	2.34	3	1.96	0	0.00	14	6.18	2.27*	1.92
Ureter	3	8.05*	3	2.98	2	3.92	0	0.00	8	2.07	3.87*	1.46
<b>Bone, joints</b>	1	7.08	0	0.00	0	0.00	1	14.87	2	0.76	2.63	0.30
<b>Soft tissue including heart</b>	2	2.77	2	1.00	1	0.91	0	0.00	5	4.26	1.17	0.18
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	3.72	0	0.00	1	1.01	0.99	0.00
<b>Melanoma of skin</b>	3	0.86	9	0.91	8	1.50	1	0.48	21	20.79	1.01	0.05
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.38	0.00	-0.34
<b>Brain, central nervous system</b>	2	1.24	3	0.70	1	0.48	0	0.00	6	8.67	0.69	-0.66
<b>Thyroid</b>	1	1.61	2	1.25	1	1.33	0	0.00	4	3.23	1.24	0.19
<b>Lymphatic, hematopoietic</b>	17	1.13	50	1.20	21	0.94	7	0.83	95	87.78	1.08	1.77
Hodgkin lymphoma	0	0.00	0	0.00	1	2.29	0	0.00	1	1.85	0.54	-0.21
Non-Hodgkin lymphoma	5	0.78	17	0.95	11	1.14	4	1.11	37	37.68	0.98	-0.17
Myeloma	9	3.35*	9	1.21	5	1.28	1	0.71	24	15.41	1.56	2.11
Leukemia	3	0.54	24	1.55	4	0.48	2	0.60	33	32.85	1.00	0.04
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.19
Chronic lymphocytic	2	0.90	7	1.15	1	0.31	0	0.00	10	12.85	0.78	-0.70
Acute non-lymphocytic	1	0.52	9	1.69	1	0.35	0	0.00	11	11.22	0.98	-0.06
Chronic myeloid	0	0.00	4	1.90	0	0.00	0	0.00	4	4.51	0.89	-0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 17,741 PYR and for male cancers on 22,942 PYR.

## Kidney Parenchyma Renal Cell Carcinoma, Both Sexes, ≥18 Years of Age

**Table 11.2.9:** Risk of subsequent primary cancers after renal cell carcinoma of the kidney parenchyma, both sexes, ≥18 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	32,992	23,064										
			24,626	70,144	12,859	45,712	6,158	32,626	32,992	171,546		
<b>All subsequent cancers</b>	481	1.44*	1,144	1.05	879	1.09*	708	1.06	3,212	2,890.10	1.11*	18.76
All excluding same site	427	1.31*	1,065	1.00	819	1.04	656	1.01	2,967	2,830.88	1.05*	7.93
<b>Buccal cavity, pharynx</b>	10	1.06	15	0.51*	19	0.94	9	0.59	53	74.44	0.71*	-1.25
Lip	1	0.70	2	0.45	5	1.64	6	2.61	14	11.19	1.25	0.16
Tongue	2	1.06	2	0.34	2	0.49	0	0.00	6	15.04	0.40*	-0.53
Salivary gland	1	1.32	2	0.81	3	1.65	1	0.65	7	6.57	1.06	0.02
Mouth	5	2.05	2	0.26*	6	1.16	1	0.26	14	19.02	0.74	-0.29
Nasopharynx	1	2.58	3	2.55	0	0.00	0	0.00	4	2.87	1.40	0.07
Tonsil	0	0.00	1	0.35	2	1.04	1	0.73	4	7.11	0.56	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.16	0.00	-0.13
Hypopharynx	0	0.00	1	0.32	1	0.47	0	0.00	2	7.75	0.26*	-0.34
<b>Digestive system</b>	72	0.99	206	0.88	195	1.13	150	1.06	623	620.40	1.00	0.15
Esophagus	5	1.26	9	0.70	6	0.65	4	0.53	24	33.68	0.71	-0.56
Stomach	7	0.93	18	0.75	17	0.98	18	1.29	60	62.76	0.96	-0.16
Small intestine	4	3.84*	3	0.88	2	0.78	2	0.92	11	9.18	1.20	0.11
Colon	30	0.94	99	0.95	97	1.25*	65	1.00	291	278.83	1.04	0.71
Rectum, rectosigmoid junction	10	0.78	34	0.83	33	1.12	22	0.95	99	106.17	0.93	-0.42
Anus, anal canal	1	1.51	1	0.47	4	2.59	1	0.80	7	5.59	1.25	0.08
Liver	3	1.14	5	0.58	6	0.95	3	0.56	17	22.88	0.74	-0.34
Gallbladder	1	1.12	3	1.06	2	0.97	2	1.19	8	7.49	1.07	0.03
Bile ducts, other biliary	2	1.33	6	1.20	2	0.52	4	1.16	14	13.82	1.01	0.01
Pancreas	9	1.04	25	0.90	24	1.17	29	1.70*	87	74.14	1.17	0.75
<b>Respiratory system</b>	41	0.68*	175	0.89	132	0.93	117	1.03	465	511.74	0.91*	-2.72
Nose, nasal cavity, ear	0	0.00	4	2.50	1	0.87	0	0.00	5	4.17	1.20	0.05
Larynx	1	0.23	8	0.58	8	0.84	5	0.72	22	34.70	0.63*	-0.74
Lung, bronchus	40	0.72*	163	0.91	123	0.94	112	1.06	438	471.65	0.93	-1.96
<b>Female breast</b>	25	0.90	71	0.80	70	1.08	43	0.83	209	233.15	0.90	-3.75
<b>Female genital system</b>	18	1.43	37	0.95	23	0.84	16	0.76	94	100.11	0.94	-0.95
Cervix uteri	1	0.68	7	1.61	3	1.09	3	1.60	14	10.46	1.34	0.55
Corpus uteri	11	1.70	24	1.20	16	1.15	10	0.94	61	51.14	1.19	1.53
Ovary	4	1.10	5	0.43	3	0.36	3	0.46	15	29.94	0.50*	-2.32
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	1.54	0.00	-0.24
Vulva	1	1.87	0	0.00	1	0.75	0	0.00	2	4.76	0.42	-0.43
<b>Male genital system</b>	139	1.92*	293	1.20*	201	1.07	177	1.08	810	669.29	1.21*	13.13
Prostate	137	1.92*	292	1.21*	200	1.07	175	1.08	804	662.73	1.21*	13.18
Testis	1	2.48	1	0.88	1	1.60	1	2.91	4	2.51	1.59	0.14
<b>Urinary system</b>	100	3.64*	160	1.78*	107	1.59*	90	1.60*	457	240.89	1.90*	12.60
Urinary bladder	44	2.33*	74	1.19	43	0.92	37	0.93	198	167.52	1.18*	1.78
Kidney parenchyma	54	7.82*	79	3.53*	60	3.65*	52	3.85*	245	59.22	4.14*	10.83
Renal pelvis, other urinary	2	1.20	7	1.31	4	1.02	1	0.31	14	14.15	0.99	-0.01
Ureter	1	1.82	5	2.83	3	2.31	0	0.00	9	4.67	1.93	0.25
<b>Bone, joints</b>	1	3.35	0	0.00	0	0.00	2	4.01	3	2.38	1.26	0.04
<b>Soft tissue including heart</b>	3	2.29	6	1.42	3	0.98	3	1.16	15	11.17	1.34	0.22
<b>Kaposi sarcoma</b>	0	0.00	2	1.19	1	0.95	0	0.00	3	3.98	0.75	-0.06
<b>Melanoma of skin</b>	14	1.82	34	1.34	29	1.53*	14	0.87	91	68.08	1.34*	1.34
<b>Eye, orbit</b>	0	0.00	1	0.64	0	0.00	1	1.15	2	4.03	0.50	-0.12
<b>Brain, central nervous system</b>	5	1.41	8	0.71	7	0.88	8	1.30	28	28.87	0.97	-0.05
<b>Thyroid</b>	15	8.31*	16	2.84*	8	2.10	4	1.41	43	14.09	3.05*	1.69
<b>Lymphatic, hematopoietic</b>	32	1.30	98	1.22	61	1.02	58	1.16	249	214.84	1.16*	1.99
Hodgkin lymphoma	0	0.00	4	1.52	2	1.15	1	0.80	7	6.48	1.08	0.03
Non-Hodgkin lymphoma	15	1.36	33	0.91	25	0.92	29	1.25	102	97.76	1.04	0.25
Myeloma	11	2.60*	16	1.16	12	1.17	8	0.93	47	36.93	1.27	0.59
Leukemia	6	0.71	45	1.63*	22	1.07	20	1.17	93	73.66	1.26*	1.13
Acute lymphocytic	0	0.00	1	1.29	1	1.79	2	4.62	4	2.01	1.99	0.12
Chronic lymphocytic	3	0.87	10	0.90	8	0.97	10	1.48	31	29.55	1.05	0.08
Acute non-lymphocytic	3	1.06	16	1.73	6	0.86	4	0.68	29	24.93	1.16	0.24
Chronic myeloid	0	0.00	10	2.69*	3	1.08	1	0.43	14	9.99	1.40	0.23

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 64,390 PYR and for male cancers on 107,156 PYR.

**Table 11.3.1:** Characteristics of patients with an initial cancer of the renal pelvis or ureter, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	3,824	100.0	2,529	100.0	6,353	100.0
<b>Initial treatment</b>						
Any radiation	375	9.8	257	10.2	632	9.9
With surgery	304	7.9	202	8.0	506	8.0
Without surgery	71	1.9	55	2.2	126	2.0
No radiation	3,449	90.2	2,272	89.8	5,721	90.1
With surgery	3,130	81.9	2,041	80.7	5,171	81.4
Without surgery	319	8.3	231	9.1	550	8.7
<b>Race</b>						
White	3,448	90.2	2,264	89.5	5,712	89.9
Black	130	3.4	124	4.9	254	4.0
Other	238	6.2	136	5.4	374	5.9
Unknown	8	0.2	5	0.2	13	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	16	0.4	8	0.3	24	0.4
30–49	286	7.5	103	4.1	389	6.1
50–69	1,771	46.3	918	36.3	2,689	42.3
70–79	1,214	31.7	892	35.3	2,106	33.1
≥ 80	537	14.0	608	24.0	1,145	18.0
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	2,707	70.8	1,981	78.3	4,688	73.8
1st and 2nd cancers	923	24.1	465	18.4	1,388	21.8
1st, 2nd, and 3rd cancers	174	4.6	70	2.8	244	3.8
1st, 2nd, 3rd, and additional cancers	20	0.5	13	0.5	33	0.5
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	68.8	—	72.6	—	70.4	—
Median year of 1st cancer diagnosis	1985.6	—	1987.0	—	1986.2	—
Median person-years at risk	3.9	—	3.2	—	3.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	97.5	—	97.3	—	97.4
1st, 2nd, and additional cancers	—	96.6	—	96.2	—	96.5
1st cancer only	—	1.9	—	2.4	—	2.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



## Renal Pelvis and Ureter Both Sexes

**Table 11.3.2:** Risk of subsequent primary cancers after cancer of the renal pelvis or ureter, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	6,353	4,597	527	6.29*	826	3.00*	350	1.64*	277	1.35*	1,980	777.94	2.55*	315.73
All excluding same site			93	1.19	347	1.35*	258	1.30*	237	1.24*	935	725.01	1.29*	55.15
<b>Buccal cavity, pharynx</b>			4	1.78	8	1.11	1	0.19	6	1.34	19	19.12	0.99	-0.03
Lip			0	0.00	1	0.74	0	0.00	1	1.27	2	3.50	0.57	-0.39
Tongue			1	2.39	1	0.74	0	0.00	0	0.00	2	3.62	0.55	-0.42
Salivary gland			1	5.29	1	1.60	0	0.00	1	2.03	3	1.81	1.66	0.31
Mouth			1	1.71	4	2.14	0	0.00	2	1.77	7	4.91	1.43	0.55
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.18
Tonsil			0	0.00	0	0.00	0	0.00	1	2.90	1	1.56	0.64	-0.15
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.13
Hypopharynx			1	4.46	1	1.38	1	1.96	1	2.40	4	1.88	2.13	0.56
<b>Digestive system</b>			17	0.84	88	1.34*	64	1.28	56	1.20	225	182.85	1.23*	11.07
Esophagus			1	1.10	3	1.01	4	1.76	3	1.36	11	8.34	1.32	0.70
Stomach			3	1.36	6	0.85	4	0.76	5	1.05	18	19.34	0.93	-0.35
Small intestine			0	0.00	2	2.53	0	0.00	0	0.00	2	2.29	0.87	-0.08
Colon			8	0.87	46	1.52*	44	1.88*	34	1.55*	132	84.88	1.56*	12.38
Rectum, rectosigmoid junction			0	0.00	13	1.14	4	0.47	6	0.81	23	30.87	0.74	-2.07
Anus, anal canal			0	0.00	0	0.00	0	0.00	0	0.00	0	1.41	0.00	-0.37
Liver			2	3.17	0	0.00	1	0.62	1	0.60	4	5.96	0.67	-0.52
Gallbladder			0	0.00	2	2.15	2	2.95	1	1.69	5	2.49	2.01	0.66
Bile ducts, other biliary			0	0.00	2	1.42	0	0.00	2	1.68	4	4.15	0.96	-0.04
Pancreas			2	0.84	10	1.30	5	0.85	3	0.55	20	21.46	0.93	-0.38
<b>Respiratory system</b>			26	1.78*	95	1.98*	78	2.15*	71	2.12*	270	132.47	2.04*	36.12
Nose, nasal cavity, ear			0	0.00	0	0.00	1	3.21	1	3.48	2	1.14	1.76	0.23
Larynx			0	0.00	5	1.55	3	1.30	3	1.54	11	8.48	1.30	0.66
Lung, bronchus			26	1.93*	90	2.03*	74	2.21*	66	2.11*	256	122.52	2.09*	35.06
<b>Female breast</b>			6	0.89	27	1.29	20	1.31	20	1.41	73	57.10	1.28*	11.09
<b>Female genital system</b>			3	0.96	10	1.05	8	1.22	6	1.04	27	24.98	1.08	1.41
Cervix uteri			0	0.00	1	1.03	0	0.00	0	0.00	1	2.41	0.42	-0.98
Corpus uteri			2	1.25	4	0.83	4	1.22	5	1.77	15	12.51	1.20	1.74
Ovary			1	1.10	4	1.44	3	1.50	1	0.55	9	7.51	1.20	1.04
Vagina			0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.31
Vulva			0	0.00	1	1.93	0	0.00	0	0.00	1	1.47	0.68	-0.33
<b>Male genital system</b>			26	1.52	74	1.26	47	0.96	50	0.99	197	175.09	1.13	9.23
Prostate			25	1.48	73	1.25	45	0.93	50	1.00	193	173.49	1.11	8.22
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.18
<b>Urinary system</b>			434	60.99*	485	20.48*	95	5.11*	41	2.27*	1,055	67.47	15.64*	259.38
Urinary bladder			411	80.76*	439	25.80*	85	6.33*	30	2.29*	965	48.65	19.83*	240.68
Kidney parenchyma			0	0.00	6	1.18	3	0.75	1	0.26	10	14.54	0.69	-1.19
Renal pelvis, other urinary			23	47.79*	40	25.71*	7	6.01*	10	9.37*	80	4.27	18.73*	19.89
Ureter			12	73.32*	18	33.91*	5	12.51*	4	11.15*	39	1.45	26.85*	9.86
<b>Bone, joints</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.16
<b>Soft tissue including heart</b>			0	0.00	0	0.00	1	1.26	1	1.25	2	2.93	0.68	-0.25
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-0.22
<b>Melanoma of skin</b>			1	0.64	6	1.14	4	0.92	5	1.06	16	15.90	1.01	0.03
<b>Eye, orbit</b>			0	0.00	1	2.51	0	0.00	1	3.73	2	1.08	1.85	0.24
<b>Brain, central nervous system</b>			5	6.24*	5	1.92	2	1.03	0	0.00	12	7.16	1.68	1.27
<b>Thyroid</b>			0	0.00	2	1.77	0	0.00	1	1.35	3	3.04	0.99	-0.01
<b>Lymphatic, hematopoietic</b>			3	0.48	18	0.86	22	1.35	10	0.63	53	59.30	0.89	-1.65
Hodgkin lymphoma			0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-0.42
Non-Hodgkin lymphoma			1	0.37	9	1.01	8	1.13	3	0.41	21	25.91	0.81	-1.29
Myeloma			0	0.00	3	0.85	4	1.47	2	0.76	9	9.95	0.90	-0.25
Leukemia			2	0.85	6	0.77	10	1.67	5	0.88	23	21.84	1.05	0.31
Acute lymphocytic			0	0.00	0	0.00	0	0.00	1	7.17	1	0.56	1.79	0.12
Chronic lymphocytic			1	1.05	2	0.64	5	2.06	2	0.89	10	8.75	1.14	0.33
Acute non-lymphocytic			0	0.00	2	0.77	2	1.00	2	1.03	6	7.32	0.82	-0.35
Chronic myeloid			1	3.17	1	0.97	2	2.50	0	0.00	4	2.93	1.36	0.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 14,345 PYR and for male cancers on 23,728 PYR.

**Table 11.3.3:** Risk of subsequent primary cancers after cancer of the renal pelvis or ureter, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	187	7.29*	276	3.46*	95	1.62*	87	1.59*	645	218.71	2.95*	297.16
All excluding same site	27	1.09	118	1.53*	78	1.38*	80	1.52*	303	210.73	1.44*	64.32
<b>Buccal cavity, pharynx</b>	2	4.41	4	2.86	0	0.00	0	0.00	6	3.76	1.60	1.56
Lip	0	0.00	1	9.12	0	0.00	0	0.00	1	0.31	3.25	0.48
Tongue	0	0.00	1	3.28	0	0.00	0	0.00	1	0.82	1.22	0.12
Salivary gland	1	19.93	0	0.00	0	0.00	0	0.00	1	0.43	2.33	0.40
Mouth	1	6.20	2	4.00	0	0.00	0	0.00	3	1.35	2.23	1.15
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.19
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.16
<b>Digestive system</b>	8	1.17	26	1.22	19	1.21	23	1.58*	76	58.24	1.31*	12.38
Esophagus	1	5.91	0	0.00	0	0.00	1	2.71	2	1.45	1.38	0.38
Stomach	0	0.00	4	2.26	2	1.57	2	1.78	8	4.75	1.69	2.27
Small intestine	0	0.00	1	3.92	0	0.00	0	0.00	1	0.73	1.37	0.19
Colon	3	0.87	10	0.93	15	1.87*	15	1.99*	43	29.80	1.44*	9.20
Rectum, rectosigmoid junction	0	0.00	6	1.84	1	0.43	2	0.99	9	8.63	1.04	0.26
Rectum	0	0.00	3	1.41	1	0.66	1	0.74	5	5.69	0.88	-0.48
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.46
Liver	1	7.25	0	0.00	0	0.00	0	0.00	1	1.21	0.83	-0.14
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.35	0.00	-0.94
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	2.70	1	1.35	0.74	-0.25
Pancreas	2	2.28	4	1.46	1	0.49	1	0.51	8	7.60	1.05	0.28
<b>Respiratory system</b>	6	1.94	34	3.48*	21	2.86*	20	2.77*	81	27.42	2.95*	37.35
Nose, nasal cavity, ear	0	0.00	0	0.00	1	12.05	1	12.71	2	0.31	6.47	1.18
Larynx	0	0.00	0	0.00	1	4.99	1	5.64	2	0.76	2.63	0.86
Lung, bronchus	6	2.03	34	3.64*	19	2.70*	18	2.59*	77	26.28	2.93*	35.36
<b>Female breast</b>	6	0.89	27	1.29	20	1.31	20	1.41	73	57.10	1.28*	11.09
<b>Female genital system</b>	3	0.96	10	1.05	8	1.22	6	1.04	27	24.98	1.08	1.41
Cervix uteri	0	0.00	1	1.03	0	0.00	0	0.00	1	2.41	0.42	-0.98
Corpus uteri	2	1.25	4	0.83	4	1.22	5	1.77	15	12.51	1.20	1.74
Ovary	1	1.10	4	1.44	3	1.50	1	0.55	9	7.51	1.20	1.04
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.31
Vulva	0	0.00	1	1.93	0	0.00	0	0.00	1	1.47	0.68	-0.33
<b>Urinary system</b>	160	122.79*	159	39.08*	17	5.64*	7	2.41	343	11.29	30.37*	231.23
Urinary bladder	155	192.75*	151	59.95*	17	9.11*	4	2.23	327	6.99	46.81*	223.08
Kidney parenchyma	0	0.00	1	0.84	0	0.00	0	0.00	1	3.32	0.30	-1.62
Renal pelvis, other urinary	5	42.17*	7	19.27*	0	0.00	3	12.36*	15	0.99	15.21*	9.77
Ureter	5	131.04*	4	34.18*	0	0.00	3	39.55*	12	0.31	38.15*	8.15
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.13
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.60
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.08
<b>Melanoma of skin</b>	0	0.00	1	0.76	3	2.99	3	2.97	7	3.75	1.87	2.26
<b>Eye, orbit</b>	0	0.00	1	8.49	0	0.00	1	13.56	2	0.31	6.42	1.18
<b>Brain, central nervous system</b>	1	4.05	1	1.31	1	1.80	0	0.00	3	2.07	1.45	0.65
<b>Thyroid</b>	0	0.00	2	3.66	0	0.00	0	0.00	2	1.44	1.39	0.39
<b>Lymphatic, hematopoietic</b>	0	0.00	9	1.39	4	0.83	2	0.43	15	18.07	0.83	-2.14
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.31
Non-Hodgkin lymphoma	0	0.00	6	1.99	3	1.31	0	0.00	9	8.52	1.06	0.33
Myeloma	0	0.00	2	1.78	0	0.00	0	0.00	2	3.09	0.65	-0.76
Leukemia	0	0.00	1	0.46	1	0.62	2	1.30	4	6.01	0.67	-1.40
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.11
Chronic lymphocytic	0	0.00	1	1.17	0	0.00	1	1.69	2	2.35	0.85	-0.24
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	1	1.86	1	2.08	0.48	-0.75
Chronic myeloid	0	0.00	0	0.00	1	4.58	0	0.00	1	0.82	1.22	0.13

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Renal Pelvis and Ureter Males

**Table 11.3.4:** Risk of subsequent primary cancers after cancer of the renal pelvis or ureter, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	3,824	2,790	3,042	9,000	1,722	6,406	923	5,531	3,824	23,728		
<b>All subsequent cancers</b>	340	5.85*	550	2.81*	255	1.64*	190	1.26*	1,335	559.23	2.39*	326.95
All excluding same site	66	1.24	229	1.27*	180	1.26*	157	1.14	632	514.28	1.23*	49.61
<b>Buccal cavity, pharynx</b>	2	1.12	4	0.69	1	0.24	6	1.68	13	15.37	0.85	-1.00
Lip	0	0.00	0	0.00	0	0.00	1	1.42	1	3.19	0.31	-0.92
Tongue	1	3.12	0	0.00	0	0.00	0	0.00	1	2.80	0.36	-0.76
Salivary gland	0	0.00	1	2.12	0	0.00	1	2.61	2	1.38	1.45	0.26
Mouth	0	0.00	2	1.46	0	0.00	2	2.50	4	3.56	1.12	0.19
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.23
Tonsil	0	0.00	0	0.00	0	0.00	1	3.48	1	1.28	0.78	-0.12
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.17
Hypopharynx	1	5.12	1	1.57	1	2.21	1	2.72	4	1.65	2.42	0.99
<b>Digestive system</b>	9	0.68	62	1.39*	45	1.30	33	1.02	149	124.61	1.20*	10.28
Esophagus	0	0.00	3	1.23	4	2.13	2	1.09	9	6.90	1.31	0.89
Stomach	3	1.85	2	0.38	2	0.50	3	0.82	10	14.59	0.69	-1.93
Small intestine	0	0.00	1	1.86	0	0.00	0	0.00	1	1.56	0.64	-0.24
Colon	5	0.87	36	1.85*	29	1.88*	19	1.32	89	55.08	1.62*	14.30
Rectum, rectosigmoid junction	0	0.00	7	0.85	3	0.49	4	0.74	14	22.24	0.63	-3.47
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.31
Liver	1	2.03	0	0.00	1	0.78	1	0.74	3	4.76	0.63	-0.74
Gallbladder	0	0.00	2	4.82	2	6.37	1	3.50	5	1.14	4.39*	1.63
Bile ducts, other biliary	0	0.00	2	2.14	0	0.00	1	1.21	3	2.80	1.07	0.08
Pancreas	0	0.00	6	1.20	4	1.05	2	0.56	12	13.86	0.87	-0.78
<b>Respiratory system</b>	20	1.74*	61	1.59*	57	1.97*	51	1.94*	189	105.05	1.80*	35.38
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.35
Larynx	0	0.00	5	1.70	2	0.95	2	1.13	9	7.72	1.17	0.54
Lung, bronchus	20	1.90*	56	1.60*	55	2.07*	48	1.98*	179	96.24	1.86*	34.88
<b>Male breast</b>	0	0.00	1	2.80	0	0.00	0	0.00	1	1.02	0.98	-0.01
<b>Male genital system</b>	26	1.52	74	1.26	47	0.96	50	0.99	197	175.09	1.13	9.23
Prostate	25	1.48	73	1.25	45	0.93	50	1.00	193	173.49	1.11	8.22
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.18
<b>Urinary system</b>	274	47.14*	326	16.63*	78	5.01*	34	2.24*	712	56.17	12.67*	276.40
Urinary bladder	256	59.74*	288	19.86*	68	5.88*	26	2.30*	638	41.67	15.31*	251.32
Kidney parenchyma	0	0.00	5	1.28	3	0.97	1	0.33	9	11.22	0.80	-0.94
Renal pelvis, other urinary	18	49.63*	33	27.67*	7	7.75*	7	8.49*	65	3.28	19.79*	26.01
Ureter	7	55.77*	14	33.83*	5	15.82*	1	3.54	27	1.14	23.72*	10.90
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.18
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	1.77	1	1.74	2	2.07	0.96	-0.03
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.30
<b>Melanoma of skin</b>	1	0.87	5	1.26	1	0.30	2	0.54	9	12.14	0.74	-1.33
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.32
<b>Brain, central nervous system</b>	4	7.22*	4	2.17	1	0.72	0	0.00	9	5.09	1.77	1.65
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	1	2.47	1	1.60	0.62	-0.25
<b>Lymphatic, hematopoietic</b>	3	0.71	9	0.63	18	1.58	8	0.71	38	41.22	0.92	-1.36
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.15	0.00	-0.48
Non-Hodgkin lymphoma	1	0.58	3	0.51	5	1.04	3	0.60	12	17.39	0.69	-2.27
Myeloma	0	0.00	1	0.42	4	2.11	2	1.07	7	6.86	1.02	0.06
Leukemia	2	1.20	5	0.89	9	2.05	3	0.72	19	15.82	1.20	1.34
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	10.15	1	0.40	2.51	0.25
Chronic lymphocytic	1	1.48	1	0.44	5	2.80	1	0.61	8	6.40	1.25	0.68
Acute non-lymphocytic	0	0.00	2	1.09	2	1.38	1	0.71	5	5.23	0.96	-0.10
Chronic myeloid	1	4.52	1	1.35	1	1.72	0	0.00	3	2.11	1.42	0.37

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 11.3.5:** Risk of subsequent primary cancers after cancer of the renal pelvis or ureter, both sexes, <60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	83	14.73*	134	5.08*	83	2.39*	115	1.52*	415	142.27	2.92*	224.72
All excluding same site	11	2.06*	37	1.49*	56	1.71*	95	1.34*	199	133.87	1.49*	53.67
<b>Buccal cavity, pharynx</b>	0	0.00	2	1.74	0	0.00	2	1.03	4	4.61	0.87	-0.51
Lip	0	0.00	1	7.14	0	0.00	0	0.00	1	0.59	1.69	0.34
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.97	0.00	-0.80
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.27
Mouth	0	0.00	1	3.26	0	0.00	1	2.11	2	1.18	1.69	0.68
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.18
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.41
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.12
Hypopharynx	0	0.00	0	0.00	0	0.00	1	4.63	1	0.51	1.95	0.40
<b>Digestive system</b>	3	2.76	9	1.74	14	2.06*	22	1.50	48	27.73	1.73*	16.70
Esophagus	0	0.00	0	0.00	0	0.00	2	2.23	2	1.77	1.13	0.19
Stomach	1	8.35	0	0.00	1	1.44	2	1.38	4	2.82	1.42	0.97
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.37
Colon	2	4.87	9	4.49*	9	3.27*	15	2.39*	35	11.44	3.06*	19.41
Rectum, rectosigmoid junction	0	0.00	0	0.00	2	1.44	2	0.75	4	5.35	0.75	-1.12
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.25
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	1.21	0.00	-1.00
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.23
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.47
Pancreas	0	0.00	0	0.00	2	2.50	0	0.00	2	3.28	0.61	-1.05
<b>Respiratory system</b>	5	4.33*	8	1.46	18	2.53*	32	2.30*	63	27.64	2.28*	29.13
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.19
Larynx	0	0.00	0	0.00	2	3.19	2	2.08	4	2.25	1.78	1.44
Lung, bronchus	5	4.91*	8	1.64	16	2.50*	29	2.26*	58	25.09	2.31*	27.11
<b>Female breast</b>	0	0.00	2	0.72	4	1.27	9	1.65	15	12.08	1.24	7.59
<b>Female genital system</b>	0	0.00	1	0.72	2	1.38	3	1.32	6	5.46	1.10	1.40
Cervix uteri	0	0.00	1	5.08	0	0.00	0	0.00	1	0.63	1.59	0.96
Corpus uteri	0	0.00	0	0.00	1	1.28	2	1.64	3	2.92	1.03	0.20
Ovary	0	0.00	0	0.00	1	2.40	1	1.46	2	1.57	1.27	1.11
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.16
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.44
<b>Male genital system</b>	0	0.00	6	1.69	7	1.06	19	0.95	32	30.62	1.05	1.66
Prostate	0	0.00	6	1.75	7	1.08	19	0.96	32	30.17	1.06	2.20
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.30
<b>Urinary system</b>	72	161.35*	98	46.09*	28	9.85*	20	3.17*	218	11.73	18.58*	169.96
Urinary bladder	68	250.06*	88	66.27*	23	12.44*	14	3.24*	193	7.76	24.86*	152.63
Kidney parenchyma	0	0.00	1	1.46	1	1.19	0	0.00	2	3.33	0.60	-1.10
Renal pelvis, other urinary	4	164.84*	9	78.06*	4	25.96*	6	17.39*	23	0.64	36.01*	18.43
Ureter	1	149.37*	4	116.76*	3	60.01*	2	17.17*	10	0.21	48.21*	8.07
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.12
<b>Soft tissue including heart</b>	0	0.00	0	0.00	1	7.05	0	0.00	1	0.58	1.72	0.35
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.24
<b>Melanoma of skin</b>	0	0.00	2	2.15	1	0.95	3	1.51	6	4.18	1.44	1.50
<b>Eye, orbit</b>	0	0.00	1	18.59	0	0.00	0	0.00	1	0.23	4.33	0.63
<b>Brain, central nervous system</b>	3	29.73*	2	4.73	1	2.15	0	0.00	6	1.78	3.38*	3.48
<b>Thyroid</b>	0	0.00	1	3.87	0	0.00	1	2.64	2	0.96	2.08	0.86
<b>Lymphatic, hematopoietic</b>	0	0.00	1	0.50	4	1.61	3	0.56	8	10.30	0.78	-1.89
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.34
Non-Hodgkin lymphoma	0	0.00	1	1.04	2	1.68	0	0.00	3	4.95	0.61	-1.61
Myeloma	0	0.00	0	0.00	1	2.57	1	1.14	2	1.62	1.23	0.31
Leukemia	0	0.00	0	0.00	1	1.25	2	1.15	3	3.31	0.91	-0.25
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	2	2.83	2	1.36	1.47	0.53
Acute non-lymphocytic	0	0.00	0	0.00	1	3.96	0	0.00	1	1.10	0.91	-0.08
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.36

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,845 PYR and for male cancers on 8,291 PYR.

## Renal Pelvis and Ureter Both Sexes, ≥60 Years of Age

**Table 11.3.6:** Risk of subsequent primary cancers after cancer of the renal pelvis or ureter, both sexes, ≥60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	444	5.68*	692	2.78*	267	1.49*	162	1.25*	1,565	635.67	2.46*	358.31
All excluding same site	82	1.13	310	1.34*	202	1.22*	142	1.18	736	591.15	1.25*	55.85
<b>Buccal cavity, pharynx</b>	4	2.02	6	0.99	1	0.25	4	1.58	15	14.51	1.03	0.19
Lip	0	0.00	0	0.00	0	0.00	1	1.92	1	2.90	0.34	-0.73
Tongue	1	2.74	1	0.90	0	0.00	0	0.00	2	2.65	0.76	-0.25
Salivary gland	1	5.79	1	1.80	0	0.00	1	3.03	3	1.47	2.04	0.59
Mouth	1	1.94	3	1.92	0	0.00	1	1.53	5	3.73	1.34	0.49
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.18
Tonsil	0	0.00	0	0.00	0	0.00	1	6.56	1	1.06	0.94	-0.02
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.14
Hypopharynx	1	5.08	1	1.66	1	2.73	0	0.00	3	1.36	2.20	0.63
<b>Digestive system</b>	14	0.73	79	1.30*	50	1.15	34	1.06	177	155.11	1.14	8.44
Esophagus	1	1.20	3	1.15	4	2.19	1	0.76	9	6.58	1.37	0.93
Stomach	2	0.96	6	0.92	3	0.65	3	0.90	14	16.52	0.85	-0.97
Small intestine	0	0.00	2	2.84	0	0.00	0	0.00	2	1.84	1.08	0.06
Colon	6	0.68	37	1.31	35	1.69*	19	1.21	97	73.44	1.32*	9.08
Rectum, rectosigmoid junction	0	0.00	13	1.26	2	0.28	4	0.83	19	25.52	0.74	-2.51
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.10	0.00	-0.42
Liver	2	3.42	0	0.00	1	0.75	1	1.01	4	4.76	0.84	-0.29
Gallbladder	0	0.00	2	2.26	2	3.27	1	2.29	5	2.22	2.26	1.07
Bile ducts, other biliary	0	0.00	2	1.53	0	0.00	2	2.33	4	3.58	1.12	0.16
Pancreas	2	0.89	10	1.41	3	0.59	3	0.80	18	18.18	0.99	-0.07
<b>Respiratory system</b>	21	1.56	87	2.04*	60	2.06*	39	1.98*	207	104.83	1.97*	39.39
Nose, nasal cavity, ear	0	0.00	0	0.00	1	3.98	1	5.47	2	0.91	2.20	0.42
Larynx	0	0.00	5	1.87	1	0.59	1	1.01	7	6.23	1.12	0.30
Lung, bronchus	21	1.69*	82	2.08*	58	2.14*	37	2.01*	198	97.42	2.03*	38.78
<b>Female breast</b>	6	0.99	25	1.38	16	1.32	11	1.26	58	45.01	1.29	12.37
<b>Female genital system</b>	3	1.08	9	1.11	6	1.17	3	0.85	21	19.52	1.08	1.41
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.78	0.00	-1.69
Corpus uteri	2	1.41	4	0.98	3	1.20	3	1.86	12	9.58	1.25	2.30
Ovary	1	1.23	4	1.66	2	1.26	0	0.00	7	5.93	1.18	1.01
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.37
Vulva	0	0.00	1	2.06	0	0.00	0	0.00	1	1.30	0.77	-0.29
<b>Male genital system</b>	26	1.57*	68	1.23	40	0.95	31	1.02	165	144.47	1.14	13.30
Prostate	25	1.53	67	1.22	38	0.91	31	1.03	161	143.32	1.12	11.45
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.12
<b>Urinary system</b>	362	54.28*	387	17.96*	67	4.26*	21	1.78*	837	55.74	15.02*	301.22
Urinary bladder	343	71.20*	351	22.37*	62	5.35*	16	1.82*	772	40.89	18.88*	281.88
Kidney parenchyma	0	0.00	5	1.13	2	0.64	1	0.44	8	11.21	0.71	-1.24
Renal pelvis, other urinary	19	41.58*	31	21.52*	3	2.97	4	5.54*	57	3.63	15.70*	20.58
Ureter	11	70.08*	14	28.19*	2	5.72	2	8.26	29	1.25	23.29*	10.70
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.18
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	1	1.91	1	2.35	0.42	-0.52
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.21
<b>Melanoma of skin</b>	1	0.74	4	0.92	3	0.91	2	0.74	10	11.72	0.85	-0.66
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	6.17	1	0.85	1.18	0.06
<b>Brain, central nervous system</b>	2	2.86	3	1.37	1	0.67	0	0.00	6	5.39	1.11	0.24
<b>Thyroid</b>	0	0.00	1	1.15	0	0.00	0	0.00	1	2.08	0.48	-0.42
<b>Lymphatic, hematopoietic</b>	3	0.51	17	0.90	18	1.31	7	0.66	45	49.00	0.92	-1.54
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-0.45
Non-Hodgkin lymphoma	1	0.41	8	1.01	6	1.02	3	0.64	18	20.96	0.86	-1.14
Myeloma	0	0.00	3	0.93	3	1.29	1	0.57	7	8.32	0.84	-0.51
Leukemia	2	0.90	6	0.84	9	1.73	3	0.76	20	18.53	1.08	0.57
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	11.13	1	0.45	2.23	0.21
Chronic lymphocytic	1	1.11	2	0.69	5	2.40	0	0.00	8	7.39	1.08	0.23
Acute non-lymphocytic	0	0.00	2	0.84	1	0.57	2	1.50	5	6.22	0.80	-0.47
Chronic myeloid	1	3.39	1	1.05	2	2.87	0	0.00	4	2.49	1.61	0.58

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 10,501 PYR and for male cancers on 15,436 PYR.

# Chapter 12

## New Malignancies Following Cancer of the Bone and Soft Tissue, and Kaposi Sarcoma

Eric A. Engels, Joseph F. Fraumeni Jr.

### Synopsis

We evaluated the risk of subsequent primary cancer in 4,807 persons with malignancies of bone, 12,448 persons with malignancies of soft tissue, and 11,679 persons with Kaposi sarcoma (KS). The overall risk of subsequent cancers was significantly increased among survivors of bone sarcomas (O/E=1.24, O=223, EAR=13 per 10,000 person-years) and soft tissue sarcomas (O/E=1.19, O=1,006, EAR=20). Among patients with bone or soft tissue sarcomas, there were excess risks of subsequent primary tumors of bone or soft tissue. Some tumors were of the same histologic type (osteosarcoma, chondrosarcoma, neurilemmoma), representing multicentric lesions. In other cases, radiotherapy for the primary malignancy or an underlying hereditary predisposition (e.g., Li-Fraumeni syndrome) played a role. The effect of radiotherapy was greatest in patients with Ewing sarcoma, who displayed 60- to 70-fold excesses of bone and soft tissue sarcomas, arising mostly in the field of radiation. Radiotherapy, chemotherapy, and/or hereditary syndromes may also account for observed excesses of lung cancer and acute non-lymphocytic leukemia (ANLL) following bone sarcomas. Radiotherapy and/or increased surveillance may have contributed to excesses of stomach and thyroid cancers following soft tissue sarcoma, whereas both radiotherapy and chemotherapy were likely related to the increased risk of ANLL. The nearly 2-fold elevation in risk of melanoma following soft tissue sarcoma could have been caused by shared risk factors or diagnostic overlap. No new cancers were found in excess following KS diagnosed before 1980 (O/E=0.89 excluding subsequent KS, O=43). However, beginning in 1980, with the onset of the acquired immunodeficiency syndrome (AIDS) epidemic, KS was significantly associated with several subsequent malignancies (O/E=4.77 excluding subsequent KS, O=716, EAR=230). Most notably, non-Hodgkin lymphoma (O/E=75.99) occurred in marked excess following KS, caused by the strong immunosuppressive effects of human immunodeficiency virus infection on lymphoma risk. Immunosuppression was also likely responsible for the 9-fold increase in risk of Hodgkin lymphoma. In addition, patients

with KS during the AIDS era were prone to cancers of the anus, cervix, and liver, likely caused by concomitant viral infections. A 3-fold increase in the risk of ANLL also was observed in individuals with AIDS-related KS, possibly related to chemotherapy.

### Bone and Joint Sarcomas

Malignancies arising in bones and joint cartilage account for 0.2% of new cancers and 0.2% of cancer deaths (Miller et al, 1996; Jemal et al, 2005). Three distinct histologic subtypes constitute the majority of cases (osteosarcoma 35%, Ewing sarcoma [ES] 16%, and chondrosarcoma 28%) (Table 12.A). There is a slight predominance of males with bone/joint malignancies overall (57%) and within each of the 3 major subtypes. Prognosis varies by histologic subtype, with 5-year relative survival rates of 62.2%, 56.8%, and 84.1% for osteosarcoma, ES, and chondrosarcoma, respectively. Osteosarcomas have a bimodal age of onset, with peaks of incidence in adolescence and old age. The adolescent peak and the predominance of tumors arising in the metaphyses of long bones suggest that the pubertal growth spurt may be etiologically important. ES occurs in adolescence and young adulthood; it is very uncommon after age 30 years. It appears to be derived from primitive neural tissue and often affects the axial skeleton. For unknown reasons, the tumor is extremely rare in blacks (1.6% of ES cases in SEER). Chondrosarcoma, which develops in joint cartilage, steadily increases in incidence with advancing age. Treatment for bone/joint malignancies usually includes surgical resection, although many patients with ES receive primary radiotherapy instead (Table 12.A). Beginning in the 1980s, multidrug adjuvant chemotherapy, including doxorubicin and often an alkylating agent, has become an important part of the treatment of osteosarcoma (Malawer et al, 2001). Similar chemotherapy regimens have also been used for ES.

Several risk factors for bone sarcomas have been identified, but together they explain only a small portion of cases. Radiotherapy and chemotherapy with alkylating agents, given in high doses to treat other tumors, increase the risk for osteosarcoma in a dose-response manner (Tucker et al, 1987; Le Vu et al, 1998). Sarcomas can also arise as components of hereditary neoplastic or preneoplastic disorders. For example, Li-Fraumeni syndrome (LFS) is a dominantly inherited constellation of

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000).*

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**Table 12.A:** Risk of subsequent primary cancers by age at initial diagnosis and histologic type of bone and soft tissue sarcoma, SEER 1973-2000.

Histologic type	Age at initial diagnosis, yr	Number of patients	Mean age at initial diagnosis, yr	Mean PYR	Radiation, %	Surgery, %	O	O/E	EAR
<b>All bone sarcomas</b>	<b>All ages</b>	<b>4,807</b>	<b>37.4</b>	<b>6.7</b>	<b>26.5</b>	<b>73.5</b>	<b>223</b>	<b>1.24*</b>	<b>13.27</b>
Ewing sarcoma	All ages	789	17.9	6.0	62.1	44.7	23	6.45*	41.04
Osteosarcoma	<18	750	13.3	7.1	6.5	80.4	10	5.15*	15.11
	18-29	376	22.8	7.2	10.1	82.4	6	2.51	13.44
	≥30	578	55.5	4.7	25.1	70.8	36	1.42	39.29
Chondrosarcoma	<30	243	21.9	10.2	12.8	87.7	2	0.86	-1.29
	≥30	1,106	55.6	7.4	14.6	86.3	104	1.09	10.76
Other histologies	All ages	965	49.9	6.3	37.2	71.5	42	0.85	-12.16
<b>All soft tissue sarcomas</b>	<b>All ages</b>	<b>12,448</b>	<b>50.2</b>	<b>6.5</b>	<b>40.8</b>	<b>84.8</b>	<b>1,006</b>	<b>1.19*</b>	<b>19.81</b>
Rhabdomyosarcoma	<18	361	7.8	6.8	65.9	60.4	5	8.25*	17.94
	≥18	320	48.1	4.4	50.3	72.2	19	1.37	36.72
Fibrosarcoma	<18	248	10.8	9.8	21.8	90.7	7	8.35*	25.25
	18-29	421	24.5	9.2	33.7	91.4	15	3.60*	27.85
	≥30	3,821	61.1	6.2	43.9	90.4	402	1.18*	26.23
Neuroblastoma	All ages	342	6.2	8.5	34.2	71.1	0	0.00	-4.14
Liposarcomas	All ages	2,158	56.9	8.4	39.0	91.9	259	1.04	5.95
Leiomyosarcomas	All ages	1,299	58.4	5.3	28.4	83.2	103	1.17	21.27
Other histologies	All ages	3,478	45.9	5.5	42.4	78.5	196	1.31*	24.77

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P <0.05.

diverse malignancies in children and young adults, including osteosarcoma, chondrosarcoma, soft tissue sarcomas, brain tumors, adrenocortical neoplasia, breast carcinoma, acute leukemia, and other tumors to a lesser degree (Li et al, 1988; Hisada et al, 1998; Nichols et al, 2001). Patients with this syndrome are prone to multiple primary cancers and to the carcinogenic effects of radiotherapy. Most LFS cases have been associated with germline mutations of the p53 tumor suppressor gene. In addition, osteosarcomas occur excessively in individuals with germline mutations of the RB1 gene (hereditary retinoblastoma) or the DNA helicase genes (Werner syndrome and Rothmund-Thomson syndrome) (Miller et al, 1996; Spurney et al, 1998). The excess risk of osteosarcoma among adults with Paget disease of bone, which has a hereditary component, contributes to the subsequent primary peak of this tumor in later life (Miller et al, 1996). Chondrosarcoma, osteosarcoma, and other bone tumors have been reported in association with various disorders of skeletal development, including fibrous dysplasia and hereditary osteochondromas (Miller et al, 1996; Gigante et al, 2001). In contrast, no clear-cut risk factor for ES has been identified.

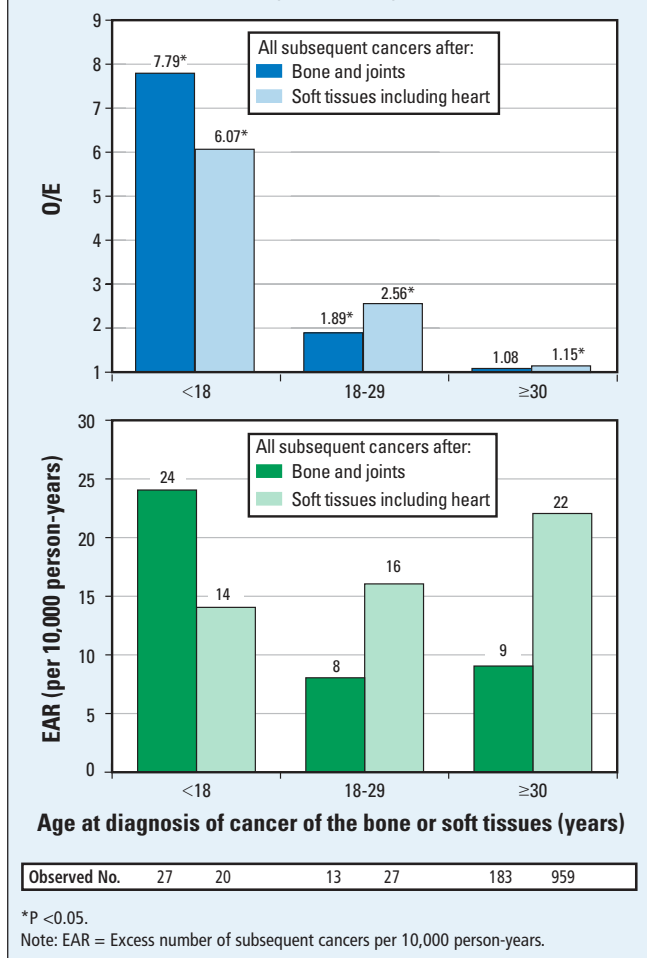
## Results and Discussion

A total of 223 subsequent primary cancers were observed in 4,807 individuals surviving at least 2 months with a primary bone/joint tumor (O/E=1.24, 95% CI=1.08-1.41, EAR=13 per 10,000 person-years). The cumulative incidence at 25 years of developing a second cancer, adjusted for the competing risk of death due to other causes, was

8.6% (95% CI=7.2%-10.1%). The risk of developing a new malignancy was relatively constant over time since initial diagnosis, and overall there was no difference in risk by gender. Risk was especially high for children with bone sarcomas (ages <18 years, O/E=7.79, EAR=24), as noted previously (Neglia et al, 2001); risk was lower for young adults (ages 18-29 years, O/E=1.89, EAR=8) and was not elevated for older adults (ages ≥30 years, O/E=1.08, EAR=9) (Figure 12.1). Risk was increased beyond expectation for acute non-lymphocytic leukemia (ANLL) and for malignancies of the lung, bone, and soft tissue. The overall relative risk and excess absolute risk of new cancers was highest for persons with ES (O/E=6.45, EAR=41). Among persons with osteosarcoma, the relative risk was higher for those younger than age 30 years (O/E=3.69) than for older individuals (O/E=1.42), although the older patients had higher excess absolute risks (EAR=39) than the younger ones (EAR=15). Little elevation in cancer risk was seen among patients with chondrosarcoma (O/E=1.09, EAR=8).

Ten subsequent primary sarcomas of the bone were reported (O/E=30.36). Five of these cases (4 chondrosarcomas, 1 osteosarcoma) represented multicentric primary lesions, as they followed tumors of identical histology and arose at second locations separated by an interval of 0.5 to 5 years. Multicentric osteosarcomas have been reported with genetic susceptibility states such as LFS and Rothmund-Thomson syndrome (Spurney et al, 1998). In addition, 3 bone malignancies, all osteosarcomas, arose in patients with ES (O/E=62.40) at sites previously treated with radiotherapy. The marked excess

**Figure 12.1:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after cancer of the bone or soft tissues, both sexes, SEER 1973-2000.



risk of osteosarcoma is consistent with the radiation effect previously described in ES, although chemotherapy and possibly genetic factors could play a role (Tucker et al, 1987; Travis et al, 1994; Kuttesch et al, 1996; Le Vu et al, 1998).

Soft tissue sarcomas also occurred in excess following bone cancer (O/E=9.70, O=9). Risk was much higher when radiotherapy was given during initial treatment (O/E=18.59, O=3) than when it was not (O/E=7.83, O=6). The risk was greatest following ES (O/E=69.43), with most subsequent sarcomas (3 of 4 cases) arising in the field of radiation. The findings are consistent with previous reports documenting an exceptional risk of soft tissue tumors following radiotherapy for ES (Travis et al, 1994; Kuttesch et al, 1996). In 2 cases in our series, soft tissue sarcomas followed childhood-onset osteosarcoma, suggesting underlying LFS (Hisada et al, 1998).

The risk of lung cancer was excessive following bone sarcomas (O/E=1.45). Risk was highest after ES (O/E=8.35, O=2), with the lung cancers arising 9 and 15 years after radiotherapy. This finding is consistent with the elevated risk of lung cancer reported after radiotherapy for breast cancer and Hodgkin lymphoma (Travis et

al, 1995; Metayer et al, 2000; Travis et al, 2002). We also found an excess risk of lung cancer following osteosarcoma (O/E=2.73, O=11), arising mostly in the lower limbs, consistent with the notion that chemotherapy may increase the risk of some lung cancers (Travis et al, 2002). The complex of osteosarcoma and lung cancer might also result from genetic susceptibility to both tumors (e.g., LFS or hereditary retinoblastoma) (Sanders et al, 1989; Hisada et al, 1998; Kleinerman et al, 2000; Nichols et al, 2001).

Ten cases of ANLL occurred after bone sarcomas in our survey (7 myeloid, 2 monocytic, 1 not specified, O/E=6.11). The elevated risk was most pronounced for osteosarcoma (O/E=9.96, O=3) and ES (O/E=86.62, O=5). Nine of the 10 cases received initial chemotherapy, suggesting an effect of multiagent chemotherapy (Dunst et al, 1998; Rodriguez-Galindo, 2000), along with genetic factors, particularly because osteosarcoma and leukemia are both components of LFS.

For patients with osteosarcoma, we also observed an excess of tumors at various sites of the digestive system (O/E=2.34), including the esophagus, stomach, colon and rectum, liver, pancreas, and retroperitoneum. This finding is difficult to explain, given the diversity of tumors and the small numbers at each site.

### Soft Tissue Sarcomas, Including Heart

Malignancies that arise in the soft tissues account for about 0.7% of human cancers and 0.6% of all cancer deaths (Zahm et al, 1996; Jemal et al, 2005). This group includes tumors with various histologies derived from the spectrum of cells that make up normal connective tissue. In SEER, 55% of cases of soft tissue sarcoma arose in males, and the median age at diagnosis was 53 years. Among 1,448 children (ages <18 years) the most frequent soft tissue malignancies were rhabdomyosarcoma (25% of cases), neuroblastoma (21%), and fibrosarcoma (17%). Among 11,000 adults (ages ≥18 years), the most common tumors were fibrosarcomas (39%), liposarcomas (19%), and leiomyosarcomas (12%). Some tumors of connective tissue arise in visceral organs (e.g., leiomyosarcomas of the uterus), but they are not included in this analysis. Prognosis was more favorable for soft tissue sarcoma in children than in adults: 5-year relative survival rates were 74.4% for ages younger than 18 years versus 66.9% for ages 18 years or older. Therapy for soft tissue malignancies usually consists of surgical resection, with some patients receiving radiotherapy or chemotherapy as well (Brennan et al, 2001).

The etiology of most soft tissue malignancies is unknown, and because of their rarity, the histologic types are often combined. Risk for soft tissue sarcomas is increased by radiation therapy and possibly chemotherapy for other malignant conditions (Zahm et al, 1996). An excess risk has been suggested for occupational exposures to certain herbicides, but the evidence is not clear-cut (Zahm et al, 1996). In some cases, especially in childhood, genetic factors are important, particularly in

LFS, neurofibromatosis type 1, and hereditary retinoblastoma (Bader, 1987; Li et al, 1988; Hisada et al, 1998).

## Results and Discussion

We studied 12,448 individuals who survived at least 2 months with a soft tissue malignancy, a category that included 83 patients (0.7%) with primary malignancies of the heart. A total of 1,006 subsequent primary cancers were diagnosed (O/E=1.19, 95% CI=1.12-1.27, EAR=20). Thirteen percent of patients with soft tissue sarcoma developed a second cancer within 25 years (cumulative incidence 12.9%, 95% CI=11.9%-13.9%). Excluding 342 patients with soft tissue neuroblastomas did not affect the results (O/E=1.19). The relative risk for a subsequent primary cancer was much higher for children diagnosed with a soft tissue malignancy (ages <18 years, O/E=6.07, EAR=14) than for adults (ages 18-29, O/E=2.56, EAR=16; ages ≥30, O/E=1.15, EAR=22) (Figure 12.1), primarily among those with an initial fibrosarcoma or rhabdomyosarcoma (Table 12.A). Risks were similar among males and females and remained relatively constant throughout the first 10 years of follow-up. Significantly increased risks were seen for subsequent cancers of the stomach, thyroid, bone, and soft tissues, as well as for melanoma and acute myeloid leukemia.

Subsequent primary soft tissue sarcomas arose in excess following the initial tumor (O/E=9.30, O=34). Twenty-three of these cases had histologies that were identical or similar to the primary tumors, consistent with multicentric lesions. Six cases had multiple neoplasms of Schwann cells (neurilemmomas, neurofibrosarcomas), possibly caused by neurofibromatosis type 1 (Bader, 1987).

Twelve subsequent primary bone malignancies followed soft tissue tumors (O/E=13.30). Radiotherapy may have been involved (Tucker et al, 1987; Heyn et al, 1993; Le Vu et al, 1998; Cohen et al, 2005), because the risk was higher in irradiated (O/E=25.19, O=8) than in nonirradiated persons (O/E=6.84, O=4); among irradiated individuals, 7 of the bone tumors (5 osteosarcomas, 2 chondrosarcomas) arose at irradiated sites. Genetic predisposition probably contributed to the excess risk (Hisada et al, 1998), which was pronounced in the childhood cases (O/E=47.38, O=5).

An excess of acute myelogenous leukemia (AML) was observed following soft tissue sarcoma (O/E=3.06). Although only 2 of the 18 cases occurred in children, their relative risk was much higher (O/E=23.82 versus 2.76 for adults). Both children developed AML within 3 years of radiotherapy. The overall risk for AML was higher in irradiated (O/E=4.87) compared with nonirradiated individuals (O/E=2.09), consistent with reports of radiotherapy-related leukemia (Preston et al, 1994). However, an effect of chemotherapy also seems likely (Heyn et al, 1994), since 9 of the AML cases received chemotherapy as part of their initial treatment for soft tissue sarcoma.

We observed excess risks for cancers of the thyroid (O/E=2.39) and stomach (O/E=1.80) following soft tissue

malignancies, all of which were diagnosed in adult life. Radiotherapy may have played a role, even though risks were similar in patients who were or were not irradiated during their initial course of treatment. It also seems possible that the excess of thyroid cancer could have been the result of increased surveillance.

Finally, the risk of melanoma was elevated (O/E=1.80) following soft tissue tumors with a wide range of histologies, in both irradiated (O/E=2.11) and nonirradiated (O/E=1.62) patients. An association between soft tissue sarcomas and melanoma has been noted previously (Tucker et al, 1985; Berking and Brady, 1997), suggesting common risk factors or diagnostic overlap in some cases (Sandberg and Bridge, 2001).

## Kaposi Sarcoma

Kaposi sarcoma (KS) is a distinctive cutaneous tumor of vascular origin. It occurred only rarely in the U.S. before the 1980-1981 onset of the human immunodeficiency virus (HIV)-associated epidemic of acquired immunodeficiency syndrome (AIDS). In the pre-AIDS era, KS arose almost exclusively in the elderly, particularly among men of Mediterranean or central/eastern European origin (classic KS). The HIV/AIDS epidemic ushered in a sharp increase in KS incidence, especially in homosexual men (Beral et al, 1990). Before the advent of effective anti-HIV therapy in the mid-1990s, KS risk was extremely high in HIV-infected individuals, with a lifetime cumulative incidence of 10% (Frisch et al, 2001).

A recently discovered virus, KS-associated herpesvirus (KSHV, also known as human herpesvirus 8), is a necessary cofactor for KS (Chang et al, 1994). Most KSHV infections are asymptomatic, but in the presence of AIDS-related immunosuppression, KSHV causes KS through incompletely understood mechanisms (Moore and Chang, 2001). KSHV infection is highly prevalent in HIV-infected homosexual men, consistent with sexual transmission (Martin et al, 1998).

By distinguishing KS cases according to year of diagnosis in the SEER Program (1973-1979 versus 1980-2000), it is possible largely to separate classic and AIDS-associated cases. In the earlier group of 210 2-month survivors, 74% were male, the median age was 73 years, and the 5-year survival rate (relative to the general population) was 88%, reflecting the epidemiology of classic KS and its indolent nature. In the later group of 11,469 2-month survivors, 97% were male, the median age was 38 years, and the 5-year relative survival rate was 44%, a pattern consistent with the dramatic rise of KS in young, HIV-infected homosexual men and the poorer prognosis for AIDS patients. Still, recent improvements in anti-HIV therapy have prolonged post-KS survival. Localized KS is usually treated with intralesional chemotherapy or low-dose radiotherapy. Because of the aggressive nature of AIDS-associated KS, it is sometimes treated with systemic chemotherapy (McGarvey et al, 1998).



## Results and Discussion

The risk of subsequent primary cancer following pre-1980 diagnoses of KS in 210 patients was not increased overall (O/E=0.89, O=43, 95% CI=0.64-1.19, excluding subsequent KS), consistent with a previous analysis of SEER data (Biggar et al, 1994). Although an Israeli study of classic KS revealed elevated risks of non-Hodgkin lymphoma (NHL)(O/E=3.94, O=8) and melanoma (O/E=5.81, O=5) (Iscovich et al, 1999), we found only a slight, nonsignificant excess of NHL (O/E=1.41, O=2, 95% CI=0.16-5.08) and no cases of melanoma. KSHV is not known to play a major role in NHL in HIV-uninfected persons, though it has been implicated in a rare variant, primary effusion lymphoma (Cesarman et al, 1995).

By contrast, in the AIDS era (1980-2000), our study revealed that 11,469 persons with KS were at elevated risk for subsequent primary malignancies (O/E=4.77, O=716, 95% CI=4.43-5.13, EAR=230, excluding second KS). The 10-year cumulative incidence of second cancer did not change appreciably during the AIDS era (6.2%, 95% CI=5.5%-6.9% for 1980-1989 versus 7.1%, 95% CI=6.4%-7.9% for 1990-2000). Individuals with KS were particularly prone to develop a new malignancy early in the follow-up period (<1 year, O/E=9.60; 1-4 years, O/E=5.22); thereafter the risk declined. Excess risks of subsequent cancer were confined to the 11,175 men with KS (O/E=5.35) with only 23 non-KS tumors seen among the 294 women with KS (O/E=1.12). Risk increases in excess of 4-fold were seen for both whites and blacks. Patients diagnosed at ages younger than 40 years had particularly high risks of subsequent cancers (O/E=29.50, O=362, EAR=264), although approximately 2-fold risk increases were seen among older patients (ages  $\geq$ 40 years, O/E=2.57, O=354, EAR=190). Several malignancies were significantly increased among KS patients, including cancers of the anus, cervix, and liver, as well as NHL, Hodgkin lymphoma, and ANLL.

A markedly increased risk of NHL (O/E=75.99, O=539, EAR=216) explained most of the overall cancer excess (Cannon et al, 2000). The 10-year cumulative incidence of NHL among KS patients diagnosed between 1980 and 2000 was 5.1% (95% CI=4.7%-5.5%). The relationship between KS and NHL is readily explained by the potent effect of AIDS-related immune suppression on the risks of both tumors (Frisch et al, 2001). In HIV infection, NHL may arise because of defective immunological control of lymphoproliferative stimuli, especially from Epstein-Barr virus (EBV) infection (Shibata et al, 1993). In addition, it is possible that KSHV acts independently to increase the risk for NHL, particularly primary effusion lymphoma or other high-grade variants (Cesarman et al, 1995; Engels et al, 2001), although this effect appears to be small compared with the influence of HIV itself. Risk for NHL was higher in men (O/E=85.50) than women (O/E=3.64), which may reflect varying proportions of classic and AIDS-associated KS cases even in the AIDS era. Supporting this possibility, in the AIDS era only 3% of males with KS were older than 70 years of age at diagnosis, compared with 67% of females.

In the AIDS era, individuals with KS had a 37-fold increase in risk of anal cancer, with all cases arising in men, presumably due to the high prevalence of human papillomavirus infection in homosexual men (Palefsky et al, 1998). Similarly, a 10-fold elevation in risk was seen for cervical cancer, based on 2 cases, probably because of frequent infections with human papillomavirus in HIV-infected women. Hepatitis B and C virus infections as well as alcohol abuse are common in some HIV-infected groups and probably account for the 5-fold increase in risk of liver cancer in our study. AIDS-related immunosuppression and poor control of EBV infection appear to account for an excess of Hodgkin lymphoma reported among persons with AIDS (Frisch et al, 2001), consistent with the relationship we observed between KS and Hodgkin lymphoma (O/E=9.01). An excess of ANLL also was seen following KS, which may be related to chemotherapy, although an elevated risk of AML has previously been reported in individuals with AIDS alone (Frisch et al, 2001).

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**Table 12.1.1:** Characteristics of patients with an initial cancer of the bones or joints, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	2,749	100.0	2,058	100.0	4,807	100.0
<b>Initial treatment</b>						
Any radiation	736	26.8	537	26.1	1,273	26.5
With surgery	362	13.2	298	14.5	660	13.7
Without surgery	374	13.6	239	11.6	613	12.8
No radiation	2,013	73.2	1,521	73.9	3,534	73.5
With surgery	1,652	60.1	1,221	59.3	2,873	59.8
Without surgery	361	13.1	300	14.6	661	13.8
<b>Race</b>						
White	2,357	85.7	1,717	83.4	4,074	84.8
Black	199	7.2	189	9.2	388	8.1
Other	177	6.4	132	6.4	309	6.4
Unknown	16	0.6	20	1.0	36	0.7
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	1,359	49.4	939	45.6	2,298	47.8
30–49	555	20.2	428	20.8	983	20.4
50–69	573	20.8	393	19.1	966	20.1
70–79	204	7.4	184	8.9	388	8.1
≥ 80	58	2.1	114	5.5	172	3.6
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	2,624	95.5	1,978	96.1	4,602	95.7
1st and 2nd cancers	114	4.1	74	3.6	188	3.9
1st, 2nd, and 3rd cancers	10	0.4	6	0.3	16	0.3
1st, 2nd, 3rd, and additional cancers	1	0.0	0	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	30.4	—	33.8	—	31.7	—
Median year of 1st cancer diagnosis	1987.9	—	1988.0	—	1988.0	—
Median person-years at risk	3.5	—	4.3	—	3.9	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	96.0	—	97.5	—	96.6
1st, 2nd, and additional cancers	—	96.0	—	97.5	—	96.6
1st cancer only	—	3.2	—	2.5	—	2.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.



## Bone Both Sexes

**Table 12.1.2:** Risk of subsequent primary cancers after cancer of the bones or joints, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	4,807	3,636										
			3,999	11,418	2,156	8,283	1,250	8,896	4,807	32,232		
<b>All subsequent cancers</b>	21	1.15	70	1.22	55	1.24	77	1.27*	223	180.22	1.24*	13.27
All excluding same site	20	1.10	65	1.14	52	1.18	76	1.26	213	179.89	1.18*	10.27
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	1	0.84	0	0.00	1	4.80	0.21	-1.18
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.21
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-0.31
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.14
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	1.22	0.00	-0.38
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.07
Tonsil	0	0.00	0	0.00	1	8.29	0	0.00	1	0.49	2.05	0.16
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.14
<b>Digestive system</b>	6	1.54	9	0.77	10	1.13	20	1.71*	45	36.10	1.25	2.76
Esophagus	0	0.00	3	5.03*	1	2.24	1	1.63	5	1.85	2.70	0.98
Stomach	0	0.00	1	0.85	2	2.32	4	3.67	7	3.54	1.98	1.07
Small intestine	1	18.32	0	0.00	0	0.00	1	4.94	2	0.57	3.49	0.44
Colon	2	1.16	4	0.77	3	0.76	6	1.15	15	16.10	0.93	-0.34
Rectum, rectosigmoid junction	1	1.42	1	0.48	1	0.64	4	2.00	7	6.37	1.10	0.20
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.13
Liver	1	7.58	0	0.00	2	6.32	0	0.00	3	1.32	2.28	0.52
Gallbladder	0	0.00	0	0.00	0	0.00	1	7.20	1	0.46	2.15	0.17
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.78	0.00	-0.24
Pancreas	1	2.15	0	0.00	0	0.00	3	2.15	4	4.31	0.93	-0.10
<b>Respiratory system</b>	4	1.31	19	2.00*	9	1.24	11	1.16	43	29.31	1.47*	4.25
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.09
Larynx	0	0.00	2	2.92	1	1.98	0	0.00	3	2.03	1.48	0.30
Lung, bronchus	4	1.43	17	1.96*	8	1.21	10	1.14	39	26.90	1.45*	3.75
<b>Female breast</b>	1	0.49	4	0.60	3	0.56	14	1.99*	22	21.09	1.04	0.62
<b>Female genital system</b>	0	0.00	4	1.31	2	0.85	1	0.34	7	9.38	0.75	-1.63
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.53	0.00	-1.05
Corpus uteri	0	0.00	4	2.80	2	1.85	0	0.00	6	4.29	1.40	1.17
Ovary	0	0.00	0	0.00	0	0.00	1	1.08	1	2.83	0.35	-1.26
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.09
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.27
<b>Male genital system</b>	1	0.32	5	0.50	8	1.03	14	1.17	28	32.94	0.85	-2.79
Prostate	0	0.00	4	0.42	8	1.08	14	1.21	26	31.58	0.82	-3.16
Testis	0	0.00	1	2.76	0	0.00	0	0.00	1	1.13	0.88	-0.08
<b>Urinary system</b>	3	2.17	3	0.70	3	0.91	3	0.65	12	13.57	0.88	-0.49
Urinary bladder	1	1.07	2	0.70	3	1.36	2	0.65	8	9.10	0.88	-0.34
Kidney parenchyma	2	5.59	1	0.87	0	0.00	1	0.78	4	3.68	1.09	0.10
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.24
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.08
<b>Bone, joints</b>	1	23.71	5	40.55*	3	37.30*	1	11.98	10	0.33	30.36*	3.00
<b>Soft tissue including heart</b>	0	0.00	1	3.34	4	17.29*	4	13.18*	9	0.93	9.70*	2.50
<b>Kaposi sarcoma</b>	1	13.11	0	0.00	0	0.00	0	0.00	1	0.98	1.02	0.01
<b>Melanoma of skin</b>	1	1.98	3	1.74	2	1.39	0	0.00	6	5.80	1.03	0.06
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.09
<b>Brain, central nervous system</b>	0	0.00	1	1.24	0	0.00	0	0.00	1	2.44	0.41	-0.45
<b>Thyroid</b>	0	0.00	1	1.63	2	3.90	2	2.82	5	2.01	2.48	0.93
<b>Lymphatic, hematopoietic</b>	3	2.01	14	2.98*	4	1.09	6	1.21	27	14.79	1.83*	3.79
Hodgkin lymphoma	0	0.00	0	0.00	1	3.12	0	0.00	1	1.19	0.84	-0.06
Non-Hodgkin lymphoma	2	3.10	3	1.45	0	0.00	2	0.84	7	6.76	1.04	0.08
Myeloma	0	0.00	1	1.49	0	0.00	0	0.00	1	2.11	0.47	-0.35
Leukemia	1	1.96	10	6.48*	3	2.59	4	2.63	18	4.73	3.80*	4.12
Acute lymphocytic	0	0.00	1	9.01	0	0.00	1	14.54	2	0.29	6.93	0.53
Chronic lymphocytic	0	0.00	1	1.84	0	0.00	1	1.81	2	1.69	1.18	0.10
Acute non-lymphocytic	1	5.81	6	11.35*	2	4.99	1	1.87	10	1.64	6.11*	2.60
Chronic myeloid	0	0.00	1	4.67	1	6.05	1	4.46	3	0.67	4.46	0.72

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 14,569 PYR and for male cancers on 17,664 PYR.

**Table 12.1.3:** Risk of subsequent primary cancers after cancer of the bones or joints, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	6	0.86	22	0.99	26	1.48	32	1.40	86	69.58	1.24	11.27
All excluding same site	6	0.86	20	0.90	24	1.37	31	1.36	81	69.46	1.17	7.92
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.21	0.00	-0.83
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.05
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.18
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.11
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.27
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.04
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.07
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.05
<b>Digestive system</b>	3	1.99	1	0.22	5	1.46	9	2.08	18	13.75	1.31	2.92
Esophagus	0	0.00	0	0.00	1	10.31	0	0.00	1	0.39	2.59	0.42
Stomach	0	0.00	0	0.00	1	3.92	2	6.38	3	1.04	2.90	1.35
Small intestine	1	47.53	0	0.00	0	0.00	0	0.00	1	0.22	4.51	0.53
Colon	1	1.34	1	0.45	1	0.59	5	2.35	8	6.79	1.18	0.83
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	1.49	1	2.21	0.45	-0.83
Rectum	0	0.00	0	0.00	0	0.00	1	2.23	1	1.45	0.69	-0.31
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.14
Liver	0	0.00	0	0.00	2	25.50*	0	0.00	2	0.32	6.34	1.16
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.20
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.21
Pancreas	1	5.24	0	0.00	0	0.00	1	1.74	2	1.78	1.12	0.15
<b>Respiratory system</b>	0	0.00	6	2.25	2	0.91	2	0.68	10	8.63	1.16	0.94
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.06
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.20
Lung, bronchus	0	0.00	6	2.37	2	0.96	2	0.71	10	8.22	1.22	1.22
<b>Female breast</b>	1	0.49	4	0.60	3	0.56	14	1.99*	22	21.09	1.04	0.62
<b>Female genital system</b>	0	0.00	4	1.31	2	0.85	1	0.34	7	9.38	0.75	-1.63
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.53	0.00	-1.05
Corpus uteri	0	0.00	4	2.80	2	1.85	0	0.00	6	4.29	1.40	1.17
Ovary	0	0.00	0	0.00	0	0.00	1	1.08	1	2.83	0.35	-1.26
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.09
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.27
<b>Urinary system</b>	1	3.22	1	1.04	2	2.64	1	1.00	5	3.03	1.65	1.35
Urinary bladder	0	0.00	1	1.81	2	4.66	0	0.00	3	1.72	1.74	0.88
Kidney parenchyma	1	9.69	0	0.00	0	0.00	1	2.70	2	1.08	1.85	0.63
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.16
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.05
<b>Bone, joints</b>	0	0.00	2	45.52*	2	65.20*	1	30.13	5	0.12	40.81*	3.35
<b>Soft tissue including heart</b>	0	0.00	1	8.91	1	11.12	1	8.74	3	0.35	8.54*	1.82
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02
<b>Melanoma of skin</b>	0	0.00	0	0.00	2	3.68	0	0.00	2	2.13	0.94	-0.09
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.07
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.61
<b>Thyroid</b>	0	0.00	1	2.45	2	5.72	1	2.05	4	1.36	2.94	1.81
<b>Lymphatic, hematopoietic</b>	1	1.82	2	1.16	3	2.19	2	1.13	8	5.42	1.48	1.77
Hodgkin lymphoma	0	0.00	0	0.00	1	7.68	0	0.00	1	0.47	2.13	0.36
Non-Hodgkin lymphoma	0	0.00	1	1.27	0	0.00	0	0.00	1	2.53	0.40	-1.05
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.55
Leukemia	1	5.67	1	1.88	2	4.94	2	3.94	6	1.62	3.70*	3.01
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	39.95	1	0.10	9.86	0.62
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.37
Acute non-lymphocytic	1	15.76	0	0.00	1	6.58	1	5.12	3	0.61	4.95	1.64
Chronic myeloid	0	0.00	0	0.00	1	17.12	0	0.00	1	0.23	4.31	0.53

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 12.1.4:** Risk of subsequent primary cancers after cancer of the bones or joints, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	15	1.33	48	1.37*	29	1.09	45	1.19	137	110.64	1.24*	14.92
All excluding same site	14	1.25	45	1.29	28	1.05	45	1.20	132	110.43	1.20*	12.21
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	1	1.13	0	0.00	1	3.59	0.28	-1.47
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.33
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.41
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.16
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.47
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.10
Tonsil	0	0.00	0	0.00	1	10.72	0	0.00	1	0.38	2.62	0.35
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.21
<b>Digestive system</b>	3	1.25	8	1.11	5	0.92	11	1.50	27	22.36	1.21	2.63
Esophagus	0	0.00	3	6.36*	0	0.00	1	2.04	4	1.46	2.73	1.44
Stomach	0	0.00	1	1.20	1	1.64	2	2.58	4	2.50	1.60	0.85
Small intestine	0	0.00	0	0.00	0	0.00	1	8.02	1	0.35	2.84	0.37
Colon	1	1.02	3	1.01	2	0.89	1	0.32	7	9.31	0.75	-1.31
Rectum, rectosigmoid junction	1	2.19	1	0.73	1	0.99	3	2.26	6	4.16	1.44	1.04
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.11
Liver	1	9.99	0	0.00	0	0.00	0	0.00	1	1.00	1.00	0.00
Gallbladder	0	0.00	0	0.00	0	0.00	1	18.66	1	0.17	5.86	0.47
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.27
Pancreas	0	0.00	0	0.00	0	0.00	2	2.43	2	2.53	0.79	-0.30
<b>Respiratory system</b>	4	1.79	13	1.90*	7	1.39	9	1.37	33	20.69	1.60*	6.97
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.10
Larynx	0	0.00	2	3.39	1	2.32	0	0.00	3	1.75	1.72	0.71
Lung, bronchus	4	1.99	11	1.79	6	1.32	8	1.34	29	18.68	1.55*	5.84
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.12
<b>Male genital system</b>	1	0.32	5	0.50	8	1.03	14	1.17	28	32.94	0.85	-2.79
Prostate	0	0.00	4	0.42	8	1.08	14	1.21	26	31.58	0.82	-3.16
Testis	0	0.00	1	2.76	0	0.00	0	0.00	1	1.13	0.88	-0.08
<b>Urinary system</b>	2	1.87	2	0.60	1	0.39	2	0.55	7	10.53	0.66	-2.00
Urinary bladder	1	1.33	1	0.43	1	0.56	2	0.79	5	7.38	0.68	-1.35
Kidney parenchyma	1	3.93	1	1.23	0	0.00	0	0.00	2	2.60	0.77	-0.34
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.32
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.10
<b>Bone, joints</b>	1	36.39	3	37.80*	1	20.10	0	0.00	5	0.21	24.17*	2.71
<b>Soft tissue including heart</b>	0	0.00	0	0.00	3	21.21*	3	15.88*	6	0.58	10.41*	3.07
<b>Kaposi sarcoma</b>	1	13.58	0	0.00	0	0.00	0	0.00	1	0.96	1.05	0.02
<b>Melanoma of skin</b>	1	3.10	3	2.76	0	0.00	0	0.00	4	3.67	1.09	0.19
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.10
<b>Brain, central nervous system</b>	0	0.00	1	1.94	0	0.00	0	0.00	1	1.55	0.64	-0.31
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	1	4.50	1	0.65	1.53	0.20
<b>Lymphatic, hematopoietic</b>	2	2.12	12	4.05*	1	0.44	4	1.26	19	9.37	2.03*	5.45
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.41
Non-Hodgkin lymphoma	2	5.02	2	1.56	0	0.00	2	1.32	6	4.23	1.42	1.00
Myeloma	0	0.00	1	2.41	0	0.00	0	0.00	1	1.31	0.76	-0.18
Leukemia	0	0.00	9	8.90*	1	1.33	2	1.97	12	3.11	3.86*	5.03
Acute lymphocytic	0	0.00	1	13.74	0	0.00	0	0.00	1	0.19	5.34	0.46
Chronic lymphocytic	0	0.00	1	2.73	0	0.00	1	2.61	2	1.15	1.74	0.48
Acute non-lymphocytic	0	0.00	6	18.02*	1	4.02	0	0.00	7	1.03	6.80*	3.38
Chronic myeloid	0	0.00	1	7.16	0	0.00	1	6.68	2	0.44	4.53	0.88

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 12.2.1:** Characteristics of patients with an initial cancer of the soft tissues including heart, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	6,787	100.0	5,661	100.0	12,448	100.0
<b>Initial treatment</b>						
Any radiation	2,786	41.0	2,289	40.4	5,075	40.8
With surgery	2,338	34.4	1,911	33.8	4,249	34.1
Without surgery	448	6.6	378	6.7	826	6.6
No radiation	4,001	59.0	3,372	59.6	7,373	59.2
With surgery	3,436	50.6	2,867	50.6	6,303	50.6
Without surgery	565	8.3	505	8.9	1,070	8.6
<b>Race</b>						
White	5,617	82.8	4,652	82.2	10,269	82.5
Black	664	9.8	619	10.9	1,283	10.3
Other	449	6.6	349	6.2	798	6.4
Unknown	57	0.8	41	0.7	98	0.8
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	1,441	21.2	1,299	22.9	2,740	22.0
30–49	1,662	24.5	1,279	22.6	2,941	23.6
50–69	2,175	32.0	1,619	28.6	3,794	30.5
70–79	1,014	14.9	812	14.3	1,826	14.7
≥ 80	495	7.3	652	11.5	1,147	9.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	6,217	91.6	5,330	94.2	11,547	92.8
1st and 2nd cancers	501	7.4	301	5.3	802	6.4
1st, 2nd, and 3rd cancers	65	1.0	29	0.5	94	0.8
1st, 2nd, 3rd, and additional cancers	4	0.1	1	0.0	5	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	52.9	—	53.3	—	53.1	—
Median year of 1st cancer diagnosis	1989.2	—	1989.0	—	1989.1	—
Median person-years at risk	3.8	—	4.0	—	3.9	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.3	—	95.8	—	95.4
1st, 2nd, and additional cancers	—	95.1	—	95.5	—	95.2
1st cancer only	—	3.9	—	3.9	—	3.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Soft Tissues Both Sexes

**Table 12.2.2:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	117	1.31*	354	1.24*	267	1.22*	268	1.07	1,006	845.73	1.19*	19.81
All excluding same site	111	1.25*	338	1.19*	260	1.19*	263	1.05	972	842.07	1.15*	16.06
<b>Buccal cavity, pharynx</b>	3	1.25	6	0.79	5	0.89	6	1.02	20	21.53	0.93	-0.19
Lip	0	0.00	0	0.00	1	1.24	0	0.00	1	3.12	0.32	-0.26
Tongue	0	0.00	2	1.32	2	1.75	2	1.63	6	4.35	1.38	0.20
Salivary gland	2	9.56*	1	1.49	0	0.00	0	0.00	3	1.98	1.51	0.13
Mouth	0	0.00	1	0.50	1	0.68	2	1.34	4	5.59	0.72	-0.20
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.93	0.00	-0.11
Tonsil	0	0.00	1	1.38	0	0.00	1	1.76	2	2.06	0.97	-0.01
Oropharynx	0	0.00	1	4.77	0	0.00	0	0.00	1	0.60	1.66	0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	1	1.76	1	2.13	0.47	-0.14
<b>Digestive system</b>	21	1.04	54	0.85	50	1.05	52	0.99	177	183.77	0.96	-0.84
Esophagus	1	1.02	1	0.32	3	1.24	4	1.45	9	9.31	0.97	-0.04
Stomach	4	1.86	9	1.35	10	2.05	11	2.12*	34	18.88	1.80*	1.87
Small intestine	1	3.67	0	0.00	1	1.44	1	1.19	3	2.69	1.12	0.04
Colon	8	0.88	26	0.91	19	0.88	15	0.63	68	83.09	0.82	-1.87
Rectum, rectosigmoid junction	4	1.16	10	0.92	5	0.62	6	0.70	25	31.02	0.81	-0.74
Anus, anal canal	0	0.00	0	0.00	1	2.18	0	0.00	1	1.76	0.57	-0.09
Liver	1	1.46	1	0.46	1	0.59	1	0.50	4	6.57	0.61	-0.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	2.45	0.00	-0.30
Bile ducts, other biliary	1	2.33	0	0.00	1	0.95	3	2.40	5	4.09	1.22	0.11
Pancreas	0	0.00	6	0.79	6	1.05	11	1.74	23	22.08	1.04	0.11
<b>Respiratory system</b>	18	1.20	52	1.08	37	1.00	44	1.06	151	141.78	1.07	1.14
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	1.25	0.00	-0.15
Larynx	0	0.00	5	1.52	2	0.81	3	1.16	10	9.39	1.06	0.08
Lung, bronchus	18	1.31	47	1.06	35	1.02	40	1.04	140	130.74	1.07	1.14
<b>Female breast</b>	13	1.41	26	0.88	38	1.66*	23	0.90	100	87.36	1.14	3.39
<b>Female genital system</b>	3	0.71	16	1.20	15	1.53	11	1.05	45	37.81	1.19	1.93
Cervix uteri	0	0.00	0	0.00	1	0.75	1	0.76	2	5.12	0.39	-0.84
Corpus uteri	2	0.97	8	1.25	8	1.71	6	1.20	24	18.13	1.32	1.57
Ovary	0	0.00	6	1.54	6	2.03	2	0.62	14	11.31	1.24	0.72
Vagina	1	15.10	0	0.00	0	0.00	0	0.00	1	0.59	1.69	0.11
Vulva	0	0.00	1	1.64	0	0.00	2	3.90	3	1.78	1.68	0.33
<b>Male genital system</b>	27	1.61*	70	1.28	51	1.18	47	0.85	195	169.84	1.15	5.77
Prostate	26	1.58*	70	1.30*	49	1.15	45	0.83	190	166.88	1.14	5.30
Testis	0	0.00	0	0.00	2	4.17	0	0.00	2	1.86	1.08	0.03
<b>Urinary system</b>	10	1.42	28	1.24	18	1.04	25	1.26	81	66.60	1.22	1.78
Urinary bladder	4	0.82	21	1.35	15	1.27	19	1.40	59	45.80	1.29	1.63
Kidney parenchyma	5	2.91	5	0.89	3	0.69	2	0.39	15	16.79	0.89	-0.22
Renal pelvis, other urinary	1	2.25	2	1.42	0	0.00	4	3.56	7	4.01	1.74	0.37
Ureter	0	0.00	1	2.18	0	0.00	0	0.00	1	1.31	0.76	-0.04
<b>Bone, joints</b>	0	0.00	7	21.96*	2	8.56	3	12.04*	12	0.90	13.30*	1.37
<b>Soft tissue including heart</b>	6	15.03*	16	12.80*	7	7.53*	5	4.65*	34	3.65	9.30*	3.75
<b>Kaposi sarcoma</b>	3	13.23*	2	2.63	0	0.00	0	0.00	5	2.22	2.26	0.34
<b>Melanoma of skin</b>	1	0.48	12	1.74	10	1.82	15	2.25*	38	21.12	1.80*	2.09
<b>Eye, orbit</b>	0	0.00	1	2.31	0	0.00	0	0.00	1	1.22	0.82	-0.03
<b>Brain, central nervous system</b>	0	0.00	7	2.22	3	1.26	2	0.78	12	9.09	1.32	0.36
<b>Thyroid</b>	2	3.24	6	2.98*	3	1.97	3	1.75	14	5.87	2.39*	1.00
<b>Lymphatic, hematopoietic</b>	7	1.01	42	1.90*	20	1.19	23	1.20	92	65.12	1.41*	3.32
Hodgkin lymphoma	0	0.00	2	1.98	0	0.00	1	1.35	3	2.80	1.07	0.02
Non-Hodgkin lymphoma	0	0.00	7	0.72	9	1.18	12	1.34	28	29.37	0.95	-0.17
Myeloma	2	1.76	10	2.76*	1	0.36	2	0.62	15	10.76	1.39	0.52
Leukemia	5	2.05	23	2.99*	10	1.75	8	1.26	46	22.19	2.07*	2.94
Acute lymphocytic	0	0.00	2	5.81	0	0.00	0	0.00	2	0.90	2.21	0.14
Chronic lymphocytic	3	3.25	6	2.05	4	1.82	2	0.83	15	8.47	1.77	0.81
Acute non-lymphocytic	2	2.45	9	3.47*	4	2.06	5	2.28	20	7.54	2.65*	1.54
Chronic myeloid	0	0.00	5	4.71*	1	1.27	1	1.12	7	3.08	2.27	0.48

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 37,323 PYR and for male cancers on 43,588 PYR.

**Table 12.2.3:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	45	1.39*	118	1.15	105	1.33*	94	1.08	362	300.92	1.20*	16.37
All excluding same site	42	1.30	110	1.07	100	1.28*	92	1.06	344	299.58	1.15*	11.90
<b>Buccal cavity, pharynx</b>	1	1.73	1	0.55	3	2.20	1	0.70	6	5.20	1.15	0.22
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.09
Tongue	0	0.00	0	0.00	1	3.31	1	3.11	2	1.15	1.74	0.23
Salivary gland	1	14.80	0	0.00	0	0.00	0	0.00	1	0.62	1.61	0.10
Mouth	0	0.00	0	0.00	1	2.16	0	0.00	1	1.77	0.57	-0.21
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.06
Tonsil	0	0.00	1	6.30	0	0.00	0	0.00	1	0.44	2.26	0.15
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.09
<b>Digestive system</b>	8	1.05	14	0.59*	11	0.62	15	0.79	48	67.92	0.71*	-5.34
Esophagus	0	0.00	0	0.00	1	2.04	0	0.00	1	1.88	0.53	-0.24
Stomach	1	1.58	3	1.56	3	2.13	2	1.36	9	5.43	1.66	0.96
Small intestine	0	0.00	0	0.00	1	3.78	1	3.19	2	1.02	1.97	0.26
Colon	3	0.79	9	0.76	4	0.45	6	0.64	22	33.84	0.65*	-3.17
Rectum, rectosigmoid junction	2	1.68	1	0.27	0	0.00	1	0.36	4	10.37	0.39*	-1.71
Rectum	2	2.56	0	0.00	0	0.00	1	0.54	3	6.83	0.44	-1.03
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.92	0.00	-0.25
Liver	0	0.00	0	0.00	0	0.00	1	2.14	1	1.55	0.65	-0.15
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.48	0.00	-0.40
Bile ducts, other biliary	1	6.09	0	0.00	0	0.00	1	2.21	2	1.53	1.31	0.13
Pancreas	0	0.00	1	0.33	1	0.43	3	1.17	5	8.97	0.56	-1.06
<b>Respiratory system</b>	8	2.04	15	1.17	9	0.89	12	1.01	44	38.66	1.14	1.43
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.11
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.33
Lung, bronchus	8	2.14	15	1.23	9	0.93	11	0.97	43	36.91	1.17	1.63
<b>Female breast</b>	13	1.41	26	0.88	38	1.66*	23	0.90	100	87.36	1.14	3.39
<b>Female genital system</b>	3	0.71	16	1.20	15	1.53	11	1.05	45	37.81	1.19	1.93
Cervix uteri	0	0.00	0	0.00	1	0.75	1	0.76	2	5.12	0.39	-0.84
Corpus uteri	2	0.97	8	1.25	8	1.71	6	1.20	24	18.13	1.32	1.57
Ovary	0	0.00	6	1.54	6	2.03	2	0.62	14	11.31	1.24	0.72
Vagina	1	15.10	0	0.00	0	0.00	0	0.00	1	0.59	1.69	0.11
Vulva	0	0.00	1	1.64	0	0.00	2	3.90	3	1.78	1.68	0.33
<b>Urinary system</b>	2	1.32	7	1.46	3	0.81	10	2.44*	22	14.11	1.56	2.11
Urinary bladder	0	0.00	5	1.77	3	1.39	8	3.39*	16	8.24	1.94*	2.08
Kidney parenchyma	2	4.07	2	1.26	0	0.00	1	0.70	5	4.75	1.05	0.07
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	3.22	1	1.12	0.89	-0.03
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.09
<b>Bone, joints</b>	0	0.00	3	24.98*	2	22.41*	1	10.50	6	0.34	17.51*	1.52
<b>Soft tissue including heart</b>	3	20.45*	8	17.42*	5	14.52*	2	5.19	18	1.34	13.48*	4.46
<b>Kaposi sarcoma</b>	1	73.88	0	0.00	0	0.00	0	0.00	1	0.12	8.07	0.23
<b>Melanoma of skin</b>	0	0.00	2	0.87	3	1.64	1	0.48	6	6.91	0.87	-0.24
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.12
<b>Brain, central nervous system</b>	0	0.00	3	2.67	1	1.18	0	0.00	4	3.23	1.24	0.21
<b>Thyroid</b>	1	2.60	2	1.58	1	1.04	2	1.85	6	3.69	1.63	0.62
<b>Lymphatic, hematopoietic</b>	3	1.19	17	2.13*	9	1.47	12	1.78	41	23.34	1.76*	4.73
Hodgkin lymphoma	0	0.00	1	2.74	0	0.00	0	0.00	1	1.02	0.98	-0.01
Non-Hodgkin lymphoma	0	0.00	5	1.35	6	2.08	8	2.44*	19	11.02	1.72*	2.14
Myeloma	1	2.34	5	3.71*	0	0.00	1	0.87	7	3.96	1.77	0.81
Leukemia	2	2.43	6	2.34	3	1.56	3	1.47	14	7.34	1.91*	1.78
Acute lymphocytic	0	0.00	1	7.60	0	0.00	0	0.00	1	0.34	2.94	0.18
Chronic lymphocytic	0	0.00	2	2.15	1	1.43	1	1.36	4	2.67	1.50	0.36
Acute non-lymphocytic	2	6.91	2	2.20	1	1.46	2	2.66	7	2.63	2.66*	1.17
Chronic myeloid	0	0.00	1	2.79	0	0.00	0	0.00	1	1.03	0.97	-0.01

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Soft Tissues Males

**Table 12.2.4:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	72	1.27	236	1.29*	162	1.15	174	1.06	644	544.81	1.18*	22.76
All excluding same site	69	1.22	228	1.25*	160	1.14	171	1.05	628	542.49	1.16*	19.62
<b>Buccal cavity, pharynx</b>	2	1.10	5	0.86	2	0.47	5	1.12	14	16.33	0.86	-0.53
Lip	0	0.00	0	0.00	1	1.40	0	0.00	1	2.77	0.36	-0.41
Tongue	0	0.00	2	1.80	1	1.19	1	1.10	4	3.20	1.25	0.18
Salivary gland	1	7.06	1	2.18	0	0.00	0	0.00	2	1.36	1.47	0.15
Mouth	0	0.00	1	0.73	0	0.00	2	1.99	3	3.82	0.79	-0.19
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.16
Tonsil	0	0.00	0	0.00	0	0.00	1	2.21	1	1.62	0.62	-0.14
Oropharynx	0	0.00	1	6.05	0	0.00	0	0.00	1	0.48	2.10	0.12
Hypopharynx	0	0.00	0	0.00	0	0.00	1	2.09	1	1.79	0.56	-0.18
<b>Digestive system</b>	13	1.04	40	1.00	39	1.30	37	1.11	129	115.85	1.11	3.02
Esophagus	1	1.29	1	0.40	2	1.04	4	1.80	8	7.42	1.08	0.13
Stomach	3	1.98	6	1.26	7	2.02	9	2.42*	25	13.45	1.86*	2.65
Small intestine	1	5.94	0	0.00	0	0.00	0	0.00	1	1.67	0.60	-0.15
Colon	5	0.95	17	1.01	15	1.18	9	0.63	46	49.25	0.93	-0.75
Rectum, rectosigmoid junction	2	0.88	9	1.25	5	0.93	5	0.87	21	20.65	1.02	0.08
Anus, anal canal	0	0.00	0	0.00	1	4.62	0	0.00	1	0.84	1.19	0.04
Liver	1	1.94	1	0.60	1	0.78	0	0.00	3	5.02	0.60	-0.46
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.22
Bile ducts, other biliary	0	0.00	0	0.00	1	1.54	2	2.52	3	2.57	1.17	0.10
Pancreas	0	0.00	5	1.10	5	1.48	8	2.12	18	13.11	1.37	1.12
<b>Respiratory system</b>	10	0.91	37	1.04	28	1.04	32	1.08	107	103.12	1.04	0.89
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-0.19
Larynx	0	0.00	5	1.74	2	0.93	3	1.34	10	8.16	1.23	0.42
Lung, bronchus	10	1.00	32	0.99	26	1.06	29	1.07	97	93.83	1.03	0.73
<b>Male breast</b>	0	0.00	0	0.00	1	3.79	1	3.20	2	1.03	1.94	0.22
<b>Male genital system</b>	27	1.61*	70	1.28	51	1.18	47	0.85	195	169.84	1.15	5.77
Prostate	26	1.58*	70	1.30*	49	1.15	45	0.83	190	166.88	1.14	5.30
Testis	0	0.00	0	0.00	2	4.17	0	0.00	2	1.86	1.08	0.03
<b>Urinary system</b>	8	1.45	21	1.18	15	1.11	15	0.95	59	52.49	1.12	1.49
Urinary bladder	4	1.01	16	1.26	12	1.24	11	0.98	43	37.56	1.14	1.25
Kidney parenchyma	3	2.44	3	0.75	3	0.96	1	0.27	10	12.04	0.83	-0.47
Renal pelvis, other urinary	1	3.14	2	1.97	0	0.00	3	3.69	6	2.89	2.08	0.71
Ureter	0	0.00	1	2.94	0	0.00	0	0.00	1	0.97	1.03	0.01
<b>Bone, joints</b>	0	0.00	4	20.14*	0	0.00	2	12.99*	6	0.56	10.72*	1.25
<b>Soft tissue including heart</b>	3	11.87*	8	10.11*	2	3.42	3	4.35	16	2.32	6.90*	3.14
<b>Kaposi sarcoma</b>	2	9.38*	2	2.79	0	0.00	0	0.00	4	2.09	1.91	0.44
<b>Melanoma of skin</b>	1	0.73	10	2.17*	7	1.91	14	3.06*	32	14.21	2.25*	4.08
<b>Eye, orbit</b>	0	0.00	1	3.63	0	0.00	0	0.00	1	0.78	1.27	0.05
<b>Brain, central nervous system</b>	0	0.00	4	1.97	2	1.31	2	1.20	8	5.86	1.37	0.49
<b>Thyroid</b>	1	4.29	4	5.32*	2	3.56	1	1.57	8	2.18	3.66*	1.33
<b>Lymphatic, hematopoietic</b>	4	0.91	25	1.77*	11	1.02	11	0.88	51	41.77	1.22	2.12
Hodgkin lymphoma	0	0.00	1	1.55	0	0.00	1	2.15	2	1.78	1.13	0.05
Non-Hodgkin lymphoma	0	0.00	2	0.33	3	0.63	4	0.70	9	18.35	0.49*	-2.15
Myeloma	1	1.41	5	2.19	1	0.57	1	0.49	8	6.80	1.18	0.28
Leukemia	3	1.86	17	3.31*	7	1.84	5	1.16	32	14.85	2.16*	3.93
Acute lymphocytic	0	0.00	1	4.70	0	0.00	0	0.00	1	0.56	1.77	0.10
Chronic lymphocytic	3	4.80	4	2.00	3	2.00	1	0.59	11	5.80	1.90	1.19
Acute non-lymphocytic	0	0.00	7	4.16*	3	2.38	3	2.08	13	4.91	2.65*	1.86
Chronic myeloid	0	0.00	4	5.69*	1	1.92	1	1.66	6	2.05	2.93*	0.91

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 12.2.5:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, both sexes, <18 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	1,448	1,117	0	0.00	5	7.85*	4	6.32*	11	5.98*	20	3.29	6.07*	14.28
All excluding same site			0	0.00	5	8.32*	3	4.94	11	6.13*	19	3.17	5.99*	13.53
<b>Buccal cavity, pharynx</b>			0	0.00	0	0.00	0	0.00	3	81.37*	3	0.06	49.72*	2.51
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Tongue			0	0.00	0	0.00	0	0.00	1	133.20*	1	0.01	99.97*	0.85
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.02
Mouth			0	0.00	0	0.00	0	0.00	1	171.24*	1	0.01	100.34*	0.85
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Tonsil			0	0.00	0	0.00	0	0.00	1	†	1	0.00	475.45*	0.85
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Digestive system</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.12
Esophagus			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Stomach			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Small intestine			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Colon			0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.04
Rectum, rectosigmoid junction			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.02
Anus, anal canal			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Liver			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.02
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Bile ducts, other biliary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Pancreas			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Respiratory system</b>			0	0.00	0	0.00	1	108.74*	0	0.00	1	0.06	15.51	0.80
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Larynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Lung, bronchus			0	0.00	0	0.00	1	280.75*	0	0.00	1	0.04	28.41	0.82
<b>Female breast</b>			0	0.00	0	0.00	0	0.00	4	19.24*	4	0.22	18.08*	6.47
<b>Female genital system</b>			0	0.00	0	0.00	0	0.00	1	5.16	1	0.26	3.82	1.26
Cervix uteri			0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.19
Corpus uteri			0	0.00	0	0.00	0	0.00	1	47.90	1	0.02	43.47	1.67
Ovary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.19
Vagina			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Vulva			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Male genital system</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.44
Prostate			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	-0.01
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.43
<b>Urinary system</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.09
Urinary bladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02
Kidney parenchyma			0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.06
Renal pelvis, other urinary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Bone, joints</b>			0	0.00	2	64.32*	1	34.32	2	54.36*	5	0.11	47.38*	4.18
<b>Soft tissue including heart</b>			0	0.00	0	0.00	1	38.03	0	0.00	1	0.12	8.34	0.75
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.08
<b>Melanoma of skin</b>			0	0.00	0	0.00	0	0.00	1	4.76	1	0.29	3.44	0.61
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02
<b>Brain, central nervous system</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.28
<b>Thyroid</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.21
<b>Lymphatic, hematopoietic</b>			0	0.00	3	12.30*	0	0.00	0	0.00	3	0.90	3.32	1.79
Hodgkin lymphoma			0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.26
Non-Hodgkin lymphoma			0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.20
Myeloma			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Leukemia			0	0.00	3	20.83*	0	0.00	0	0.00	3	0.37	8.14*	2.25
Acute lymphocytic			0	0.00	1	9.43	0	0.00	0	0.00	1	0.23	4.38	0.66
Chronic lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Acute non-lymphocytic			0	0.00	2	66.03*	0	0.00	0	0.00	2	0.10	19.63*	1.62
Chronic myeloid			0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02

\*P < 0.05. †O/E > 500. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,839 PYR and for male cancers on 5,858 PYR.

## Soft Tissues

### Both Sexes, 18-29 Years of Age

**Table 12.2.6:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, both sexes, 18-29 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	1,292	990	1,087	3,343	665	2,700	431	3,151	1,292	10,183		
<b>All subsequent cancers</b>	2	4.71	8	4.30*	7	3.02*	10	1.68	27	10.57	2.56*	16.14
All excluding same site	1	2.42	6	3.30*	6	2.63	9	1.52	22	10.41	2.11*	11.38
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.27
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.03
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.06
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.05
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.05
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.04
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.03
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Digestive system</b>	0	0.00	0	0.00	0	0.00	3	4.41	3	0.95	3.15	2.01
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.04
Stomach	0	0.00	0	0.00	0	0.00	1	14.25	1	0.10	9.59	0.88
Small intestine	0	0.00	0	0.00	0	0.00	1	44.66	1	0.03	30.78	0.95
Colon	0	0.00	0	0.00	0	0.00	1	4.27	1	0.34	2.95	0.65
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.19
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.04
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.07
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.02
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.08
<b>Respiratory system</b>	0	0.00	0	0.00	0	0.00	2	4.67	2	0.54	3.71	1.43
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.02
Larynx	0	0.00	0	0.00	0	0.00	1	23.55	1	0.05	19.19	0.93
Lung, bronchus	0	0.00	0	0.00	0	0.00	1	2.71	1	0.45	2.23	0.54
<b>Female breast</b>	0	0.00	1	5.49	3	7.93*	1	0.69	5	2.04	2.45	6.21
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	1	1.73	1	1.11	0.90	-0.24
Cervix uteri	0	0.00	0	0.00	0	0.00	1	4.86	1	0.50	2.02	1.06
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.46
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.70
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.02
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.07
<b>Male genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-1.41
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.31
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-1.09
<b>Urinary system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.39
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.19
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.18
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.07
<b>Soft tissue including heart</b>	1	85.87*	2	48.84*	1	27.04	1	16.28	5	0.15	33.11*	4.76
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.51
<b>Melanoma of skin</b>	0	0.00	1	4.38	1	3.72	1	1.93	3	1.07	2.81	1.90
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.03
<b>Brain, central nervous system</b>	0	0.00	1	10.77	1	10.98	0	0.00	2	0.36	5.60	1.61
<b>Thyroid</b>	0	0.00	1	5.69	0	0.00	1	3.87	2	0.65	3.07	1.32
<b>Lymphatic, hematopoietic</b>	1	10.23	2	5.51	0	0.00	0	0.00	3	1.47	2.04	1.50
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.41
Non-Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.66
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.05
Leukemia	1	45.22	2	25.78*	0	0.00	0	0.00	3	0.32	9.37*	2.63
Acute lymphocytic	0	0.00	1	55.96	0	0.00	0	0.00	1	0.05	18.86	0.93
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.03
Acute non-lymphocytic	1	94.35*	1	27.00	0	0.00	0	0.00	2	0.14	14.44*	1.83
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.07

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 4,769 PYR and for male cancers on 5,415 PYR.

**Table 12.2.7:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, both sexes, ≥30 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	115	1.30*	341	1.20*	256	1.18*	247	1.02	959	831.87	1.15*	21.54
All excluding same site	110	1.25*	327	1.16*	251	1.17*	243	1.00	931	828.49	1.12*	17.37
<b>Buccal cavity, pharynx</b>	3	1.26	6	0.79	5	0.90	3	0.53	17	21.19	0.80	-0.71
Lip	0	0.00	0	0.00	1	1.26	0	0.00	1	3.08	0.32	-0.35
Tongue	0	0.00	2	1.33	2	1.77	1	0.85	5	4.28	1.17	0.12
Salivary gland	2	9.72*	1	1.52	0	0.00	0	0.00	3	1.92	1.57	0.18
Mouth	0	0.00	1	0.50	1	0.69	1	0.69	3	5.53	0.54	-0.43
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.15
Tonsil	0	0.00	1	1.38	0	0.00	0	0.00	1	2.03	0.49	-0.17
Oropharynx	0	0.00	1	4.77	0	0.00	0	0.00	1	0.60	1.67	0.07
Hypopharynx	0	0.00	0	0.00	0	0.00	1	1.79	1	2.11	0.47	-0.19
<b>Digestive system</b>	21	1.05	54	0.85	50	1.05	49	0.95	174	182.67	0.95	-1.47
Esophagus	1	1.02	1	0.32	3	1.24	4	1.47	9	9.27	0.97	-0.04
Stomach	4	1.87	9	1.35	10	2.06	10	1.96	33	18.76	1.76*	2.41
Small intestine	1	3.68	0	0.00	1	1.45	0	0.00	2	2.65	0.75	-0.11
Colon	8	0.88	26	0.91	19	0.88	14	0.60	67	82.71	0.81	-2.66
Rectum, rectosigmoid junction	4	1.16	10	0.92	5	0.62	6	0.71	25	30.80	0.81	-0.98
Anus, anal canal	0	0.00	0	0.00	1	2.21	0	0.00	1	1.72	0.58	-0.12
Liver	1	1.47	1	0.46	1	0.60	1	0.51	4	6.48	0.62	-0.42
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	2.44	0.00	-0.41
Bile ducts, other biliary	1	2.33	0	0.00	1	0.96	3	2.44	5	4.97	1.23	0.16
Pancreas	0	0.00	6	0.79	6	1.05	11	1.76	23	21.08	1.05	0.17
<b>Respiratory system</b>	18	1.20	52	1.08	36	0.97	42	1.03	148	141.17	1.05	1.16
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	1.23	0.00	-0.21
Larynx	0	0.00	5	1.52	2	0.81	2	0.79	9	9.33	0.96	-0.06
Lung, bronchus	18	1.31	47	1.06	34	1.00	39	1.03	138	130.26	1.06	1.31
<b>Female breast</b>	13	1.42	25	0.85	35	1.56*	18	0.75	91	85.10	1.07	2.21
<b>Female genital system</b>	3	0.72	16	1.23	15	1.58	9	0.93	43	36.44	1.18	2.46
Cervix uteri	0	0.00	0	0.00	1	0.86	0	0.00	1	4.51	0.22	-1.31
Corpus uteri	2	0.98	8	1.25	8	1.73	5	1.04	23	17.89	1.29	1.91
Ovary	0	0.00	6	1.57	6	2.10	2	0.67	14	10.87	1.29	1.17
Vagina	1	15.25	0	0.00	0	0.00	0	0.00	1	0.58	1.73	0.16
Vulva	0	0.00	1	1.66	0	0.00	2	4.10	3	1.74	1.72	0.47
<b>Male genital system</b>	27	1.61*	70	1.28*	51	1.18	47	0.86	195	168.82	1.16	8.10
Prostate	26	1.58*	70	1.30*	49	1.15	45	0.83	190	166.71	1.14	7.21
Testis	0	0.00	0	0.00	2	7.90	0	0.00	2	1.02	1.96	0.30
<b>Urinary system</b>	10	1.43	28	1.25	18	1.05	25	1.28	81	66.11	1.23	2.52
Urinary bladder	4	0.82	21	1.35	15	1.27	19	1.41	59	45.58	1.29	2.27
Kidney parenchyma	5	2.93	5	0.90	3	0.69	2	0.40	15	16.53	0.91	-0.26
Renal pelvis, other urinary	1	2.25	2	1.43	0	0.00	4	3.59	7	4.00	1.75	0.51
Ureter	0	0.00	1	2.18	0	0.00	0	0.00	1	1.31	0.77	-0.05
<b>Bone, joints</b>	0	0.00	5	18.86*	1	5.33	1	5.22	7	0.73	9.61*	1.06
<b>Soft tissue including heart</b>	5	13.30*	14	11.94*	5	5.77*	4	4.13*	28	3.38	8.28*	4.17
<b>Kaposi sarcoma</b>	3	14.21*	2	3.05	0	0.00	0	0.00	5	1.60	3.12*	0.58
<b>Melanoma of skin</b>	1	0.50	11	1.65	9	1.74	13	2.19*	34	19.76	1.72*	2.41
<b>Eye, orbit</b>	0	0.00	1	2.43	0	0.00	0	0.00	1	1.16	0.86	-0.03
<b>Brain, central nervous system</b>	0	0.00	6	2.03	2	0.91	2	0.86	10	8.41	1.19	0.27
<b>Thyroid</b>	2	3.50	5	2.76	3	2.31	2	1.54	12	4.98	2.41*	1.19
<b>Lymphatic, hematopoietic</b>	6	0.89	37	1.72*	20	1.23	23	1.26	86	62.74	1.37*	3.94
Hodgkin lymphoma	0	0.00	2	2.53	0	0.00	1	2.03	3	2.08	1.44	0.16
Non-Hodgkin lymphoma	0	0.00	7	0.73	9	1.21	12	1.42	28	28.46	0.98	-0.08
Myeloma	2	1.76	10	2.76*	1	0.36	2	0.63	15	10.70	1.40	0.73
Leukemia	4	1.69	18	2.41*	10	1.79	8	1.31	40	21.50	1.86*	3.13
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.11
Chronic lymphocytic	3	3.25	6	2.05	4	1.82	2	0.84	15	8.44	1.78	1.11
Acute non-lymphocytic	1	1.26	6	2.38	4	2.12	5	2.39	16	7.30	2.19*	1.47
Chronic myeloid	0	0.00	5	4.81*	1	1.31	1	1.19	7	2.98	2.35	0.68

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 26,715 PYR and for male cancers on 32,315 PYR.

## Soft Tissues Both Sexes, Radiotherapy

**Table 12.2.8:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	5,075	3,767	4,053	11,106	1,971	7,241	1,027	6,075	5,075	28,189		
<b>All subsequent cancers</b>	49	1.33	149	1.33*	93	1.21	82	1.20	373	294.37	1.27*	27.89
All excluding same site	46	1.25	142	1.27*	91	1.19	80	1.17	359	293.10	1.22*	23.38
<b>Buccal cavity, pharynx</b>	1	1.03	2	0.70	1	0.53	2	1.28	6	7.31	0.82	-0.46
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.36
Tongue	0	0.00	1	1.72	0	0.00	1	3.00	2	1.50	1.33	0.18
Salivary gland	1	11.69	0	0.00	0	0.00	0	0.00	1	0.68	1.46	0.11
Mouth	0	0.00	0	0.00	1	2.03	1	2.51	2	1.90	1.06	0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.25
Oropharynx	0	0.00	1	12.67	0	0.00	0	0.00	1	0.20	4.94	0.28
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.26
<b>Digestive system</b>	8	0.98	24	0.98	15	0.91	14	0.99	61	63.19	0.97	-0.78
Esophagus	1	2.48	0	0.00	2	2.39	1	1.34	4	3.21	1.25	0.28
Stomach	2	2.32	3	1.19	3	1.83	3	2.17	11	6.39	1.72	1.63
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.94	0.00	-0.33
Colon	3	0.81	14	1.27	5	0.67	3	0.46	25	28.61	0.87	-1.28
Rectum, rectosigmoid junction	2	1.42	5	1.20	1	0.36	2	0.87	10	10.61	0.94	-0.21
Anus, anal canal	0	0.00	0	0.00	1	6.18	0	0.00	1	0.62	1.62	0.14
Liver	0	0.00	1	1.15	0	0.00	0	0.00	1	2.30	0.43	-0.46
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.30
Bile ducts, other biliary	0	0.00	0	0.00	1	2.67	1	2.89	2	1.44	1.39	0.20
Pancreas	0	0.00	0	0.00	1	0.51	4	2.32	5	7.60	0.66	-0.92
<b>Respiratory system</b>	6	0.96	20	1.06	12	0.94	14	1.26	52	49.05	1.06	1.05
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.15
Larynx	0	0.00	3	2.40	1	1.21	1	1.47	5	3.18	1.57	0.65
Lung, bronchus	6	1.05	17	0.98	11	0.93	13	1.26	47	45.31	1.04	0.60
<b>Female breast</b>	7	1.79	10	0.85	11	1.34	7	0.97	35	31.07	1.13	3.01
<b>Female genital system</b>	1	0.57	8	1.55	3	0.87	2	0.69	14	13.27	1.05	0.56
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.70	0.00	-1.30
Corpus uteri	1	1.17	5	2.00	1	0.60	2	1.44	9	6.41	1.40	1.98
Ovary	0	0.00	2	1.30	2	1.90	0	0.00	4	4.02	1.00	-0.01
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.15
Vulva	0	0.00	1	4.17	0	0.00	0	0.00	1	0.64	1.56	0.28
<b>Male genital system</b>	10	1.42	27	1.23	17	1.09	18	1.19	72	59.59	1.21	8.21
Prostate	9	1.31	27	1.25	16	1.05	18	1.21	70	58.52	1.20	7.59
Testis	0	0.00	0	0.00	1	5.83	0	0.00	1	0.69	1.44	0.20
<b>Urinary system</b>	3	1.04	14	1.60	7	1.17	5	0.93	29	23.03	1.26	2.12
Urinary bladder	0	0.00	12	1.99*	7	1.71	3	0.82	22	15.80	1.39	2.20
Kidney parenchyma	3	4.16	1	0.45	0	0.00	0	0.00	4	5.86	0.68	-0.66
Renal pelvis, other urinary	0	0.00	1	1.87	0	0.00	2	6.57	3	1.37	2.18	0.58
Ureter	0	0.00	1	5.70	0	0.00	0	0.00	1	0.45	2.23	0.20
<b>Bone, joints</b>	0	0.00	4	32.69*	2	24.56*	2	27.71*	8	0.32	25.19*	2.73
<b>Soft tissue including heart</b>	3	18.34*	7	14.47*	2	6.09	2	6.73	14	1.27	11.00*	4.51
<b>Kaposi sarcoma</b>	2	20.36*	0	0.00	0	0.00	0	0.00	2	0.78	2.57	0.43
<b>Melanoma of skin</b>	1	1.13	6	2.14	2	1.00	7	3.74*	16	7.57	2.11*	2.99
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.15
<b>Brain, central nervous system</b>	0	0.00	3	2.44	1	1.21	0	0.00	4	3.18	1.26	0.29
<b>Thyroid</b>	1	3.87	1	1.26	2	3.68	1	2.07	5	2.08	2.41	1.04
<b>Lymphatic, hematopoietic</b>	5	1.75	19	2.20*	12	2.03*	6	1.13	42	22.73	1.85*	6.84
Hodgkin lymphoma	0	0.00	1	2.59	0	0.00	0	0.00	1	0.98	1.02	0.01
Non-Hodgkin lymphoma	0	0.00	3	0.77	6	2.19	4	1.61	13	10.40	1.25	0.92
Myeloma	2	4.29	5	3.56*	1	1.04	0	0.00	8	3.70	2.16	1.52
Leukemia	3	3.04	10	3.39*	5	2.53	2	1.16	20	7.64	2.62*	4.39
Acute lymphocytic	0	0.00	1	7.89	0	0.00	0	0.00	1	0.31	3.21	0.24
Chronic lymphocytic	2	5.35	1	0.89	1	1.33	0	0.00	4	2.90	1.38	0.39
Acute non-lymphocytic	1	2.99	5	4.99*	3	4.43	2	3.30	11	2.62	4.20*	2.97
Chronic myeloid	0	0.00	2	4.92	1	3.65	0	0.00	3	1.06	2.83	0.69

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 13,070 PYR and for male cancers on 15,119 PYR.

**Table 12.2.9:** Risk of subsequent primary cancers after cancer of the soft tissues including heart, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	68	1.30*	205	1.18*	174	1.22*	186	1.02	633	551.36	1.15*	15.49
All excluding same site	65	1.25	196	1.13	169	1.19*	183	1.01	613	548.97	1.12*	12.14
<b>Buccal cavity, pharynx</b>	2	1.41	4	0.84	4	1.07	4	0.92	14	14.22	0.98	-0.04
Lip	0	0.00	0	0.00	1	1.85	0	0.00	1	2.09	0.48	-0.21
Tongue	0	0.00	1	1.08	2	2.67	1	1.11	4	2.85	1.40	0.22
Salivary gland	1	8.08	1	2.42	0	0.00	0	0.00	2	1.30	1.54	0.13
Mouth	0	0.00	1	0.80	0	0.00	1	0.91	2	3.69	0.54	-0.32
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.12
Tonsil	0	0.00	1	2.22	0	0.00	1	2.39	2	1.36	1.47	0.12
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.08
Hypopharynx	0	0.00	0	0.00	0	0.00	1	2.38	1	1.41	0.71	-0.08
<b>Digestive system</b>	13	1.09	30	0.77	35	1.12	38	0.99	116	120.57	0.96	-0.87
Esophagus	0	0.00	1	0.52	1	0.63	3	1.49	5	6.10	0.82	-0.21
Stomach	2	1.56	6	1.45	7	2.16	8	2.10	23	12.48	1.84*	2.00
Small intestine	1	6.32	0	0.00	1	2.23	1	1.64	3	1.75	1.72	0.24
Colon	5	0.93	12	0.68	14	0.99	12	0.70	43	54.49	0.79	-2.18
Rectum, rectosigmoid junction	2	0.97	5	0.74	4	0.75	4	0.64	15	20.41	0.73	-1.03
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.14	0.00	-0.22
Liver	1	2.54	0	0.00	1	0.93	1	0.68	3	4.27	0.70	-0.24
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-0.31
Bile ducts, other biliary	1	3.97	0	0.00	0	0.00	2	2.22	3	2.65	1.13	0.07
Pancreas	0	0.00	6	1.28	5	1.33	7	1.52	18	14.47	1.24	0.67
<b>Respiratory system</b>	12	1.37	32	1.09	25	1.03	30	0.99	99	92.73	1.07	1.19
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.16
Larynx	0	0.00	2	0.98	1	0.60	2	1.05	5	6.22	0.80	-0.23
Lung, bronchus	12	1.50	30	1.11	24	1.07	27	0.97	93	85.43	1.09	1.44
<b>Female breast</b>	6	1.13	16	0.90	27	1.84*	16	0.87	65	56.29	1.15	3.59
<b>Female genital system</b>	2	0.80	8	0.98	12	1.89	9	1.19	31	24.54	1.26	2.66
Cervix uteri	0	0.00	0	0.00	1	1.12	1	1.03	2	3.42	0.58	-0.59
Corpus uteri	1	0.83	3	0.77	7	2.32	4	1.11	15	11.72	1.28	1.35
Ovary	0	0.00	4	1.69	4	2.10	2	0.86	10	7.29	1.37	1.12
Vagina	1	25.70	0	0.00	0	0.00	0	0.00	1	0.39	2.57	0.25
Vulva	0	0.00	0	0.00	0	0.00	2	5.52	2	1.14	1.75	0.35
<b>Male genital system</b>	17	1.74*	43	1.31	34	1.22	29	0.73	123	110.26	1.12	4.48
Prostate	17	1.77*	43	1.34	33	1.21	27	0.69*	120	108.37	1.11	4.09
Testis	0	0.00	0	0.00	1	3.24	0	0.00	1	1.16	0.86	-0.06
<b>Urinary system</b>	7	1.69	14	1.02	11	0.98	20	1.38	52	43.58	1.19	1.60
Urinary bladder	4	1.39	9	0.95	8	1.04	16	1.61	37	30.01	1.23	1.33
Kidney parenchyma	2	2.00	4	1.18	3	1.06	2	0.54	11	10.93	1.01	0.01
Renal pelvis, other urinary	1	3.79	1	1.15	0	0.00	2	2.44	4	2.64	1.52	0.26
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.16
<b>Bone, joints</b>	0	0.00	3	15.28*	0	0.00	1	5.65	4	0.58	6.84*	0.65
<b>Soft tissue including heart</b>	3	12.72*	9	11.74*	5	8.31*	3	3.86	20	2.38	8.40*	3.34
<b>Kaposi sarcoma</b>	1	7.78	2	4.39	0	0.00	0	0.00	3	1.44	2.08	0.30
<b>Melanoma of skin</b>	0	0.00	6	1.46	8	2.30	8	1.67	22	13.55	1.62*	1.60
<b>Eye, orbit</b>	0	0.00	1	3.74	0	0.00	0	0.00	1	0.80	1.26	0.04
<b>Brain, central nervous system</b>	0	0.00	4	2.07	2	1.29	2	1.07	8	5.91	1.35	0.40
<b>Thyroid</b>	1	2.78	5	4.10*	1	1.02	2	1.62	9	3.79	2.37*	0.99
<b>Lymphatic, hematopoietic</b>	2	0.49	23	1.71*	8	0.73	17	1.22	50	42.39	1.18	1.44
Hodgkin lymphoma	0	0.00	1	1.60	0	0.00	1	1.90	2	1.82	1.10	0.03
Non-Hodgkin lymphoma	0	0.00	4	0.68	3	0.61	8	1.24	15	18.97	0.79	-0.75
Myeloma	0	0.00	5	2.25	0	0.00	2	0.85	7	7.05	0.99	-0.01
Leukemia	2	1.38	13	2.74*	5	1.33	6	1.30	26	14.55	1.79*	2.17
Acute lymphocytic	0	0.00	1	4.60	0	0.00	0	0.00	1	0.59	1.69	0.08
Chronic lymphocytic	1	1.82	5	2.77	3	2.07	2	1.13	11	5.57	1.98	1.03
Acute non-lymphocytic	1	2.08	4	2.52	1	0.79	3	1.89	9	4.92	1.83	0.77
Chronic myeloid	0	0.00	3	4.58	0	0.00	1	1.54	4	2.02	1.98	0.38

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 24,253 PYR and for male cancers on 28,469 PYR.



## Kaposi Sarcoma

### Both Sexes, Diagnosis Years 1973-1979

**Table 12.3.1:** Characteristics of patients with an initial Kaposi sarcoma, both sexes, SEER 1973-1979, with follow-up through 2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	155	100.0	55	100.0	210	100.0
<b>Initial treatment</b>						
Any radiation	52	33.5	13	23.6	65	31.0
With surgery	13	8.4	4	7.3	17	8.1
Without surgery	39	25.2	9	16.4	48	22.9
No radiation	103	66.5	42	76.4	145	69.0
With surgery	66	42.6	32	58.2	98	46.7
Without surgery	37	23.9	10	18.2	47	22.4
<b>Race</b>						
White	138	89.0	51	92.7	189	90.0
Black	10	6.5	3	5.5	13	6.2
Other	7	4.5	0	0.0	7	3.3
Unknown	0	0.0	1	1.8	1	0.5
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	0	0.0	1	1.8	1	0.5
30–49	11	7.1	3	5.5	14	6.7
50–69	50	32.3	15	27.3	65	31.0
70–79	55	35.5	22	40.0	77	36.7
≥ 80	39	25.2	14	25.5	53	25.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	124	80.0	49	89.1	173	82.4
1st and 2nd cancers	25	16.1	6	10.9	31	14.8
1st, 2nd, and 3rd cancers	4	2.6	0	0.0	4	1.9
1st, 2nd, 3rd, and additional cancers	2	1.3	0	0.0	2	1.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	72.2	—	74.6	—	73.3	—
Median year of 1st cancer diagnosis	1976.5	—	1977.6	—	1977.0	—
Median person-years at risk	6.9	—	12.3	—	8.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	90.3	—	83.3	—	89.2
1st, 2nd, and additional cancers	—	90.3	—	83.3	—	89.2
1st cancer only	—	6.5	—	16.7	—	8.1

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Kaposi Sarcoma**  
**Both Sexes, Diagnosis Years 1973-1979**

**Table 12.3.2:** Risk of subsequent primary cancers after Kaposi sarcoma, both sexes, SEER 1973-1979, with follow-up through 2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	210 165		191 644		138 556		98 818		210 2,183			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4	1.25	16	1.25	8	0.65	17	0.84	45	48.57	0.93	-16.36
All excluding same site	4	1.25	15	1.17	7	0.57	17	0.84	43	48.51	0.89	-25.23
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	2	4.68	2	1.23	1.63	3.53
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-1.27
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.95
Salivary gland	0	0.00	0	0.00	0	0.00	1	19.39	1	0.12	8.54	4.04
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-1.41
Nasopharynx	0	0.00	0	0.00	0	0.00	1	77.56*	1	0.04	26.20	4.41
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.43
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.13
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.53
<b>Digestive system</b>	1	1.14	3	0.86	1	0.31	5	1.03	10	12.42	0.81	-11.08
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-2.39
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	1.49	0.00	-6.80
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.60
Colon	1	2.61	1	0.64	1	0.66	4	1.72	7	5.80	1.21	5.50
Rectum, rectosigmoid junction	0	0.00	2	3.21	0	0.00	1	1.35	3	2.08	1.45	4.23
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.36
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-1.58
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.79
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-1.18
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	1.44	0.00	-6.61
<b>Respiratory system</b>	0	0.00	2	0.90	2	0.96	1	0.32	5	7.99	0.63	-13.71
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.34
Larynx	0	0.00	0	0.00	1	7.17	0	0.00	1	0.53	1.90	2.17
Lung, bronchus	0	0.00	2	0.98	1	0.52	1	0.34	4	7.37	0.54	-15.43
<b>Female breast</b>	0	0.00	1	1.78	1	1.61	1	0.83	3	2.52	1.19	7.10
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-17.42
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-1.94
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-8.49
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-5.05
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.36
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-1.07
<b>Male genital system</b>	0	0.00	6	2.12	1	0.36	3	0.58	10	11.52	0.87	-10.11
Prostate	0	0.00	6	2.15	1	0.36	3	0.58	10	11.40	0.88	-9.31
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.18
<b>Urinary system</b>	1	3.40	0	0.00	1	0.91	1	0.55	3	4.37	0.69	-6.25
Urinary bladder	1	4.45	0	0.00	1	1.21	0	0.00	2	3.27	0.61	-5.82
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	2.81	1	0.81	1.24	0.89
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-1.33
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.44
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.17
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.84
<b>Kaposi sarcoma</b>	0	0.00	1	66.50	1	61.45	0	0.00	2	0.06	32.07*	8.88
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-3.51
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.30
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-1.76
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.71
<b>Lymphatic, hematopoietic</b>	2	8.31	2	2.07	1	1.08	3	1.89	8	3.72	2.15	19.60
Hodgkin lymphoma	1	105.92*	0	0.00	0	0.00	0	0.00	1	0.10	9.61	4.10
Non-Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	2	3.01	2	1.42	1.41	2.65
Myeloma	1	23.37	0	0.00	1	6.07	1	3.56	3	0.66	4.53	10.71
Leukemia	0	0.00	2	4.67	0	0.00	0	0.00	2	1.53	1.30	2.14
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.17
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-2.83
Acute non-lymphocytic	0	0.00	1	7.40	0	0.00	0	0.00	1	0.49	2.03	2.32
Chronic myeloid	0	0.00	1	17.66	0	0.00	0	0.00	1	0.21	4.86	3.64

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 678 PYR and for male cancers on 1,505 PYR.

## Kaposi Sarcoma

### Both Sexes, Diagnosis Years 1980-2000

**Table 12.3.3:** Characteristics of patients with an initial Kaposi sarcoma, both sexes, SEER 1980-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	11,175	100.0	294	100.0	11,469	100.0
<b>Initial treatment</b>						
Any radiation	2,798	25.0	91	31.0	2,889	25.2
With surgery	302	2.7	27	9.2	329	2.9
Without surgery	2,496	22.3	64	21.8	2,560	22.3
No radiation	8,377	75.0	203	69.0	8,580	74.8
With surgery	1,236	11.1	101	34.4	1,337	11.7
Without surgery	7,141	63.9	102	34.7	7,243	63.2
<b>Race</b>						
White	9,567	85.6	228	77.6	9,795	85.4
Black	1,207	10.8	51	17.3	1,258	11.0
Other	304	2.7	9	3.1	313	2.7
Unknown	97	0.9	6	2.0	103	0.9
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	1,349	12.1	13	4.4	1,362	11.9
30–49	8,539	76.4	56	19.0	8,595	74.9
50–69	940	8.4	29	9.9	969	8.4
70–79	196	1.8	64	21.8	260	2.3
≥ 80	151	1.4	132	44.9	283	2.5
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	10,487	93.8	272	92.5	10,759	93.8
1st and 2nd cancers	678	6.1	20	6.8	698	6.1
1st, 2nd, and 3rd cancers	9	0.1	2	0.7	11	0.1
1st, 2nd, 3rd, and additional cancers	1	0.0	0	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	37.6	—	78.1	—	37.8	—
Median year of 1st cancer diagnosis	1991.0	—	1991.8	—	1991.0	—
Median person-years at risk	1.2	—	2.9	—	1.2	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	69.6	—	77.3	—	69.9
1st, 2nd, and additional cancers	—	69.5	—	77.3	—	69.7
1st cancer only	—	6.5	—	18.2	—	6.9

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Kaposi Sarcoma**  
**Both Sexes, Diagnosis Years 1980-2000**

**Table 12.3.4:** Risk of subsequent primary cancers after Kaposi sarcoma, both sexes, SEER 1980-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	260	9.60*	370	5.22*	73	1.95*	20	1.12	723	153.23	4.72*	231.23
All excluding same site	259	10.01*	366	5.28*	71	1.91*	20	1.12	716	150.12	4.77*	229.65
<b>Buccal cavity, pharynx</b>	0	0.00	3	1.38	0	0.00	0	0.00	3	4.52	0.66	-0.62
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.28
Tongue	0	0.00	2	4.34	0	0.00	0	0.00	2	0.95	2.10	0.43
Salivary gland	0	0.00	1	4.83	0	0.00	0	0.00	1	0.44	2.26	0.23
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.43
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.08
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.21
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.16
<b>Digestive system</b>	8	1.48	24	1.57*	14	1.68	7	1.78	53	32.91	1.61*	8.15
Esophagus	0	0.00	1	1.19	0	0.00	1	4.45	2	1.83	1.10	0.07
Stomach	2	3.32	2	1.22	1	1.14	1	2.46	6	3.53	1.70	1.00
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.22
Colon	1	0.43	7	1.04	4	1.06	2	1.12	14	14.60	0.96	-0.24
Rectum, rectosigmoid junction	1	1.07	1	0.39	3	2.23	2	3.24	7	5.46	1.28	0.62
Anus, anal canal	3	41.27*	6	34.68*	3	39.38*	1	31.97	13	0.35	36.81*	5.13
Liver	0	0.00	5	7.96*	2	5.91	0	0.00	7	1.36	5.16*	2.29
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.14
Bile ducts, other biliary	1	8.52	0	0.00	0	0.00	0	0.00	1	0.78	1.29	0.09
Pancreas	0	0.00	1	0.57	1	1.04	0	0.00	2	3.80	0.53	-0.73
<b>Respiratory system</b>	6	1.47	9	0.82	6	1.01	1	0.34	22	23.89	0.92	-0.77
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.11
Larynx	0	0.00	1	1.17	2	4.79	0	0.00	3	1.81	1.65	0.48
Lung, bronchus	6	1.65	7	0.71	4	0.73	1	0.37	18	21.71	0.83	-1.51
<b>Female breast</b>	1	1.31	2	0.82	0	0.00	0	0.00	3	4.98	0.60	-15.58
<b>Female genital system</b>	1	3.13	1	1.00	0	0.00	0	0.00	2	2.04	0.98	-0.29
Cervix uteri	1	28.35	1	9.74	0	0.00	0	0.00	2	0.20	9.95*	14.13
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.91	0.00	-7.17
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-5.06
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.36
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-1.30
<b>Male genital system</b>	6	1.06	16	0.95	10	0.99	4	0.77	36	37.71	0.95	-0.73
Prostate	4	0.82	15	0.96	9	0.92	4	0.78	32	35.38	0.90	-1.44
Testis	2	2.70	1	0.93	1	4.86	0	0.00	4	2.06	1.94	0.83
<b>Urinary system</b>	0	0.00	6	0.96	5	1.46	2	1.15	13	13.69	0.95	-0.28
Urinary bladder	0	0.00	6	1.41	4	1.65	0	0.00	10	9.47	1.06	0.22
Kidney parenchyma	0	0.00	0	0.00	1	1.22	2	5.23	3	3.50	0.86	-0.20
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.29
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.09
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	1	2.33	0	0.00	0	0.00	1	0.89	1.12	0.04
<b>Kaposi sarcoma</b>	1	0.83	4	2.50	2	7.56	0	0.00	7	3.11	2.25	1.58
<b>Melanoma of skin</b>	4	2.94	1	0.35	4	3.43	2	3.80	11	5.88	1.87	2.08
<b>Eye, orbit</b>	1	19.09	0	0.00	0	0.00	0	0.00	1	0.25	3.98	0.30
<b>Brain, central nervous system</b>	2	3.77	0	0.00	0	0.00	0	0.00	2	2.16	0.93	-0.06
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.13	0.00	-0.46
<b>Lymphatic, hematopoietic</b>	227	75.25*	297	43.11*	30	9.41*	4	2.74	558	14.55	38.35*	220.55
Hodgkin lymphoma	2	6.29	5	9.89*	2	14.80*	0	0.00	9	1.00	9.01*	3.25
Non-Hodgkin lymphoma	222	143.61*	287	84.87*	28	18.72*	2	2.99	539	7.09	75.99*	215.87
Myeloma	1	3.16	0	0.00	0	0.00	0	0.00	1	1.93	0.52	-0.38
Leukemia	2	2.39	5	2.36	0	0.00	2	3.92	9	4.53	1.99	1.81
Acute lymphocytic	0	0.00	1	9.96	0	0.00	0	0.00	1	0.20	4.95	0.32
Chronic lymphocytic	1	3.75	1	1.34	0	0.00	0	0.00	2	1.61	1.24	0.16
Acute non-lymphocytic	1	3.61	3	4.30	0	0.00	1	5.76	5	1.50	3.33*	1.42
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	13.70	1	0.71	1.40	0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,273 PYR and for male cancers on 23,367 PYR.

## Kaposi Sarcoma

### Both Sexes, <40 Years of Age, Diagnosis Years 1980-2000

**Table 12.3.5:** Risk of subsequent primary cancers after Kaposi sarcoma, both sexes, <40 years of age, SEER 1980-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	6,931		4,302		656		120		6,931			
<b>Person-years in interval</b>	4,581		6,856		1,508		317		13,262			
<b>All subsequent cancers</b>	144	32.99*	194	26.44*	24	11.41*	3	4.29	365	14.50	25.17*	264.28
All excluding same site	144	41.04*	191	30.91*	24	12.57*	3	4.45	362	12.27	29.50*	263.70
<b>Buccal cavity, pharynx</b>	0	0.00	1	3.79	0	0.00	0	0.00	1	0.53	1.88	0.35
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.06
Tongue	0	0.00	1	15.63	0	0.00	0	0.00	1	0.13	7.58	0.65
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.07
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.04
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
<b>Digestive system</b>	1	2.51	6	7.27*	1	3.16	0	0.00	8	1.67	4.80*	4.77
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.07
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.15
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Colon	0	0.00	2	7.14	0	0.00	0	0.00	2	0.56	3.56	1.08
Rectum, rectosigmoid junction	0	0.00	1	6.53	0	0.00	0	0.00	1	0.31	3.21	0.52
Anus, anal canal	1	53.48	2	50.87*	1	75.05	0	0.00	4	0.08	53.15*	2.96
Liver	0	0.00	1	19.02	0	0.00	0	0.00	1	0.11	8.87	0.67
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.03
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.12
<b>Respiratory system</b>	2	9.57*	3	6.61*	0	0.00	0	0.00	5	0.94	5.32*	3.06
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.03
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.09
Lung, bronchus	2	12.45*	2	5.54	0	0.00	0	0.00	4	0.75	5.33*	2.45
<b>Female breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-4.10
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-2.25
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-1.19
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	-0.29
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.61
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	-0.02
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	-0.07
<b>Male genital system</b>	2	3.40	1	1.10	0	0.00	0	0.00	3	1.86	1.61	0.86
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.19
Testis	2	3.50	1	1.21	0	0.00	0	0.00	3	1.59	1.89	1.07
<b>Urinary system</b>	0	0.00	0	0.00	0	0.00	1	15.27	1	0.85	1.18	0.11
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.34
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	33.72	1	0.38	2.67	0.47
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.18
<b>Kaposi sarcoma</b>	0	0.00	3	2.59	0	0.00	0	0.00	3	2.23	1.34	0.58
<b>Melanoma of skin</b>	2	4.01	1	1.16	0	0.00	0	0.00	3	1.68	1.79	1.00
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.03
<b>Brain, central nervous system</b>	1	4.85	0	0.00	0	0.00	0	0.00	1	0.64	1.57	0.27
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.34
<b>Lymphatic, hematopoietic</b>	136	149.35*	178	119.28*	23	59.53*	2	19.88*	339	2.89	117.31*	253.44
Hodgkin lymphoma	2	9.84*	1	3.45	0	0.00	0	0.00	3	0.56	5.32*	1.84
Non-Hodgkin lymphoma	134	256.67*	175	199.40*	23	99.50*	1	17.13	333	1.69	197.13*	249.82
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.08
Leukemia	0	0.00	2	7.26	0	0.00	1	44.47	3	0.54	5.59*	1.86
Acute lymphocytic	0	0.00	1	25.94	0	0.00	0	0.00	1	0.07	13.38	0.70
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Acute non-lymphocytic	0	0.00	1	9.90	0	0.00	1	135.18*	2	0.20	10.15*	1.36
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 115 PYR and for male cancers on 13,147 PYR.

**Table 12.3.6:** Risk of subsequent primary cancers after Kaposi sarcoma, both sexes, ≥40 years of age, SEER 1980-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	116	5.11*	176	2.77*	49	1.39*	17	0.99	358	138.73	2.58*	192.71
All excluding same site	115	5.14*	175	2.77*	47	1.33	17	0.99	354	137.85	2.57*	189.96
<b>Buccal cavity, pharynx</b>	0	0.00	2	1.05	0	0.00	0	0.00	2	3.99	0.50	-1.75
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.54
Tongue	0	0.00	1	2.52	0	0.00	0	0.00	1	0.82	1.22	0.16
Salivary gland	0	0.00	1	5.73	0	0.00	0	0.00	1	0.38	2.63	0.54
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.84
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.14
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.39
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.10
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.33
<b>Digestive system</b>	7	1.39	18	1.25	13	1.63	7	1.84	45	31.24	1.44*	12.09
Esophagus	0	0.00	1	1.26	0	0.00	1	4.67	2	1.73	1.16	0.24
Stomach	2	3.61	2	1.30	1	1.19	1	2.54	6	3.33	1.80	2.34
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.42
Colon	1	0.46	5	0.78	4	1.09	2	1.14	12	14.04	0.85	-1.79
Rectum, rectosigmoid junction	1	1.16	0	0.00	3	2.33	2	3.39	6	5.15	1.17	0.75
Anus, anal canal	2	37.04*	4	29.92*	2	31.81*	1	36.56	9	0.28	32.39*	7.67
Liver	0	0.00	4	6.95*	2	6.39	0	0.00	6	1.24	4.83*	4.18
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.30
Bile ducts, other biliary	1	9.21	0	0.00	0	0.00	0	0.00	1	0.74	1.35	0.23
Pancreas	0	0.00	1	0.60	1	1.07	0	0.00	2	3.63	0.55	-1.43
<b>Respiratory system</b>	4	1.04	6	0.57	6	1.04	1	0.35	17	22.95	0.74	-5.23
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.20
Larynx	0	0.00	1	1.25	2	5.10	0	0.00	3	1.70	1.77	1.15
Lung, bronchus	4	1.15	5	0.52	4	0.76	1	0.38	14	20.96	0.67	-6.12
<b>Female breast</b>	1	1.33	2	0.83	0	0.00	0	0.00	3	4.94	0.61	-16.72
<b>Female genital system</b>	1	3.20	1	1.01	0	0.00	0	0.00	2	2.01	0.99	-0.09
Cervix uteri	1	31.68	1	10.50	0	0.00	0	0.00	2	0.19	10.68*	15.65
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.91	0.00	-7.85
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-5.50
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.39
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-1.43
<b>Male genital system</b>	4	0.79	15	0.94	10	1.02	4	0.79	33	35.85	0.92	-2.78
Prostate	4	0.82	15	0.97	9	0.92	4	0.80	32	35.13	0.91	-3.06
Testis	0	0.00	0	0.00	1	23.70	0	0.00	1	0.47	2.15	0.52
<b>Urinary system</b>	0	0.00	6	1.03	5	1.53	1	0.60	12	12.84	0.93	-0.73
Urinary bladder	0	0.00	6	1.49	4	1.71	0	0.00	10	9.02	1.11	0.86
Kidney parenchyma	0	0.00	0	0.00	1	1.35	1	2.84	2	3.12	0.64	-0.99
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.61
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.20
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.12
<b>Soft tissue including heart</b>	0	0.00	1	3.30	0	0.00	0	0.00	1	0.65	1.54	0.31
<b>Kaposi sarcoma</b>	1	2.86	1	2.27	2	28.59*	0	0.00	4	0.88	4.55*	2.74
<b>Melanoma of skin</b>	2	2.32	0	0.00	4	4.34*	2	4.40	8	4.20	1.90	3.34
<b>Eye, orbit</b>	1	24.75	0	0.00	0	0.00	0	0.00	1	0.21	4.81	0.70
<b>Brain, central nervous system</b>	1	3.08	0	0.00	0	0.00	0	0.00	1	1.52	0.66	-0.46
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.60
<b>Lymphatic, hematopoietic</b>	91	43.21*	119	22.05*	7	2.50*	2	1.47	219	11.66	18.78*	182.22
Hodgkin lymphoma	0	0.00	4	18.53*	2	26.46*	0	0.00	6	0.43	13.81*	4.89
Non-Hodgkin lymphoma	88	85.95*	112	44.73*	5	3.95*	1	1.64	206	5.40	38.12*	176.29
Myeloma	1	3.39	0	0.00	0	0.00	0	0.00	1	1.83	0.55	-0.73
Leukemia	2	2.97	3	1.63	0	0.00	1	2.05	6	3.99	1.50	1.76
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.11
Chronic lymphocytic	1	3.95	1	1.40	0	0.00	0	0.00	2	1.55	1.29	0.39
Acute non-lymphocytic	1	4.66	2	3.36	0	0.00	0	0.00	3	1.31	2.30	1.49
Chronic myeloid	0	0.00	0	0.00	0	0.00	1	14.52	1	0.57	1.75	0.38

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,158 PYR and for male cancers on 10,220 PYR.





# Chapter 13

## New Malignancies Following Melanoma of the Skin, Eye Melanoma, and Non-melanoma Eye Cancer

D. Michal Freedman, Barry A. Miller, Margaret A. Tucker

### Synopsis

The risk of subsequent primary cancer was assessed in 66,059 patients with cutaneous melanoma and 4,393 patients with cancers of the eye diagnosed between 1973 and 2000. The overall risk of new malignancies was significantly elevated among survivors of cutaneous melanoma (O/E=1.24, O=7,260, EAR=27 per 10,000 person-years), but no overall increase in new malignancies was observed (O/E=1.00) when subsequent cutaneous melanomas were excluded. There were also elevated risks of new malignancies among survivors of ocular melanoma (O/E=1.16, O=436, EAR=24), other ocular cancers (excluding retinoblastoma) (O/E=1.35, O=87, EAR=51), and retinoblastoma (O/E=14.59, O=15, EAR=24). More than 20% of new malignancies after cutaneous melanoma were melanomas. The excess risk of subsequent primary breast and prostate cancers, the next most common subsequent tumors after cutaneous melanoma, may reflect higher socioeconomic status (SES), increased diagnostic surveillance, or shared risk factors, including endogenous hormones or genetic factors such as BRCA2. Also elevated were subsequent non-Hodgkin lymphoma and soft tissue sarcomas, which may reflect underlying immunological deficiencies. The lower risk associated with new tobacco-related cancers (e.g., lung and bronchus, larynx, gum and mouth, esophagus, pancreas, stomach, and cervix) may be due in part to lower smoking rates and other correlates of higher SES among melanoma survivors. The excess risk of cutaneous melanoma subsequent to ocular melanoma may reflect shared risk factors, such as light eye color, exposure to ultraviolet radiation, and susceptibility genes. The very high risk of new malignancies—particularly bone and soft tissue sarcomas—observed in children with retinoblastoma is consistent with the effects of genetic susceptibility combined with radiotherapy. Several subsequent cancer sites, including the salivary gland, lung, and kidney, had elevated risks following non-melanoma eye cancers (excluding retinoblastoma), and excesses of kidney cancer were

also seen after cutaneous and ocular melanomas; but the mechanisms for these associations are unclear.

### Cutaneous Malignant Melanoma

Although cutaneous malignant melanoma is a relatively uncommon tumor, representing 4% of all incident cancers and a little more than 1% of cancer deaths in the U.S. (Jemal et al, 2005), melanoma incidence rates have been increasing over time. Cutaneous melanoma occurs predominantly in the white population; it affects more women than men under age 40 years but more men than women at older ages. Relative survival rates are high, with 5- and 10-year rates of 90.5% and 87.5%, respectively. The primary treatment for melanoma is surgical excision, with only about 2% of patients receiving initial radiotherapy and 3% receiving chemotherapy.

The major environmental risk factor for cutaneous melanoma is ultraviolet radiation from sunlight exposure (Tucker and Goldstein, 2003). Host susceptibility factors include dysplastic nevi, increased numbers of nevi, freckling, a family history of melanoma, fair complexion, light eyes, blond or red hair, and immunosuppression. High socioeconomic status (SES) has also been associated with elevated melanoma rates (Harrison et al, 1998). Studies of melanoma risk in relation to anthropometric and hormonal/reproductive factors have reported inconsistent results.

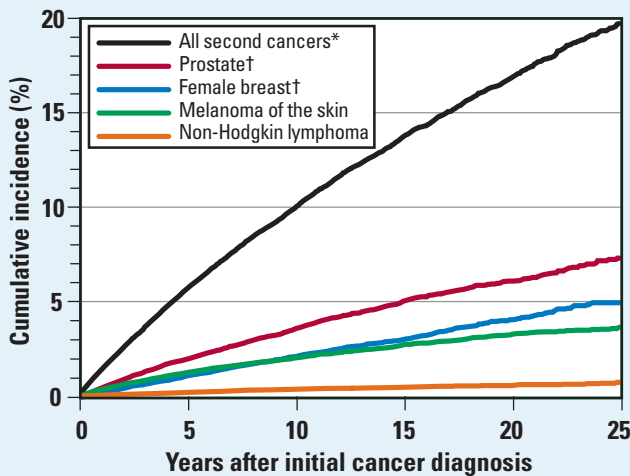
### Results and Discussion

The overall risk of subsequent primary cancers was increased by 24% among the 66,059 men and women who survived 2 months or more following a diagnosis of cutaneous melanoma (O/E=1.24, O=7,260, 95% CI=1.21-1.27, EAR=27 per 10,000 person-years), due primarily to excesses of subsequent primary melanoma (O/E=8.80). In analyses adjusted for the competing risk of death due to other causes, the cumulative incidence of developing a second cancer following cutaneous melanoma was 19.6% at 25 years (95% CI=19.0%-20.3%), which included a 3.7% incidence of second melanomas (Figure 13.1). When subsequent cutaneous melanomas were excluded, no overall increase in risk of new malignancies was observed

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).*

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**Figure 13.1:** Cumulative incidence of developing a second cancer among patients with melanoma of the skin, both sexes, SEER 1973-2000.



\* Cumulative incidence for all second cancers at 25 years is 22.2% for males and 16.9% for females.  
 † Prostate and female breast cancer curves are based on male and female melanoma patients, respectively.

(O/E=1.00). There was, however, a slight excess risk of cancers other than melanoma during the initial 5 years following diagnosis of melanoma. The risk of developing a new malignancy varied by age at diagnosis (Figure 13.2), but there were no substantial differences by gender or histologic type of melanoma. The risks were significantly increased for new malignancies of the salivary gland, small intestine, female breast, prostate, kidney, thyroid, and soft tissue, as well as for non-Hodgkin lymphoma (NHL). Deficits in risk were seen for subsequent cancers of the gum and mouth, esophagus, stomach, pancreas, larynx, lung, and cervix. Several of these findings have been reported in previous surveys of cancer risk following melanoma (Osterlind et al, 1985; Tucker et al, 1985a; Gutman et al, 1991; Swerdlow et al, 1995; Wassberg et al, 1996, 1999; Levi et al, 1997; Schmid-Wendtner et al, 2001; Crocetti and Carli, 2004), including several SEER surveys (Neugut and Santos, 1993; Goggins et al, 2001, 2004; Goggins and Tsao, 2003).

More than 20% of subsequent cancers in the current survey were cutaneous melanomas. The relative risk was similar in men and women (about 9-fold), although excess absolute risks of new melanomas were greater in men. Markedly higher relative risks (15-fold) of developing a subsequent melanoma were seen for those initially diagnosed at ages less than 30 years, while absolute risks were highest in those more than 50 years of age at first diagnosis.

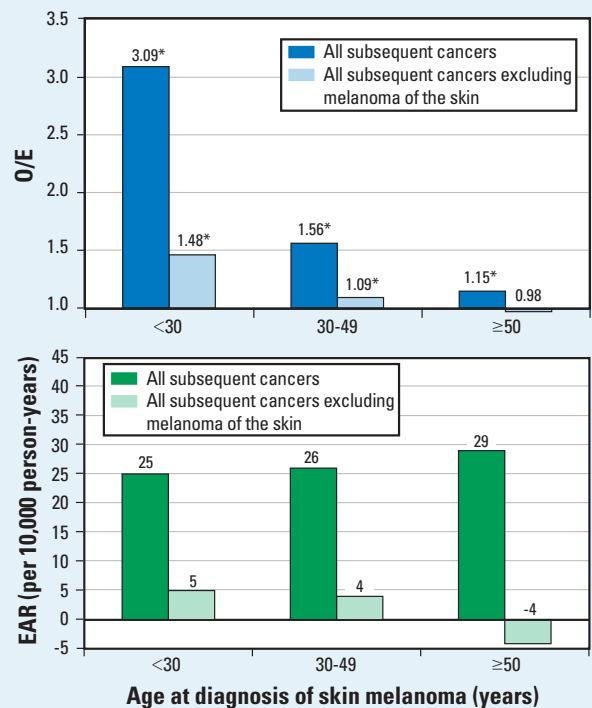
Subsequent breast and prostate cancers were the next most frequent cancers after an initial cutaneous melanoma. Although the risk of these tumors was fairly constant across most latency periods, there was some decline in prostate cancer risk among long-term survivors ( $\geq 10$  years), suggesting that early medical surveillance may have increased short-term risks by shortening the

lead time. The reciprocal increases in cutaneous melanoma risk were seen following primary prostate and breast cancers, suggesting that the tumors may share hormonal or genetic mechanisms such as BRCA2 mutations (Breast Cancer Linkage Consortium, 1999; Goggins et al, 2004). Although epidemiologic evidence of a hormonal role in melanoma is inconsistent (Tucker and Goldstein, 2003), the changing ratio of female to male incidence after menopause has suggested that endogenous estrogens may be involved as a promoting agent. It is also possible the relationships with breast and prostate cancer may partly reflect correlates of higher SES, including increased diagnostic surveillance.

The excess of subsequent NHL was most pronounced in the first year after initial diagnosis but remained non-significantly elevated among 20-year survivors. As reciprocal increases in subsequent primary cutaneous melanoma are seen after NHL (Travis et al, 1993; Goggins et al, 2001), there may be shared causal factors, especially immunologic defects, as suggested by the excess risks of both tumors in a variety of immunosuppressed populations (Greene et al, 1981; Curtis et al, 1997).

The risk of soft tissue sarcoma generally was increased over time, with somewhat higher risk among women. Although differentiating melanoma from soft tissue sarcoma may pose diagnostic difficulties, previous reports suggest that the association remains after careful histo-

**Figure 13.2:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after melanoma of the skin, both sexes, SEER 1973-2000.



Observed No.	215	91	1,462	957	5,583	4,633
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\*P <0.05.  
 Note: EAR = Excess number of subsequent cancers per 10,000 person-years.

logic review (Tucker et al, 1985a; Dunbar et al, 1994). Radiation does not appear to explain the increased risk of soft tissue sarcoma, because the excess was not seen among those receiving initial radiotherapy. Immunologic defects, which have been linked to soft tissue sarcoma (Zahm and Fraumeni, 1997), may contribute to the association with melanoma. Also noteworthy was the disproportionately high number of nerve sheath tumors among subsequent soft tissue sarcomas (13%), a finding that has been observed previously (Berking and Brady, 1997) and may reflect common embryological origins from the neural crest (Swerdlow et al, 1995; Wassberg et al, 1996) or genetic susceptibility (Randerson-Moor et al, 2001). The excess risk of small intestine tumors appeared to be partly due to the high percentage of soft tissue sarcomas (27%) in this diagnostic category.

The excess risks of kidney, salivary gland, and thyroid cancers were highest in the early years, at least partly due to increased medical surveillance and early cancer detection. However, the associations may provide clues to unrecognized risk factors, particularly for subsequent primary thyroid cancer, which remained elevated for 20 years.

The lower than expected risks associated with several tobacco-related cancers, such as those of the lung and bronchus, larynx, gum and mouth, esophagus, pancreas, stomach, and cervix, suggest lower smoking rates and other correlates of higher SES among melanoma survivors.

## Cancers of the Eye

Cancers of the eye include ocular melanomas (of the uveal tract, iris, ciliary body, and choroid) and other histologic types, particularly conjunctival squamous cell carcinomas and retinoblastomas. Together these eye cancers represent just 0.2% of all incident cancers in the U.S. and 0.04% of all cancer deaths (Jemal et al, 2005). In adults, ocular melanoma is the most common malignancy of the eye, and, after the skin, the eye is the predominant site for melanoma. Among children under age 15 years, most eye tumors are retinoblastomas. The 5-year (and 10-year) relative survival rates for cancers of the eye are about 78.7% (65.3%) for ocular melanoma, 81.4% (73.6%) for other eye cancers excluding retinoblastoma, and 97.3% (95.2%) for retinoblastoma. The most common treatments for cancers of the eye are surgical removal of the eye and irradiation. About one-fourth of SEER patients received initial radiotherapy, with or without surgery.

Both cutaneous and ocular melanomas derive from melanocytes, although risk factors for ocular melanomas are less well characterized (Vajdic et al, 2002; Hurst et al, 2003). Although sunlight appears to be a causal factor for some types of ocular melanoma (Tucker et al, 1985b; Vajdic et al, 2002), the geographic and temporal patterns of incidence differ from those of cutaneous melanomas. Nonetheless, ocular melanomas, like cutaneous melanomas, arise mainly in the white population and share host susceptibility factors, such as light eye and hair color. Occupational exposures to welding, possibly

due to artificial ultraviolet radiation, may also be etiologically relevant (Hurst et al, 2003). Genetic factors that increase susceptibility to ocular melanoma are not clearly defined (Vajdic et al, 2003).

The largest group of adult ocular cancers other than melanomas are squamous cell carcinomas of the conjunctiva, which may be due in part to ultraviolet-B (UVB) radiation exposure, as well as to infection by human papillomavirus (HPV) and human immunodeficiency virus (HIV) (Newton, 1996; Sun et al, 1997; Gillison and Shah, 2003). Approximately 30% to 40% of retinoblastomas, which are tumors of the retina occurring mainly in the first years of life, are hereditary and bilateral and involve germline mutations of the tumor suppressor gene RB1 (Friend et al, 1986).

## Results and Discussion

### Ocular Melanoma

A 16% elevated risk of subsequent primary cancers was observed among 3,217 2-month survivors of ocular melanoma (O/E=1.16, O=436, 95% CI=1.05-1.27, EAR=24). The cumulative incidence of developing a second cancer following ocular melanoma was 19.2% at 25 years (95% CI=17.2%-21.3%). The excess was primarily observed among women (O/E=1.26, O=190 for women versus O/E=1.09, O=246 for men), due partly to excesses in cutaneous melanoma and female genital tumors, especially nonsignificant increases in ovarian cancer. Risk was also higher among patients diagnosed under 50 years of age compared with older patients (O/E=1.72, O=57, EAR=32 versus O/E=1.11, O=379, EAR=21). Overall risk was highest in the first year following diagnosis (O/E=1.29), then declined over time (O/E=1.09 among 10-year survivors). Significantly elevated risks were observed for subsequent primary cancer of the kidney, soft tissue sarcoma, and cutaneous melanoma, as well as subsequent ocular melanoma.

The 4-fold increased risk of cutaneous melanoma following ocular melanoma is consistent with previous studies from Denmark (Swerdlow et al, 1995) and the SEER registries (Shors et al, 2002), and with shared host factors (light skin and eye color), UVB radiation exposure, and possibly susceptibility genes. The heightened risks of kidney cancer and soft tissue sarcoma resemble the patterns of risk following cutaneous melanoma, but the underlying mechanisms are obscure. However, in contrast to the reciprocal excess of cutaneous melanoma after kidney cancer and soft tissue sarcoma, no increase in ocular melanoma was seen after these tumors. Risks of these subsequent primary cancers did not show any particular temporal pattern and were not related to initial radiotherapy.

The excess of ovarian cancer, although nonsignificant, is interesting, because an elevated risk of ocular melanoma has been observed previously among ovarian cancer patients (Travis et al, 1996), suggesting that genetic and/or hormonal factors may be involved. Although the role of hormonal factors in ocular melanoma is limited



**Table 13.A:** Selected observed (O) subsequent primary cancers and observed-to-expected (O/E) ratios among children with retinoblastoma, by initial radiotherapy (1973-2000).

Subsequent primary cancer	O	O/E	95% Confidence interval
All subsequent cancers	15	14.59*	8.16-24.07
Radiotherapy	12	43.76*	22.59-76.45
No radiotherapy	3	3.98	0.80-11.63
Osteosarcoma	7	297.97*	119.37-613.95
Soft tissue sarcoma	3	40.75*	8.19-119.06
Acute lymphocytic leukemia	3	17.51*	3.52-51.17

Notes: Included in the total are 1 subsequent primary retinoblastoma and 1 pineoblastoma; expected values for osteosarcoma and soft tissue sarcomas were based on the International Classification of Childhood Cancer (ICCC) coding scheme (based on histology rather than site); osteosarcomas include 5 osteosarcomas of the bone, 1 osteosarcoma of the soft tissues, and 1 osteosarcoma of the eye; soft tissue sarcomas include 1 rhabdomyosarcoma, 1 liposarcoma of the soft tissues, and 1 neurofibrosarcoma of the nasal cavity.

\*P <0.05.

(Hartge et al, 1989), BRCA2 mutations have been described in family-based studies (Sinilnikova et al, 1999). However, the risk of breast cancer was not elevated in our survey of ocular melanoma.

### Non-melanoma Cancers of the Eye (Excluding Retinoblastoma)

The risk of subsequent primary cancers was elevated by 35% among 594 2-month survivors of cancers of the eye other than melanoma and retinoblastoma (O/E=1.35, O=87, 95% CI=1.08-1.66, EAR=51). The cumulative incidence of developing a second cancer following non-melanoma cancers of the eye (excluding retinoblastoma) was 15.6% at 15 years (95% CI=12.2%-19.4%). Subsequent primary cancer risk was highest in the 5 years following initial diagnosis and decreased thereafter almost to population levels. Excess risks were due entirely to new malignancies after squamous cell carcinoma of the eye (O/E=1.47). Significantly elevated risks were observed for new malignancies of the salivary gland, kidney, and lung.

Risks for subsequent lung and kidney cancers were increased primarily in the first 5 years following non-melanoma ocular cancer. There is no evidence that radiation played a role in subsequent salivary gland or kidney cancers, as excess risks were not seen in those receiving initial radiotherapy. In addition, the role of radiotherapy seemed limited in the subsequent lung cancers, because the early excess risk is inconsistent with the longer latency period expected for radiation-induced lung cancer. The increased risk of subsequent kidney cancers may be an incidental finding, because 2 out of 6 of these tumors were diagnosed at autopsy. It is also possible that smoking, which is a causal factor for lung and kidney cancers, and possibly for salivary gland cancer, may have played an etiologic role.

### Retinoblastoma

The risk of subsequent primary cancers was increased 15-fold among 582 children who were 2-month survivors of retinoblastoma (O/E=14.59, O=15, 95% CI=8.16-24.07, EAR=24) (Table 13.A). The cumulative incidence of developing a second cancer following retinoblastoma was 5.6% at 25 years (95% CI=2.9%-9.4%). Overall risks

were especially high in patients receiving initial radiotherapy (O/E=43.76, O=12), compared with nonirradiated children (O/E=3.98, O=3). In particular, elevated risks were seen for osteosarcomas, soft tissue sarcomas, and acute lymphocytic leukemia (Table 13.A). New malignancies also included a pineoblastoma, which occurred in an irradiated patient. Our findings are generally consistent with other surveys of second cancers following retinoblastoma (Draper et al, 1986; Eng et al, 1993; Moll et al, 1996; Wong et al, 1997; Kleinerman et al, 2005).

Previous studies have documented that hereditary retinoblastoma patients are prone to sarcomas and that high-dose radiotherapy further increases the risk (Tucker et al, 1987; Hawkins et al, 1996; Wong et al, 1997). In our survey, the excesses of soft tissue and bone cancers were limited to irradiated patients, with 9 of the 10 sarcomas occurring in the radiotherapy group. A high incidence of pineoblastoma, often referred to as trilateral retinoblastoma, has previously been reported for hereditary retinoblastoma (Moll et al, 1996; Wong et al, 1997). The excess of acute leukemia, based on 3 cases, has also been noted in other studies, although risk has not been quantified (Moll et al, 1997).

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**Table 13.1.1:** Characteristics of patients with an initial melanoma of the skin, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	34,949	100.0	31,110	100.0	66,059	100.0
<b>Initial treatment</b>						
Any radiation	948	2.7	452	1.5	1,400	2.1
With surgery	440	1.3	227	0.7	667	1.0
Without surgery	508	1.5	225	0.7	733	1.1
No radiation	34,001	97.3	30,658	98.5	64,659	97.9
With surgery	32,133	91.9	29,124	93.6	61,257	92.7
Without surgery	1,868	5.3	1,534	4.9	3,402	5.1
<b>Race</b>						
White	33,607	96.2	29,709	95.5	63,316	95.8
Black	164	0.5	204	0.7	368	0.6
Other	285	0.8	264	0.8	549	0.8
Unknown	893	2.6	933	3.0	1,826	2.8
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	2,271	6.5	3,696	11.9	5,967	9.0
30–49	11,233	32.1	12,112	38.9	23,345	35.3
50–69	14,291	40.9	9,555	30.7	23,846	36.1
70–79	5,050	14.4	3,454	11.1	8,504	12.9
≥ 80	2,104	6.0	2,293	7.4	4,397	6.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	31,047	88.8	28,624	92.0	59,671	90.3
1st and 2nd cancers	3,414	9.8	2,218	7.1	5,632	8.5
1st, 2nd, and 3rd cancers	426	1.2	244	0.8	670	1.0
1st, 2nd, 3rd, and additional cancers	62	0.2	24	0.1	86	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	55.6	—	49.5	—	52.9	—
Median year of 1st cancer diagnosis	1991.0	—	1990.3	—	1990.6	—
Median person-years at risk	5.3	—	6.6	—	5.8	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	96.7	—	97.4	—	97.0
1st, 2nd, and additional cancers	—	96.3	—	97.1	—	96.6
1st cancer only	—	2.7	—	2.2	—	2.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Melanoma of Skin Both Sexes

**Table 13.1.2:** Risk of subsequent primary cancers after melanoma of the skin, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	800	1.55*	2,571	1.32*	1,933	1.20*	1,956	1.09*	7,260	5,857.52	1.24*	27.30
All excluding same site	558	1.12*	2,001	1.06*	1,554	0.99	1,568	0.90*	5,681	5,678.02	1.00	0.06
<b>Buccal cavity, pharynx</b>	16	1.15	46	0.90	31	0.77	37	0.91	130	145.96	0.89	-0.31
Lip	8	3.61*	11	1.39	4	0.67	4	0.70	27	21.80	1.24	0.10
Tongue	1	0.35	8	0.76	7	0.83	7	0.80	23	30.60	0.75	-0.15
Salivary gland	2	1.57	10	2.11*	4	1.04	8	1.89	24	14.10	1.70*	0.19
Mouth	2	0.56	10	0.76	5	0.48	9	0.86	26	37.62	0.69	-0.23
Nasopharynx	2	4.05	0	0.00	3	2.17	0	0.00	5	5.04	0.99	0.00
Tonsil	0	0.00	4	0.80	4	1.02	6	1.52	14	14.22	0.98	0.00
Oropharynx	0	0.00	2	1.42	1	0.90	1	0.90	4	4.01	1.00	0.00
Hypopharynx	1	0.76	1	0.21	3	0.80	2	0.55	7	13.56	0.52	-0.13
<b>Digestive system</b>	97	0.91	401	1.02	294	0.91	274	0.78*	1,066	1,173.64	0.91*	-2.10
Esophagus	2	0.38	12	0.61	9	0.56	8	0.45*	31	58.44	0.53*	-0.53
Stomach	9	0.88	32	0.86	23	0.79	20	0.66	84	107.01	0.78*	-0.45
Small intestine	1	0.64	15	2.53*	7	1.40	7	1.21	30	18.27	1.64*	0.23
Colon	41	0.85	188	1.05	154	1.05	145	0.89	528	536.67	0.98	-0.17
Rectum, rectosigmoid junction	24	1.25	73	1.03	46	0.81	37	0.62*	180	206.88	0.87	-0.52
Anus, anal canal	1	0.91	9	2.15	4	1.13	4	0.98	18	12.91	1.39	0.10
Liver	3	0.88	12	0.94	6	0.57	5	0.41*	26	38.95	0.67*	-0.25
Gallbladder	2	1.46	4	0.79	3	0.73	4	0.89	13	14.99	0.87	-0.04
Bile ducts, other biliary	4	1.73	11	1.27	7	0.96	9	1.05	31	26.81	1.16	0.08
Pancreas	9	0.72	40	0.86	32	0.84	33	0.77	114	140.00	0.81*	-0.51
<b>Respiratory system</b>	62	0.72*	255	0.79*	205	0.77*	225	0.77*	747	964.43	0.77*	-4.23
Nose, nasal cavity, ear	0	0.00	2	0.70	3	1.30	4	1.62	9	8.41	1.07	0.01
Larynx	5	0.82	12	0.54*	8	0.46*	7	0.41*	32	62.85	0.51*	-0.60
Lung, bronchus	57	0.72*	240	0.81*	193	0.79*	212	0.78*	702	890.68	0.79*	-3.67
<b>Female breast</b>	57	1.04	246	1.14	214	1.10	248	1.06	765	699.65	1.09*	2.50
<b>Female genital system</b>	27	1.10	84	0.88	76	0.94	73	0.78*	260	294.36	0.88*	-1.31
Cervix uteri	2	0.57	8	0.60	3	0.29*	3	0.31*	16	37.02	0.43*	-0.80
Corpus uteri	18	1.52	40	0.87	43	1.09	35	0.74	136	144.49	0.94	-0.32
Ovary	5	0.69	30	1.05	24	0.96	32	1.09	91	89.97	1.01	0.04
Vagina	0	0.00	0	0.00	1	0.95	1	0.82	2	3.83	0.52	-0.07
Vulva	1	0.97	4	1.00	3	0.85	1	0.23	9	12.90	0.70	-0.15
<b>Male genital system</b>	131	1.30*	480	1.27*	370	1.18*	348	1.01	1,329	1,137.17	1.17*	7.62
Prostate	126	1.27*	472	1.27*	363	1.18*	345	1.01	1,306	1,118.90	1.17*	7.43
Testis	4	2.92	5	1.07	4	1.30	1	0.47	14	11.25	1.24	0.11
<b>Urinary system</b>	55	1.31	168	1.07	123	0.96	134	0.95	480	468.43	1.02	0.23
Urinary bladder	30	1.03	107	0.99	82	0.93	85	0.88	304	322.01	0.94	-0.35
Kidney parenchyma	22	2.10*	54	1.36*	37	1.12	41	1.11	154	119.79	1.29*	0.67
Renal pelvis, other urinary	3	1.22	7	0.77	4	0.55	8	1.02	22	26.63	0.83	-0.09
Ureter	0	0.00	0	0.00	1	0.42	2	0.79	3	8.75	0.34	-0.11
<b>Bone, joints</b>	0	0.00	2	0.97	0	0.00	3	1.83	5	5.88	0.85	-0.02
<b>Soft tissue including heart</b>	3	1.34	22	2.65*	10	1.48	19	2.57*	54	24.66	2.19*	0.57
<b>Kaposi sarcoma</b>	2	1.29	9	1.60	6	1.43	1	0.32	18	14.50	1.24	0.07
<b>Melanoma of skin</b>	242	15.41*	570	9.55*	379	7.65*	388	7.12*	1,579	179.50	8.80*	27.24
<b>Eye, orbit</b>	0	0.00	4	1.26	4	1.58	8	2.97*	16	9.25	1.73	0.13
<b>Brain, central nervous system</b>	5	0.81	27	1.18	22	1.19	17	0.88	71	66.90	1.06	0.08
<b>Thyroid</b>	20	4.70*	32	2.00*	21	1.64*	20	1.52	93	46.19	2.01*	0.91
<b>Lymphatic, hematopoietic</b>	65	1.63*	168	1.13	127	1.03	126	0.92	486	448.14	1.08	0.74
Hodgkin lymphoma	4	2.06	6	0.87	2	0.40	5	1.12	17	18.29	0.93	-0.03
Non-Hodgkin lymphoma	39	2.13*	84	1.21	75	1.28*	69	1.03	267	213.13	1.25*	1.05
Myeloma	5	0.84	27	1.21	11	0.59	15	0.72	58	67.74	0.86	-0.19
Leukemia	17	1.25	51	1.02	39	0.96	37	0.83	144	148.98	0.97	-0.10
Acute lymphocytic	1	2.19	1	0.60	5	3.77*	0	0.00	7	4.78	1.46	0.04
Chronic lymphocytic	11	2.07*	24	1.22	17	1.06	15	0.86	67	58.57	1.14	0.16
Acute non-lymphocytic	3	0.66	15	0.89	7	0.51	17	1.10	42	50.69	0.83	-0.17
Chronic myeloid	2	1.07	3	0.43	5	0.89	2	0.33	12	20.52	0.58	-0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 261,817 PYR and for male cancers on 251,895 PYR.

## Melanoma of Skin Both Sexes, Long-term Follow-up

**Table 13.1.3:** Risk of subsequent primary cancers after melanoma of the skin, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	5,304	1.30*	1,145	1.13*	561	1.03	250	1.07	7,260	5,857.52	1.24*	27.30
All excluding same site	4,113	1.04*	903	0.92*	458	0.87*	207	0.92	5,681	5,678.02	1.00	0.06
<b>Buccal cavity, pharynx</b>	93	0.88	18	0.76	12	0.99	7	1.42	130	145.96	0.89	-0.31
Lip	23	1.43	2	0.59	2	1.20	0	0.00	27	21.80	1.24	0.10
Tongue	16	0.73	4	0.79	1	0.38	2	1.84	23	30.60	0.75	-0.15
Salivary gland	16	1.62	3	1.25	4	3.14	1	1.80	24	14.10	1.70*	0.19
Mouth	17	0.63	3	0.49	3	0.96	3	2.35	26	37.62	0.69	-0.23
Nasopharynx	5	1.37	0	0.00	0	0.00	0	0.00	5	5.04	0.99	0.00
Tonsil	8	0.78	5	2.16	0	0.00	1	2.17	14	14.22	0.98	0.00
Oropharynx	3	1.04	0	0.00	1	3.03	0	0.00	4	4.01	1.00	0.00
Hypopharynx	5	0.50	1	0.46	1	0.94	0	0.00	7	13.56	0.52	-0.13
<b>Digestive system</b>	792	0.96	162	0.81*	76	0.71*	36	0.77	1,066	1,173.64	0.91*	-2.10
Esophagus	23	0.56*	3	0.30*	4	0.75	1	0.43	31	58.44	0.53*	-0.53
Stomach	64	0.84	12	0.69	5	0.55	3	0.78	84	107.01	0.78*	-0.45
Small intestine	23	1.84*	4	1.24	2	1.13	1	1.25	30	18.27	1.64*	0.23
Colon	383	1.02	86	0.94	41	0.84	18	0.83	528	536.67	0.98	-0.17
Rectum, rectosigmoid junction	143	0.97	19	0.55*	11	0.61	7	0.91	180	206.88	0.87	-0.52
Anus, anal canal	14	1.58	2	0.88	1	0.80	1	1.84	18	12.91	1.39	0.10
Liver	21	0.78	3	0.45	1	0.27	1	0.58	26	38.95	0.67*	-0.25
Gallbladder	9	0.86	3	1.19	0	0.00	1	1.68	13	14.99	0.87	-0.04
Bile ducts, other biliary	22	1.21	8	1.70	1	0.38	0	0.00	31	26.81	1.16	0.08
Pancreas	81	0.83	21	0.88	9	0.69	3	0.52	114	140.00	0.81*	-0.51
<b>Respiratory system</b>	522	0.77*	127	0.77*	69	0.78*	29	0.76	747	964.43	0.77*	-4.23
Nose, nasal cavity, ear	5	0.84	2	1.42	1	1.35	1	3.14	9	8.41	1.07	0.01
Larynx	25	0.55*	5	0.49	2	0.40	0	0.00	32	62.85	0.51*	-0.60
Lung, bronchus	490	0.79*	119	0.78*	65	0.79	28	0.78	702	890.68	0.79*	-3.67
<b>Female breast</b>	517	1.11*	129	0.99	88	1.21	31	0.98	765	699.65	1.09*	2.50
<b>Female genital system</b>	187	0.93	40	0.76	21	0.73	12	0.97	260	294.36	0.88*	-1.31
Cervix uteri	13	0.48*	3	0.50	0	0.00	0	0.00	16	37.02	0.43*	-0.80
Corpus uteri	101	1.04	15	0.58*	13	0.89	7	1.10	136	144.49	0.94	-0.32
Ovary	59	0.97	20	1.23	8	0.88	4	1.03	91	89.97	1.01	0.04
Vagina	1	0.38	1	1.48	0	0.00	0	0.00	2	3.83	0.52	-0.07
Vulva	8	0.93	1	0.43	0	0.00	0	0.00	9	12.90	0.70	-0.15
<b>Male genital system</b>	981	1.24*	208	1.06	95	0.91	45	1.05	1,329	1,137.17	1.17*	7.62
Prostate	961	1.23*	206	1.06	94	0.91	45	1.06	1,306	1,118.90	1.17*	7.43
Testis	13	1.42	0	0.00	1	1.87	0	0.00	14	11.25	1.24	0.11
<b>Urinary system</b>	346	1.06	85	1.06	33	0.78	16	0.86	480	468.43	1.02	0.23
Urinary bladder	219	0.97	55	1.01	19	0.66	11	0.86	304	322.01	0.94	-0.35
Kidney parenchyma	113	1.36*	24	1.16	12	1.07	5	1.03	154	119.79	1.29*	0.67
Renal pelvis, other urinary	14	0.74	6	1.35	2	0.85	0	0.00	22	26.63	0.83	-0.09
Ureter	1	0.16*	1	0.69	1	1.32	0	0.00	3	8.75	0.34	-0.11
<b>Bone, joints</b>	2	0.47	2	2.12	0	0.00	1	4.89	5	5.88	0.85	-0.02
<b>Soft tissue including heart</b>	35	2.03*	8	1.92	7	3.13*	4	4.13*	54	24.66	2.19*	0.57
<b>Kaposi sarcoma</b>	17	1.49	0	0.00	1	1.30	0	0.00	18	14.50	1.24	0.07
<b>Melanoma of skin</b>	1,191	9.53*	242	7.83*	103	6.25*	43	6.00*	1,579	179.50	8.80*	27.24
<b>Eye, orbit</b>	8	1.22	5	3.25*	2	2.47	1	2.92	16	9.25	1.73	0.13
<b>Brain, central nervous system</b>	54	1.13	10	0.90	6	1.04	1	0.42	71	66.90	1.06	0.08
<b>Thyroid</b>	73	2.21*	13	1.70	6	1.54	1	0.64	93	46.19	2.01*	0.91
<b>Lymphatic, hematopoietic</b>	360	1.16*	75	0.97	31	0.75	20	1.10	486	448.14	1.08	0.74
Hodgkin lymphoma	12	0.87	4	1.48	1	0.78	0	0.00	17	18.29	0.93	-0.03
Non-Hodgkin lymphoma	198	1.35*	37	0.99	18	0.88	14	1.55	267	213.13	1.25*	1.05
Myeloma	43	0.92	10	0.85	5	0.78	0	0.00	58	67.74	0.86	-0.19
Leukemia	107	1.02	24	0.95	7	0.52	6	1.03	144	148.98	0.97	-0.10
Acute lymphocytic	7	2.02	0	0.00	0	0.00	0	0.00	7	4.78	1.46	0.04
Chronic lymphocytic	52	1.26	10	1.01	2	0.38	3	1.34	67	58.57	1.14	0.16
Acute non-lymphocytic	25	0.71	10	1.16	4	0.86	3	1.44	42	50.69	0.83	-0.17
Chronic myeloid	10	0.69	2	0.58	0	0.00	0	0.00	12	20.52	0.58	-0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 261,817 PYR and for male cancers on 251,895 PYR.

# Melanoma of Skin

## Females

**Table 13.1.4:** Risk of subsequent primary cancers after melanoma of the skin, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	279	1.56*	933	1.33*	722	1.17*	855	1.14*	2,789	2,246.66	1.24*	20.71
All excluding same site	192	1.11	710	1.05	595	0.99	699	0.96	2,196	2,182.33	1.01	0.52
<b>Buccal cavity, pharynx</b>	2	0.63	14	1.14	8	0.75	12	0.96	36	38.69	0.93	-0.10
Lip	1	4.72	1	1.23	1	1.40	1	1.14	4	2.62	1.53	0.05
Tongue	0	0.00	3	1.09	3	1.24	3	1.05	9	8.74	1.03	0.01
Salivary gland	0	0.00	5	3.31*	0	0.00	2	1.30	7	4.73	1.48	0.09
Mouth	0	0.00	4	0.96	1	0.28	5	1.19	10	13.00	0.77	-0.11
Nasopharynx	1	8.38	0	0.00	1	2.55	0	0.00	2	1.42	1.40	0.02
Tonsil	0	0.00	1	0.91	0	0.00	1	0.95	2	3.39	0.59	-0.05
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.95	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	2	2.86	0	0.00	2	2.51	0.80	-0.02
<b>Digestive system</b>	42	1.16	137	0.98	99	0.82*	124	0.84	402	444.96	0.90*	-1.64
Esophagus	0	0.00	0	0.00*	1	0.31	2	0.49	3	11.98	0.25*	-0.34
Stomach	1	0.37	7	0.70	8	0.95	5	0.51	21	30.98	0.68	-0.38
Small intestine	1	1.85	5	2.35	2	1.04	2	0.79	10	7.13	1.40	0.11
Colon	22	1.21	73	1.04	52	0.86	68	0.92	215	222.41	0.97	-0.28
Rectum, rectosigmoid junction	9	1.50	23	1.00	18	0.91	16	0.69	66	71.95	0.92	-0.23
Rectum	7	1.78	15	0.99	14	1.08	10	0.65	46	47.50	0.97	-0.06
Anus, anal canal	1	1.83	4	1.85	2	1.03	3	1.25	10	7.04	1.42	0.11
Liver	2	2.79	2	0.72	2	0.81	1	0.31	7	9.23	0.76	-0.09
Gallbladder	0	0.00	3	0.98	1	0.39	2	0.68	6	9.43	0.64	-0.13
Bile ducts, other biliary	2	2.53	2	0.66	1	0.37	5	1.40	10	10.13	0.99	-0.01
Pancreas	3	0.65	15	0.84	10	0.64	18	0.92	46	57.80	0.80	-0.45
<b>Respiratory system</b>	21	0.97	79	0.91	79	0.98	94	0.89	273	295.58	0.92	-0.86
Nose, nasal cavity, ear	0	0.00	1	1.09	2	2.49	3	3.14	6	2.91	2.06	0.12
Larynx	0	0.00	2	0.68	3	1.15	2	0.65	7	9.36	0.75	-0.09
Lung, bronchus	21	1.02	76	0.91	73	0.95	88	0.87	258	282.53	0.91	-0.94
<b>Female breast</b>	57	1.04	246	1.14	214	1.10	248	1.06	765	699.65	1.09*	2.50
<b>Female genital system</b>	27	1.10	84	0.88	76	0.94	73	0.78*	260	294.36	0.88*	-1.31
Cervix uteri	2	0.57	8	0.60	3	0.29*	3	0.31*	16	37.02	0.43*	-0.80
Corpus uteri	18	1.52	40	0.87	43	1.09	35	0.74	136	144.49	0.94	-0.32
Ovary	5	0.69	30	1.05	24	0.96	32	1.09	91	89.97	1.01	0.04
Vagina	0	0.00	0	0.00	1	0.95	1	0.82	2	3.83	0.52	-0.07
Vulva	1	0.97	4	1.00	3	0.85	1	0.23	9	12.90	0.70	-0.15
<b>Urinary system</b>	9	1.13	38	1.22	30	1.08	32	0.91	109	102.17	1.07	0.26
Urinary bladder	4	0.86	17	0.94	17	1.06	16	0.79	54	59.03	0.91	-0.19
Kidney parenchyma	4	1.50	20	1.88*	12	1.24	15	1.20	51	35.48	1.44*	0.59
Renal pelvis, other urinary	1	1.62	1	0.42	1	0.48	1	0.39	4	7.66	0.52	-0.14
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	2.31	0.00	-0.09
<b>Bone, joints</b>	0	0.00	1	1.24	0	0.00	0	0.00	1	2.43	0.41	-0.05
<b>Soft tissue including heart</b>	1	1.29	11	3.67*	6	2.32	9	2.92*	27	9.44	2.86*	0.67
<b>Kaposi sarcoma</b>	0	0.00	1	4.38	0	0.00	0	0.00	1	0.70	1.42	0.01
<b>Melanoma of skin</b>	87	16.55*	223	10.81*	127	7.09*	156	7.60*	593	64.33	9.22*	20.19
<b>Eye, orbit</b>	0	0.00	2	1.78	3	3.14	6	5.39*	11	3.48	3.16*	0.29
<b>Brain, central nervous system</b>	2	0.96	9	1.10	5	0.71	7	0.86	23	25.44	0.90	-0.09
<b>Thyroid</b>	10	3.66*	16	1.53	13	1.51	15	1.66	54	30.87	1.75*	0.88
<b>Lymphatic, hematopoietic</b>	18	1.36	57	1.10	47	1.03	64	1.14	186	166.66	1.12	0.74
Hodgkin lymphoma	2	2.70	3	1.11	1	0.49	3	1.56	9	7.39	1.22	0.06
Non-Hodgkin lymphoma	6	0.94	30	1.19	30	1.32	39	1.34	105	83.56	1.26*	0.82
Myeloma	2	1.02	6	0.78	3	0.44	6	0.70	17	25.02	0.68	-0.31
Leukemia	8	1.93	18	1.13	13	0.94	16	0.96	55	50.68	1.09	0.16
Acute lymphocytic	1	6.33	1	1.66	3	5.90*	0	0.00	5	1.84	2.72	0.12
Chronic lymphocytic	4	2.63	8	1.36	5	0.97	4	0.64	21	18.82	1.12	0.08
Acute non-lymphocytic	2	1.34	4	0.69	2	0.40	10	1.63	18	18.43	0.98	-0.02
Chronic myeloid	1	1.68	1	0.44	1	0.51	1	0.43	4	7.17	0.56	-0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 13.1.5:** Risk of subsequent primary cancers after melanoma of the skin, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	521	1.54*	1,638	1.32*	1,211	1.22*	1,101	1.06	4,471	3,610.86	1.24*	34.15
All excluding same site	366	1.12*	1,291	1.07*	959	1.00	869	0.87*	3,485	3,495.69	1.00	-0.42
<b>Buccal cavity, pharynx</b>	14	1.30	32	0.83	23	0.78	25	0.89	94	107.28	0.88	-0.53
Lip	7	3.49*	10	1.41	3	0.57	3	0.62	23	19.18	1.20	0.15
Tongue	1	0.47	5	0.64	4	0.66	4	0.67	14	21.86	0.64	-0.31
Salivary gland	2	2.27	5	1.55	4	1.56	6	2.22	17	9.37	1.81*	0.30
Mouth	2	0.80	6	0.67	4	0.59	4	0.63	16	24.62	0.65	-0.34
Nasopharynx	1	2.67	0	0.00	2	2.03	0	0.00	3	3.61	0.83	-0.02
Tonsil	0	0.00	3	0.77	4	1.34	5	1.73	12	10.84	1.11	0.05
Oropharynx	0	0.00	2	1.82	1	1.18	1	1.23	4	3.07	1.30	0.04
Hypopharynx	1	0.90	1	0.25	1	0.33	2	0.70	5	11.05	0.45	-0.24
<b>Digestive system</b>	55	0.79	264	1.04	195	0.98	150	0.73*	664	728.68	0.91*	-2.57
Esophagus	2	0.46	12	0.76	8	0.63	6	0.44*	28	46.46	0.60*	-0.73
Stomach	8	1.06	25	0.92	15	0.72	15	0.73	63	76.03	0.83	-0.52
Small intestine	0	0.00	10	2.63*	5	1.64	5	1.54	20	11.13	1.80*	0.35
Colon	19	0.63*	115	1.05	102	1.18	77	0.87	313	314.27	1.00	-0.05
Rectum, rectosigmoid junction	15	1.14	50	1.05	28	0.75	21	0.57*	114	134.93	0.84	-0.83
Anus, anal canal	0	0.00	5	2.45	2	1.24	1	0.60	8	5.86	1.36	0.08
Liver	1	0.37	10	1.00	4	0.49	4	0.45	19	29.72	0.64*	-0.43
Gallbladder	2	3.63	1	0.51	2	1.32	2	1.30	7	5.56	1.26	0.06
Bile ducts, other biliary	2	1.31	9	1.61	6	1.32	4	0.80	21	16.68	1.26	0.17
Pancreas	6	0.76	25	0.87	22	0.98	15	0.65	68	82.20	0.83	-0.56
<b>Respiratory system</b>	41	0.64*	176	0.75*	126	0.68*	131	0.71*	474	668.85	0.71*	-7.74
Nose, nasal cavity, ear	0	0.00	1	0.51	1	0.66	1	0.66	3	5.49	0.55	-0.10
Larynx	5	0.94	10	0.52*	5	0.34*	5	0.36*	25	53.49	0.47*	-1.13
Lung, bronchus	36	0.62*	164	0.77*	120	0.72*	124	0.73*	444	608.16	0.73*	-6.52
<b>Male breast</b>	2	3.08	3	1.26	3	1.58	1	0.50	9	6.94	1.30	0.08
<b>Male genital system</b>	131	1.30*	480	1.27*	370	1.18*	348	1.01	1,329	1,137.17	1.17*	7.62
Prostate	126	1.27*	472	1.27*	363	1.18*	345	1.01	1,306	1,118.90	1.17*	7.43
Testis	4	2.92	5	1.07	4	1.30	1	0.47	14	11.25	1.24	0.11
<b>Urinary system</b>	46	1.35	130	1.03	93	0.92	102	0.96	371	366.26	1.01	0.19
Urinary bladder	26	1.06	90	1.00	65	0.90	69	0.90	250	262.98	0.95	-0.52
Kidney parenchyma	18	2.30*	34	1.17	25	1.08	26	1.07	103	84.31	1.22	0.74
Renal pelvis, other urinary	2	1.08	6	0.90	3	0.58	7	1.33	18	18.97	0.95	-0.04
Ureter	0	0.00	0	0.00	1	0.56	2	1.12	3	6.44	0.47	-0.14
<b>Bone, joints</b>	0	0.00	1	0.79	0	0.00	3	3.37	4	3.44	1.16	0.02
<b>Soft tissue including heart</b>	2	1.37	11	2.07*	4	0.96	10	2.33*	27	15.21	1.77*	0.47
<b>Kaposi sarcoma</b>	2	1.34	8	1.48	6	1.50	1	0.35	17	13.79	1.23	0.13
<b>Melanoma of skin</b>	155	14.84*	347	8.88*	252	7.96*	232	6.82*	986	115.17	8.56*	34.57
<b>Eye, orbit</b>	0	0.00	2	0.98	1	0.63	2	1.26	5	5.77	0.87	-0.03
<b>Brain, central nervous system</b>	3	0.74	18	1.22	17	1.49	10	0.90	48	41.45	1.16	0.26
<b>Thyroid</b>	10	6.57*	16	2.90*	8	1.90	5	1.23	39	15.33	2.54*	0.94
<b>Lymphatic, hematopoietic</b>	47	1.77*	111	1.14	80	1.03	62	0.77*	300	281.49	1.07	0.73
Hodgkin lymphoma	2	1.66	3	0.72	1	0.34	2	0.78	8	10.90	0.73	-0.12
Non-Hodgkin lymphoma	33	2.77*	54	1.22	45	1.26	30	0.80	162	129.57	1.25*	1.29
Myeloma	3	0.75	21	1.44	8	0.68	9	0.73	41	42.72	0.96	-0.07
Leukemia	9	0.96	33	0.96	26	0.96	21	0.76	89	98.30	0.91	-0.37
Acute lymphocytic	0	0.00	0	0.00	2	2.44	0	0.00	2	2.95	0.68	-0.04
Chronic lymphocytic	7	1.84	16	1.16	12	1.10	11	0.99	46	39.75	1.16	0.25
Acute non-lymphocytic	1	0.33	11	0.99	5	0.57	7	0.76	24	32.26	0.74	-0.33
Chronic myeloid	1	0.78	2	0.43	4	1.10	1	0.26	8	13.35	0.60	-0.21

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Melanoma of Skin Both Sexes, <30 Years of Age

**Table 13.1.6:** Risk of subsequent primary cancers after melanoma of the skin, both sexes, <30 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	20	8.46*	54	4.59*	41	2.63*	100	2.50*	215	69.66	3.09*	24.74
All excluding same site	4	1.98	17	1.70	14	1.04	56	1.55*	91	61.63	1.48*	5.00
<b>Buccal cavity, pharynx</b>	1	24.12	0	0.00	1	3.72	4	4.41*	6	1.42	4.23*	0.78
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.03
Tongue	0	0.00	0	0.00	1	15.39	2	8.33	3	0.36	8.43*	0.45
Salivary gland	1	67.13	0	0.00	0	0.00	0	0.00	1	0.29	3.39	0.12
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.05
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.02
Tonsil	0	0.00	0	0.00	0	0.00	2	14.64*	2	0.16	12.45*	0.31
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	0.00
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
<b>Digestive system</b>	0	0.00	1	1.90	2	2.27	7	1.90	10	5.19	1.93	0.82
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.03
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.08
Small intestine	0	0.00	0	0.00	2	58.59*	2	16.59*	4	0.18	22.22*	0.65
Colon	0	0.00	0	0.00	0	0.00	2	1.48	2	1.96	1.02	0.01
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	1.24	1	1.10	0.91	-0.02
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.04
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.04
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.02
Pancreas	0	0.00	1	27.97	0	0.00	2	5.45	3	0.48	6.29*	0.43
<b>Respiratory system</b>	0	0.00	1	4.86	0	0.00	2	0.81	3	3.13	0.96	-0.02
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.02
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.05
Lung, bronchus	0	0.00	1	7.11	0	0.00	2	0.93	3	2.65	1.13	0.06
<b>Female breast</b>	0	0.00	1	0.70	3	0.95	15	1.23	19	16.98	1.12	0.55
<b>Female genital system</b>	1	3.09	5	2.96	2	0.90	8	1.64	16	9.12	1.75*	1.86
Cervix uteri	0	0.00	2	2.09	0	0.00	1	0.60	3	3.95	0.76	-0.26
Corpus uteri	0	0.00	0	0.00	1	3.44	2	1.46	3	1.82	1.65	0.32
Ovary	0	0.00	3	6.01*	1	1.56	4	2.55	8	2.81	2.84*	1.40
Vagina	0	0.00	0	0.00	0	0.00	1	24.93	1	0.07	13.95	0.25
Vulva	1	150.16*	0	0.00	0	0.00	0	0.00	1	0.28	3.61	0.20
<b>Male genital system</b>	1	4.91	1	1.14	2	2.42	2	1.22	6	3.54	1.69	1.13
Prostate	0	0.00	0	0.00	0	0.00	2	2.44	2	0.83	2.41	0.54
Testis	1	4.95	1	1.15	2	2.46	0	0.00	4	2.68	1.49	0.61
<b>Urinary system</b>	0	0.00	0	0.00	1	2.54	4	2.49	5	2.29	2.19	0.46
Urinary bladder	0	0.00	0	0.00	1	4.92	3	3.82	4	1.15	3.48	0.49
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	1.29	1	1.07	0.94	-0.01
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.01
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.07
<b>Soft tissue including heart</b>	0	0.00	1	4.57	0	0.00	0	0.00	1	0.84	1.19	0.03
<b>Kaposi sarcoma</b>	0	0.00	2	4.10	2	2.64	0	0.00	4	2.26	1.77	0.30
<b>Melanoma of skin</b>	16	45.99*	37	21.42*	27	12.70*	44	11.48*	124	8.03	15.44*	19.74
<b>Eye, orbit</b>	0	0.00	1	25.62	0	0.00	1	11.21	2	0.18	11.12*	0.31
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.20	0.00	-0.37
<b>Thyroid</b>	1	3.57	2	1.57	0	0.00	4	2.00	7	4.90	1.43	0.36
<b>Lymphatic, hematopoietic</b>	0	0.00	2	0.99	1	0.49	9	2.45*	12	8.21	1.46	0.64
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	1.61	1	2.50	0.40	-0.25
Non-Hodgkin lymphoma	0	0.00	1	1.54	0	0.00	4	2.01	5	3.64	1.37	0.23
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.04
Leukemia	0	0.00	1	2.36	1	2.28	4	4.69*	6	1.82	3.30*	0.71
Acute lymphocytic	0	0.00	0	0.00	1	12.41	0	0.00	1	0.31	3.26	0.12
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.03
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	3	8.59*	3	0.80	3.73	0.37
Chronic myeloid	0	0.00	1	11.39	0	0.00	1	5.72	2	0.38	5.21	0.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 36,967 PYR and for male cancers on 21,783 PYR.

## Melanoma of Skin Both Sexes, 30-49 Years of Age

**Table 13.1.7:** Risk of subsequent primary cancers after melanoma of the skin, both sexes, 30-49 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	120	3.01*	383	2.01*	349	1.53*	610	1.28*	1,462	934.36	1.56*	25.88
All excluding same site	55	1.52*	215	1.22*	232	1.08	455	1.00	957	881.81	1.09*	3.69
<b>Buccal cavity, pharynx</b>	4	3.33	4	0.67	3	0.41	10	0.76	21	27.80	0.76	-0.33
Lip	2	13.22*	0	0.00	0	0.00	0	0.00	2	2.84	0.70	-0.04
Tongue	0	0.00	1	0.71	1	0.57	2	0.63	4	6.61	0.60	-0.13
Salivary gland	0	0.00	2	2.98	0	0.00	1	0.85	3	2.69	1.12	0.02
Mouth	0	0.00	1	0.70	0	0.00	4	1.19	5	6.92	0.72	-0.09
Nasopharynx	2	29.87*	0	0.00	1	2.93	0	0.00	3	1.25	2.41	0.09
Tonsil	0	0.00	0	0.00	1	0.96	2	1.17	3	3.74	0.80	-0.04
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	1	0.84	1	2.22	0.45	-0.06
<b>Digestive system</b>	5	1.15	26	1.14	31	1.01	65	0.88	127	132.08	0.96	-0.25
Esophagus	0	0.00	4	3.53	1	0.59	4	0.90	9	7.47	1.20	0.08
Stomach	1	2.22	3	1.35	0	0.00	5	0.84	9	11.45	0.79	-0.12
Small intestine	0	0.00	0	0.00	0	0.00	2	1.26	2	3.13	0.64	-0.06
Colon	3	1.81	8	0.92	13	1.09	31	1.02	55	52.50	1.05	0.12
Rectum, rectosigmoid junction	1	1.09	4	0.82	8	1.20	8	0.53	21	27.45	0.76	-0.32
Anus, anal canal	0	0.00	0	0.00	1	1.31	2	1.46	3	2.92	1.03	0.00
Liver	0	0.00	1	1.04	1	0.80	1	0.34	3	5.38	0.56	-0.12
Gallbladder	0	0.00	0	0.00	1	3.09	0	0.00	1	1.42	0.71	-0.02
Bile ducts, other biliary	0	0.00	2	4.29	0	0.00	3	1.87	5	2.78	1.80	0.11
Pancreas	0	0.00	2	0.79	6	1.69	8	0.90	16	15.46	1.03	0.03
<b>Respiratory system</b>	1	0.28	18	0.90	31	1.06	61	0.82	111	127.46	0.87	-0.81
Nose, nasal cavity, ear	0	0.00	1	2.88	0	0.00	0	0.00	1	1.50	0.67	-0.02
Larynx	0	0.00	2	1.04	1	0.38	3	0.54	6	10.45	0.57	-0.22
Lung, bronchus	1	0.32	15	0.86	29	1.11	58	0.85	103	115.04	0.90	-0.59
<b>Female breast</b>	9	0.86	54	1.08	60	1.05	103	1.12	226	209.78	1.08	1.47
<b>Female genital system</b>	3	0.70	22	1.11	22	1.02	29	0.81	76	81.33	0.93	-0.48
Cervix uteri	1	0.70	4	0.72	2	0.44	0	0.00*	7	16.06	0.44*	-0.82
Corpus uteri	1	0.79	5	0.73	10	1.12	16	0.88	32	35.12	0.91	-0.28
Ovary	1	0.75	12	1.93	8	1.16	13	1.17	34	25.52	1.33	0.77
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.07
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	2.45	0.00	-0.22
<b>Male genital system</b>	3	1.83	12	1.28	26	1.56*	83	1.16	124	99.39	1.25*	2.62
Prostate	0	0.00	8	1.26	24	1.63*	82	1.17	114	92.09	1.24*	2.33
Testis	3	3.56	3	1.06	2	1.16	1	1.00	9	6.39	1.41	0.28
<b>Urinary system</b>	6	2.98*	22	2.13*	9	0.66	23	0.72	60	58.20	1.03	0.09
Urinary bladder	3	2.83	11	1.98	5	0.66	8	0.41*	27	33.52	0.81	-0.32
Kidney parenchyma	3	3.44	10	2.27*	4	0.71	15	1.32	32	22.25	1.44	0.48
Renal pelvis, other urinary	0	0.00	1	2.51	0	0.00	0	0.00	1	2.43	0.41	-0.07
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.66	0.00	-0.03
<b>Bone, joints</b>	0	0.00	1	2.09	0	0.00	1	1.74	2	1.60	1.25	0.02
<b>Soft tissue including heart</b>	1	2.85	6	4.04*	2	1.38	9	4.15*	18	5.46	3.30*	0.62
<b>Kaposi sarcoma</b>	2	2.01	6	1.69	4	1.66	1	0.76	13	8.27	1.57	0.23
<b>Melanoma of skin</b>	65	18.39*	168	11.25*	117	8.16*	155	7.85*	505	52.55	9.61*	22.19
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	1.17	1	1.93	0.52	-0.05
<b>Brain, central nervous system</b>	1	1.01	7	1.64	5	1.17	5	0.78	18	15.93	1.13	0.10
<b>Thyroid</b>	10	6.27*	12	1.89	8	1.46	13	2.11*	43	19.59	2.19*	1.15
<b>Lymphatic, hematopoietic</b>	9	2.36*	24	1.41	25	1.36	44	1.30	102	73.12	1.39*	1.42
Hodgkin lymphoma	4	6.76*	2	0.94	0	0.00	3	1.85	9	5.95	1.51	0.15
Non-Hodgkin lymphoma	4	1.97	17	1.85*	18	1.80*	22	1.23	61	39.15	1.56*	1.07
Myeloma	1	4.12	3	2.24	1	0.53	6	1.30	11	8.06	1.36	0.14
Leukemia	0	0.00	2	0.46	6	1.22	13	1.34	21	19.96	1.05	0.05
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.22	0.00	-0.06
Chronic lymphocytic	0	0.00	1	0.94	3	1.92	7	1.86	11	6.59	1.67	0.22
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	5	1.53	5	6.96	0.72	-0.10
Chronic myeloid	0	0.00	0	0.00	1	1.20	0	0.00	1	3.23	0.31	-0.11

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 110,042 PYR and for male cancers on 93,874 PYR.

## Melanoma of Skin Both Sexes, ≥50 Years of Age

**Table 13.1.8:** Risk of subsequent primary cancers after melanoma of the skin, both sexes, ≥50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	660	1.39*	2,134	1.23*	1,543	1.13*	1,246	0.98	5,583	4,853.49	1.15*	29.06
All excluding same site	499	1.08	1,769	1.04	1,308	0.98	1,057	0.85*	4,633	4,734.58	0.98	-4.05
<b>Buccal cavity, pharynx</b>	11	0.87	42	0.94	27	0.83	23	0.86	103	116.74	0.88	-0.55
Lip	6	2.91*	11	1.53	4	0.77	4	0.92	25	18.79	1.33	0.25
Tongue	1	0.39	7	0.77	5	0.75	3	0.56	16	23.63	0.68	-0.30
Salivary gland	1	0.91	8	2.00	4	1.29	7	2.40	20	11.12	1.80*	0.35
Mouth	2	0.61	9	0.77	5	0.59	5	0.72	21	30.43	0.69	-0.38
Nasopharynx	0	0.00	0	0.00	2	1.97	0	0.00	2	3.70	0.54	-0.07
Tonsil	0	0.00	4	0.96	3	1.04	2	0.95	9	10.32	0.87	-0.05
Oropharynx	0	0.00	2	1.58	1	1.08	1	1.39	4	3.26	1.23	0.03
Hypopharynx	1	0.80	1	0.23	3	0.94	1	0.41	6	11.31	0.53	-0.21
<b>Digestive system</b>	92	0.90	374	1.01	261	0.90	202	0.74*	929	1,036.36	0.90*	-4.28
Esophagus	2	0.40	8	0.43*	8	0.56	4	0.31*	22	50.79	0.43*	-1.15
Stomach	8	0.82	29	0.83	23	0.87	15	0.62	75	95.08	0.79*	-0.80
Small intestine	1	0.70	15	2.85*	5	1.20	3	0.74	24	14.95	1.60*	0.36
Colon	38	0.82	180	1.06	141	1.04	112	0.86	471	482.22	0.98	-0.45
Rectum, rectosigmoid junction	23	1.26	69	1.05	38	0.76	28	0.63*	158	178.33	0.89	-0.81
Anus, anal canal	1	1.04	9	2.55*	3	1.09	2	0.79	15	9.78	1.53	0.21
Liver	3	0.93	11	0.93	5	0.54	4	0.44	23	33.31	0.69	-0.41
Gallbladder	2	1.50	4	0.83	2	0.53	4	1.11	12	13.52	0.89	-0.06
Bile ducts, other biliary	4	1.80	9	1.10	7	1.06	6	0.87	26	23.91	1.09	0.08
Pancreas	9	0.74	37	0.84	26	0.75	23	0.69	95	124.06	0.77*	-1.16
<b>Respiratory system</b>	61	0.74*	236	0.78*	174	0.74*	162	0.76*	633	833.84	0.76*	-8.00
Nose, nasal cavity, ear	0	0.00	1	0.40	3	1.59	4	2.33	8	6.80	1.18	0.05
Larynx	5	0.87	10	0.49*	7	0.48*	4	0.35*	26	52.13	0.50*	-1.04
Lung, bronchus	56	0.74*	224	0.80*	164	0.75*	152	0.76*	596	772.99	0.77*	-7.05
<b>Female breast</b>	48	1.09	191	1.16	151	1.13	130	1.00	520	472.89	1.10*	4.10
<b>Female genital system</b>	23	1.15	57	0.78	52	0.91	36	0.68*	168	203.91	0.82*	-3.13
Cervix uteri	1	0.52	2	0.30	1	0.21	2	0.54	6	17.00	0.35*	-0.96
Corpus uteri	17	1.61	35	0.90	32	1.05	17	0.62*	101	107.56	0.94	-0.57
Ovary	4	0.68	15	0.69	15	0.86	15	0.91	49	61.63	0.80	-1.10
Vagina	0	0.00	0	0.00	1	1.18	0	0.00	1	3.02	0.33	-0.18
Vulva	0	0.00	4	1.18	3	1.06	1	0.33	8	10.17	0.79	-0.19
<b>Male genital system</b>	127	1.28*	467	1.27*	342	1.15*	263	0.97	1,199	1,034.24	1.16*	12.09
Prostate	126	1.28*	464	1.27*	339	1.15*	261	0.97	1,190	1,025.98	1.16*	12.04
Testis	0	0.00	1	1.00	0	0.00	0	0.00	1	2.18	0.46	-0.09
<b>Urinary system</b>	49	1.22	146	1.00	113	0.99	107	1.00	415	407.94	1.02	0.28
Urinary bladder	27	0.96	96	0.94	76	0.94	74	0.97	273	287.35	0.95	-0.57
Kidney parenchyma	19	1.98*	44	1.25	33	1.22	25	1.01	121	96.47	1.25*	0.98
Renal pelvis, other urinary	3	1.26	6	0.69	4	0.59	8	1.26	21	24.13	0.87	-0.12
Ureter	0	0.00	0	0.00	1	0.44	2	0.95	3	8.07	0.37	-0.20
<b>Bone, joints</b>	0	0.00	1	0.68	0	0.00	2	2.14	3	3.88	0.77	-0.04
<b>Soft tissue including heart</b>	2	1.09	15	2.27*	8	1.58	10	2.06	35	18.36	1.91*	0.66
<b>Kaposi sarcoma</b>	0	0.00	1	0.63	0	0.00	0	0.00	1	3.96	0.25	-0.12
<b>Melanoma of skin</b>	161	13.62*	365	8.48*	235	7.10*	189	6.11*	950	118.91	7.99*	33.10
<b>Eye, orbit</b>	0	0.00	3	1.13	4	2.01	6	3.42*	13	7.14	1.82	0.23
<b>Brain, central nervous system</b>	4	0.80	20	1.10	17	1.25	12	1.00	53	48.76	1.09	0.17
<b>Thyroid</b>	9	3.78*	18	2.15*	13	2.17*	3	0.60	43	21.70	1.98*	0.85
<b>Lymphatic, hematopoietic</b>	56	1.58*	142	1.09	101	0.99	73	0.74*	372	366.80	1.01	0.21
Hodgkin lymphoma	0	0.00	4	1.05	2	0.74	1	0.45	7	9.85	0.71	-0.11
Non-Hodgkin lymphoma	35	2.16*	66	1.11	57	1.20	43	0.92	201	170.34	1.18*	1.22
Myeloma	4	0.70	24	1.14	10	0.60	9	0.56	47	59.41	0.79	-0.49
Leukemia	17	1.36	48	1.06	32	0.90	20	0.59*	117	127.21	0.92	-0.41
Acute lymphocytic	1	2.94	1	0.83	4	4.37*	0	0.00	6	3.26	1.84	0.11
Chronic lymphocytic	11	2.14*	23	1.23	14	0.96	8	0.59	56	51.81	1.08	0.17
Acute non-lymphocytic	3	0.73	15	0.99	7	0.59	9	0.77	34	42.93	0.79	-0.36
Chronic myeloid	2	1.20	2	0.33	4	0.85	1	0.22	9	16.91	0.53	-0.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 114,809 PYR and for male cancers on 136,238 PYR.

**Table 13.2.1:** Characteristics of patients with an initial ocular melanoma, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	1,671	100.0	1,546	100.0	3,217	100.0
<b>Initial treatment</b>						
Any radiation	432	25.9	368	23.8	800	24.9
With surgery	98	5.9	87	5.6	185	5.8
Without surgery	334	20.0	281	18.2	615	19.1
No radiation	1,239	74.1	1,178	76.2	2,417	75.1
With surgery	1,087	65.1	1,037	67.1	2,124	66.0
Without surgery	152	9.1	141	9.1	293	9.1
<b>Race</b>						
White	1,622	97.1	1,513	97.9	3,135	97.5
Black	17	1.0	8	0.5	25	0.8
Other	14	0.8	8	0.5	22	0.7
Unknown	18	1.1	17	1.1	35	1.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	62	3.7	64	4.1	126	3.9
30–49	359	21.5	275	17.8	634	19.7
50–69	821	49.1	702	45.4	1,523	47.3
70–79	327	19.6	323	20.9	650	20.2
≥ 80	102	6.1	182	11.8	284	8.8
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	1,450	86.8	1,369	88.6	2,819	87.6
1st and 2nd cancers	197	11.8	164	10.6	361	11.2
1st, 2nd, and 3rd cancers	23	1.4	13	0.8	36	1.1
1st, 2nd, 3rd, and additional cancers	1	0.1	0	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	60.1	—	64.3	—	62.1	—
Median year of 1st cancer diagnosis	1987.4	—	1987.4	—	1987.4	—
Median person-years at risk	5.5	—	5.7	—	5.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	81.0	—	79.1	—	80.2
1st, 2nd, and additional cancers	—	80.1	—	79.1	—	79.6
1st cancer only	—	0.5	—	7.3	—	3.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

# Ocular Melanoma

## Both Sexes

**Table 13.2.2:** Risk of subsequent primary cancers after ocular melanoma, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	3,217	2,602	3,018	9,352	1,780	6,664	993	6,569	3,217	25,186		
<b>All subsequent cancers</b>	43	1.29	149	1.20*	114	1.15	130	1.09	436	375.67	1.16*	23.96
All excluding same site	43	1.30	147	1.19*	113	1.14	128	1.08	431	375.18	1.15*	22.16
<b>Buccal cavity, pharynx</b>	0	0.00	3	0.90	2	0.80	2	0.76	7	9.40	0.75	-0.95
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.51	0.00	-0.60
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.89	0.00	-0.75
Salivary gland	0	0.00	2	7.03	0	0.00	1	3.59	3	0.87	3.46	0.85
Mouth	0	0.00	0	0.00	1	1.49	1	1.43	2	2.51	0.80	-0.20
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.12
Tonsil	0	0.00	1	3.24	0	0.00	0	0.00	1	0.85	1.18	0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.10
Hypopharynx	0	0.00	0	0.00	1	4.17	0	0.00	1	0.89	1.13	0.04
<b>Digestive system</b>	7	0.95	29	1.06	22	1.00	17	0.66	75	82.43	0.91	-2.95
Esophagus	1	3.02	3	2.44	1	1.01	0	0.00	5	3.75	1.33	0.50
Stomach	0	0.00	0	0.00	2	0.99	0	0.00	2	7.61	0.26*	-2.23
Small intestine	0	0.00	1	2.72	1	3.34	1	2.64	3	1.15	2.62	0.74
Colon	5	1.48	14	1.10	10	0.97	12	0.98	41	38.70	1.06	0.91
Rectum, rectosigmoid junction	0	0.00	4	0.81	3	0.78	1	0.24	8	14.30	0.56	-2.50
Anus, anal canal	0	0.00	0	0.00	1	4.72	1	4.02	2	0.80	2.50	0.48
Liver	0	0.00	1	1.29	2	3.16	1	1.24	4	2.42	1.65	0.63
Gallbladder	0	0.00	1	2.47	0	0.00	0	0.00	1	1.18	0.85	-0.07
Bile ducts, other biliary	1	6.61	0	0.00	0	0.00	0	0.00	1	1.82	0.55	-0.32
Pancreas	0	0.00	5	1.52	2	0.77	1	0.32	8	9.89	0.81	-0.75
<b>Respiratory system</b>	6	1.06	16	0.76	18	1.07	21	1.08	61	62.89	0.97	-0.75
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.22
Larynx	1	2.55	1	0.70	0	0.00	0	0.00	2	4.01	0.50	-0.80
Lung, bronchus	5	0.96	15	0.77	18	1.16	21	1.16	59	58.18	1.01	0.33
<b>Female breast</b>	4	1.03	8	0.55	7	0.62	17	1.31	36	42.59	0.85	-5.39
<b>Female genital system</b>	3	1.61	6	0.89	8	1.63	12	2.29*	29	18.78	1.54*	8.35
Cervix uteri	2	9.74*	0	0.00	1	2.07	0	0.00	3	1.84	1.63	0.95
Corpus uteri	0	0.00	2	0.57	5	1.98	6	2.27	13	9.68	1.34	2.72
Ovary	0	0.00	2	1.02	2	1.35	6	3.63*	10	5.63	1.77	3.57
Vagina	0	0.00	1	10.41	0	0.00	0	0.00	1	0.28	3.60	0.59
Vulva	0	0.00	1	3.28	0	0.00	0	0.00	1	0.93	1.07	0.05
<b>Male genital system</b>	5	0.89	29	1.36	19	1.04	22	0.91	75	69.41	1.08	4.32
Prostate	5	0.90	28	1.33	19	1.05	22	0.92	74	68.53	1.08	4.23
Testis	0	0.00	1	5.78	0	0.00	0	0.00	1	0.43	2.33	0.44
<b>Urinary system</b>	5	1.89	17	1.72*	8	0.99	11	1.13	41	30.32	1.35	4.24
Urinary bladder	4	2.19	7	1.02	5	0.89	7	1.02	23	21.15	1.09	0.73
Kidney parenchyma	1	1.56	10	4.17*	3	1.55	4	1.73	18	7.29	2.47*	4.25
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.88	0.00	-0.75
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.25
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.13
<b>Soft tissue including heart</b>	0	0.00	3	6.13*	1	2.62	2	4.24	6	1.48	4.07*	1.80
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.24
<b>Melanoma of skin</b>	5	6.29*	14	4.65*	8	3.29*	10	3.30*	37	9.27	3.99*	11.01
<b>Eye, orbit</b>	1	17.50	2	9.74*	1	6.50	2	11.76*	6	0.59	10.23*	2.15
<b>Brain, central nervous system</b>	1	2.66	1	0.72	3	2.81	2	1.71	7	4.00	1.75	1.19
<b>Thyroid</b>	1	4.91	2	2.67	2	3.67	0	0.00	5	2.07	2.41	1.16
<b>Lymphatic, hematopoietic</b>	5	1.98	12	1.27	8	1.05	8	0.86	33	28.88	1.14	1.64
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.38
Non-Hodgkin lymphoma	4	3.54	4	0.94	3	0.86	3	0.69	14	13.26	1.06	0.29
Myeloma	0	0.00	5	3.34*	1	0.82	2	1.34	8	4.60	1.74	1.35
Leukemia	1	1.12	3	0.91	4	1.50	3	0.94	11	10.05	1.09	0.38
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.11
Chronic lymphocytic	1	2.77	1	0.75	2	1.85	1	0.78	5	4.06	1.23	0.37
Acute non-lymphocytic	0	0.00	0	0.00	1	1.13	2	1.85	3	3.36	0.89	-0.14
Chronic myeloid	0	0.00	2	4.52	0	0.00	0	0.00	2	1.35	1.48	0.26

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 12,241 PYR and for male cancers on 12,945 PYR.

**Table 13.2.3:** Risk of subsequent primary cancers after ocular melanoma, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	22	1.61*	60	1.18	47	1.19	61	1.31*	190	150.94	1.26*	31.91
All excluding same site	22	1.61*	60	1.18	46	1.16	60	1.29	188	150.73	1.25*	30.45
<b>Buccal cavity, pharynx</b>	0	0.00	1	1.07	0	0.00	1	1.28	2	2.68	0.75	-0.55
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.16
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.48
Salivary gland	0	0.00	1	9.74	0	0.00	0	0.00	1	0.30	3.32	0.57
Mouth	0	0.00	0	0.00	0	0.00	1	3.61	1	0.94	1.06	0.05
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.18
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.14
<b>Digestive system</b>	4	1.28	14	1.19	12	1.29	9	0.81	39	35.23	1.11	3.08
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.91	0.00	-0.75
Stomach	0	0.00	0	0.00	1	1.50	0	0.00	1	2.53	0.39	-1.25
Small intestine	0	0.00	0	0.00	1	8.07	1	6.18	2	0.48	4.13	1.24
Colon	3	1.90	6	1.01	4	0.84	5	0.87	18	18.02	1.00	-0.01
Rectum, rectosigmoid junction	0	0.00	2	1.04	3	2.03	0	0.00	5	5.54	0.90	-0.44
Rectum	0	0.00	1	0.80	2	2.08	0	0.00	3	3.64	0.82	-0.52
Anus, anal canal	0	0.00	0	0.00	1	8.14	1	6.88	2	0.47	4.29	1.25
Liver	0	0.00	1	4.61	1	5.78	1	4.50	3	0.67	4.48	1.90
Gallbladder	0	0.00	1	3.60	0	0.00	0	0.00	1	0.80	1.26	0.17
Bile ducts, other biliary	1	15.31	0	0.00	0	0.00	0	0.00	1	0.79	1.27	0.17
Pancreas	0	0.00	4	2.66	1	0.84	1	0.68	6	4.57	1.31	1.17
<b>Respiratory system</b>	3	1.76	4	0.62	5	0.96	8	1.24	20	19.84	1.01	0.13
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.17
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.49
Lung, bronchus	3	1.85	4	0.65	5	1.00	8	1.29	20	18.98	1.05	0.84
<b>Female breast</b>	4	1.03	8	0.55	7	0.62	17	1.31	36	42.59	0.85	-5.39
<b>Female genital system</b>	3	1.61	6	0.89	8	1.63	12	2.29*	29	18.78	1.54*	8.35
Cervix uteri	2	9.74*	0	0.00	1	2.07	0	0.00	3	1.84	1.63	0.95
Corpus uteri	0	0.00	2	0.57	5	1.98	6	2.27	13	9.68	1.34	2.72
Ovary	0	0.00	2	1.02	2	1.35	6	3.63*	10	5.63	1.77	3.57
Vagina	0	0.00	1	10.41	0	0.00	0	0.00	1	0.28	3.60	0.59
Vulva	0	0.00	1	3.28	0	0.00	0	0.00	1	0.93	1.07	0.05
<b>Urinary system</b>	2	3.07	4	1.63	1	0.51	2	0.84	9	7.44	1.21	1.27
Urinary bladder	1	2.55	2	1.36	0	0.00	0	0.00	3	4.48	0.67	-1.21
Kidney parenchyma	1	4.88	2	2.59	1	1.63	2	2.64	6	2.35	2.56	2.99
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.51
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.16
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.12
<b>Soft tissue including heart</b>	0	0.00	2	10.15*	0	0.00	1	5.35	3	0.59	5.09*	1.97
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
<b>Melanoma of skin</b>	3	10.53*	9	8.31*	4	4.79*	5	5.00*	21	3.20	6.56*	14.54
<b>Eye, orbit</b>	0	0.00	0	0.00	1	16.45	1	14.82	2	0.24	8.45	1.44
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.60	0.00	-1.30
<b>Thyroid</b>	1	7.82	1	2.12	2	5.93	0	0.00	4	1.29	3.11	2.22
<b>Lymphatic, hematopoietic</b>	2	1.92	7	1.79	1	0.32	3	0.78	13	11.87	1.10	0.92
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.30
Non-Hodgkin lymphoma	1	2.02	3	1.60	0	0.00	0	0.00	4	5.79	0.69	-1.46
Myeloma	0	0.00	3	4.75	1	2.00	2	3.31	6	1.90	3.15*	3.35
Leukemia	1	2.97	1	0.79	0	0.00	1	0.82	3	3.80	0.79	-0.65
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.09
Chronic lymphocytic	1	7.54	1	2.01	0	0.00	1	2.11	3	1.50	2.01	1.23
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.33	0.00	-1.08
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.42

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Ocular Melanoma

## Males

**Table 13.2.4:** Risk of subsequent primary cancers after ocular melanoma, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	21	1.07	89	1.22	67	1.12	69	0.95	246	224.72	1.09	16.44
All excluding same site	21	1.07	87	1.19	67	1.12	68	0.94	243	224.45	1.08	14.33
<b>Buccal cavity, pharynx</b>	0	0.00	2	0.84	2	1.11	1	0.54	5	6.72	0.74	-1.33
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.31	0.00	-1.01
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.30	0.00	-1.00
Salivary gland	0	0.00	1	5.49	0	0.00	1	5.38	2	0.57	3.54	1.11
Mouth	0	0.00	0	0.00	1	2.36	0	0.00	1	1.57	0.64	-0.44
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.17
Tonsil	0	0.00	1	4.41	0	0.00	0	0.00	1	0.63	1.59	0.29
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.15
Hypopharynx	0	0.00	0	0.00	1	5.18	0	0.00	1	0.71	1.40	0.22
<b>Digestive system</b>	3	0.71	15	0.96	10	0.79	8	0.54	36	47.20	0.76	-8.65
Esophagus	1	3.99	3	3.24	1	1.33	0	0.00	5	2.84	1.76	1.67
Stomach	0	0.00	0	0.00	1	0.73	0	0.00	1	5.08	0.20	-3.15
Small intestine	0	0.00	1	4.71	0	0.00	0	0.00	1	0.66	1.51	0.26
Colon	2	1.11	8	1.19	6	1.08	7	1.07	23	20.68	1.11	1.79
Rectum, rectosigmoid junction	0	0.00	2	0.67	0	0.00	1	0.39	3	8.76	0.34	-4.45
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.26
Liver	0	0.00	0	0.00	1	2.18	0	0.00	1	1.75	0.57	-0.58
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.29
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.80
Pancreas	0	0.00	1	0.56	1	0.71	0	0.00	2	5.32	0.38	-2.57
<b>Respiratory system</b>	3	0.76	12	0.82	13	1.12	13	1.01	41	43.06	0.95	-1.59
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.26
Larynx	1	3.00	1	0.82	0	0.00	0	0.00	2	3.41	0.59	-1.09
Lung, bronchus	2	0.56	11	0.83	13	1.23	13	1.10	39	39.20	0.99	-0.16
<b>Male breast</b>	0	0.00	1	7.27	0	0.00	0	0.00	1	0.42	2.36	0.45
<b>Male genital system</b>	5	0.89	29	1.36	19	1.04	22	0.91	75	69.41	1.08	4.32
Prostate	5	0.90	28	1.33	19	1.05	22	0.92	74	68.53	1.08	4.23
Testis	0	0.00	1	5.78	0	0.00	0	0.00	1	0.43	2.33	0.44
<b>Urinary system</b>	3	1.51	13	1.75	7	1.15	9	1.22	32	22.88	1.40	7.04
Urinary bladder	3	2.09	5	0.93	5	1.12	7	1.29	20	16.68	1.20	2.57
Kidney parenchyma	0	0.00	8	4.92*	2	1.52	2	1.28	12	4.94	2.43*	5.45
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.26	0.00	-0.98
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.34
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.15
<b>Soft tissue including heart</b>	0	0.00	1	3.43	1	4.34	1	3.51	3	0.89	3.38	1.63
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.42
<b>Melanoma of skin</b>	2	3.92	5	2.59	4	2.51	5	2.47	16	6.07	2.64*	7.67
<b>Eye, orbit</b>	1	29.86	2	16.58*	0	0.00	1	9.75	4	0.35	11.43*	2.82
<b>Brain, central nervous system</b>	1	4.43	1	1.20	3	4.67	2	2.84	7	2.40	2.91*	3.55
<b>Thyroid</b>	0	0.00	1	3.61	0	0.00	0	0.00	1	0.79	1.27	0.16
<b>Lymphatic, hematopoietic</b>	3	2.02	5	0.91	7	1.55	5	0.91	20	17.01	1.18	2.31
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.46
Non-Hodgkin lymphoma	3	4.73	1	0.42	3	1.51	3	1.22	10	7.47	1.34	1.96
Myeloma	0	0.00	2	2.31	0	0.00	0	0.00	2	2.70	0.74	-0.54
Leukemia	0	0.00	2	0.98	4	2.39	2	1.01	8	6.25	1.28	1.35
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.13
Chronic lymphocytic	0	0.00	0	0.00	2	2.90	0	0.00	2	2.56	0.78	-0.44
Acute non-lymphocytic	0	0.00	0	0.00	1	1.84	2	3.05	3	2.04	1.47	0.74
Chronic myeloid	0	0.00	2	7.37	0	0.00	0	0.00	2	0.83	2.40	0.90

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Ocular Melanoma Both Sexes, <50 Years of Age

**Table 13.2.5:** Risk of subsequent primary cancers after ocular melanoma, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	760 625		737 2,519		518 2,021		324 2,343		760 7,509			
Number starting interval Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2	1.64	9	1.45	17	2.31*	29	1.58*	57	33.17	1.72*	31.74
All excluding same site	2	1.64	9	1.45	17	2.32*	27	1.47	55	33.11	1.66*	29.16
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.12	0.00	-1.49
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.16
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.34
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.13
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.37
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.19
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.13
<b>Digestive system</b>	0	0.00	0	0.00	3	2.71	2	0.67	5	5.08	0.98	-0.11
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.43
Stomach	0	0.00	0	0.00	1	9.19	0	0.00	1	0.47	2.12	0.70
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.15
Colon	0	0.00	0	0.00	0	0.00	1	0.83	1	2.00	0.50	-1.33
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	1.04	0.00	-1.39
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	20.09	1	0.10	10.42	1.20
Liver	0	0.00	0	0.00	1	22.04	0	0.00	1	0.21	4.69	1.05
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.06
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.14
Pancreas	0	0.00	0	0.00	1	7.74	0	0.00	1	0.60	1.68	0.54
<b>Respiratory system</b>	0	0.00	2	2.54	1	0.89	4	1.29	7	5.14	1.36	2.48
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.08
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.61
Lung, bronchus	0	0.00	2	2.90	1	1.01	4	1.42	7	4.61	1.52	3.19
<b>Female breast</b>	0	0.00	0	0.00	1	0.71	6	2.33	7	5.60	1.25	4.30
<b>Female genital system</b>	0	0.00	0	0.00	1	1.76	2	1.96	3	2.26	1.33	2.27
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-1.39
Corpus uteri	0	0.00	0	0.00	1	4.23	1	1.97	2	0.98	2.04	3.13
Ovary	0	0.00	0	0.00	0	0.00	1	3.17	1	0.70	1.42	0.91
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.06
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.20
<b>Male genital system</b>	0	0.00	1	2.90	1	1.63	6	1.72	8	4.51	1.77	8.20
Prostate	0	0.00	0	0.00	1	1.90	6	1.76	7	4.18	1.67	6.63
Testis	0	0.00	1	8.89	0	0.00	0	0.00	1	0.29	3.42	1.66
<b>Urinary system</b>	1	14.54	0	0.00	1	1.99	1	0.73	3	2.32	1.30	0.91
Urinary bladder	1	26.76	0	0.00	1	3.48	1	1.18	3	1.38	2.17	2.16
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-1.11
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.13
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.04
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.26
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.44
<b>Melanoma of skin</b>	0	0.00	4	8.60*	2	4.41	2	2.60	8	1.79	4.47*	8.27
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	2	60.85*	2	0.07	28.48*	2.57
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	1	3.91	1	0.59	1.70	0.55
<b>Thyroid</b>	1	22.36	0	0.00	2	12.53*	0	0.00	3	0.61	4.92	3.18
<b>Lymphatic, hematopoietic</b>	0	0.00	1	1.69	3	4.66	2	1.46	6	2.73	2.20	4.36
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.33
Non-Hodgkin lymphoma	0	0.00	0	0.00	2	5.94	1	1.41	3	1.41	2.12	2.12
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.41
Leukemia	0	0.00	1	6.42	1	5.69	1	2.51	3	0.76	3.94	2.98
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.06
Chronic lymphocytic	0	0.00	0	0.00	1	17.55	0	0.00	1	0.26	3.88	0.99
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	1	7.58	1	0.26	3.85	0.99
Chronic myeloid	0	0.00	1	34.44	0	0.00	0	0.00	1	0.12	8.27	1.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 3,254 PYR and for male cancers on 4,255 PYR.

## Ocular Melanoma Both Sexes, ≥50 Years of Age

**Table 13.2.6:** Risk of subsequent primary cancers after ocular melanoma, both sexes, ≥50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	2,457	1,977	2,281	6,833	1,262	4,643	669	4,225	2,457	17,678		
<b>All subsequent cancers</b>	41	1.28	140	1.19	97	1.05	101	1.01	379	342.49	1.11	20.65
All excluding same site	41	1.28	138	1.17	96	1.04	101	1.01	376	342.07	1.10	19.19
<b>Buccal cavity, pharynx</b>	0	0.00	3	0.97	2	0.90	2	0.96	7	8.28	0.85	-0.72
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	1.38	0.00	-0.78
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.63	0.00	-0.92
Salivary gland	0	0.00	2	7.64	0	0.00	1	4.30	3	0.77	3.90	1.26
Mouth	0	0.00	0	0.00	1	1.67	1	1.79	2	2.23	0.90	-0.13
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.14
Tonsil	0	0.00	1	3.59	0	0.00	0	0.00	1	0.70	1.42	0.17
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.13
Hypopharynx	0	0.00	0	0.00	1	4.65	0	0.00	1	0.79	1.27	0.12
<b>Digestive system</b>	7	0.97	29	1.09	19	0.91	15	0.66	70	77.35	0.90	-4.16
Esophagus	1	3.09	3	2.54	1	1.09	0	0.00	5	3.43	1.46	0.89
Stomach	0	0.00	0	0.00	1	0.52	0	0.00	1	7.14	0.14*	-3.47
Small intestine	0	0.00	1	2.88	1	3.65	1	3.15	3	1.03	2.90	1.11
Colon	5	1.50	14	1.13	10	1.01	11	0.99	40	36.70	1.09	1.87
Rectum, rectosigmoid junction	0	0.00	4	0.84	3	0.83	1	0.28	8	13.26	0.60	-2.97
Anus, anal canal	0	0.00	0	0.00	1	5.29	0	0.00	1	0.71	1.42	0.17
Liver	0	0.00	1	1.35	1	1.70	1	1.47	3	2.21	1.36	0.45
Gallbladder	0	0.00	1	2.52	0	0.00	0	0.00	1	1.13	0.89	-0.07
Bile ducts, other biliary	1	6.74	0	0.00	0	0.00	0	0.00	1	1.71	0.58	-0.40
Pancreas	0	0.00	5	1.57	1	0.40	1	0.36	7	9.30	0.75	-1.30
<b>Respiratory system</b>	6	1.09	14	0.69	17	1.09	17	1.05	54	57.76	0.93	-2.12
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.27
Larynx	1	2.64	1	0.74	0	0.00	0	0.00	2	3.56	0.56	-0.88
Lung, bronchus	5	0.98	13	0.69	17	1.17	17	1.12	52	53.57	0.97	-0.89
<b>Female breast</b>	4	1.11	8	0.61	6	0.61	11	1.06	29	36.99	0.78	-8.89
<b>Female genital system</b>	3	1.72	6	0.97	7	1.61	10	2.36*	26	16.51	1.57*	10.55
Cervix uteri	2	11.91*	0	0.00	1	2.77	0	0.00	3	1.39	2.16	1.79
Corpus uteri	0	0.00	2	0.60	4	1.74	5	2.34	11	8.69	1.27	2.56
Ovary	0	0.00	2	1.12	2	1.53	5	3.74*	9	4.93	1.83	4.53
Vagina	0	0.00	1	10.95	0	0.00	0	0.00	1	0.26	3.89	0.83
Vulva	0	0.00	1	3.46	0	0.00	0	0.00	1	0.87	1.15	0.15
<b>Male genital system</b>	5	0.90	28	1.33	18	1.02	16	0.78	67	64.90	1.03	2.42
Prostate	5	0.91	28	1.34	18	1.02	16	0.78	67	64.35	1.04	3.05
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.16
<b>Urinary system</b>	4	1.56	17	1.79*	7	0.93	10	1.19	38	28.01	1.36	5.65
Urinary bladder	3	1.68	7	1.06	4	0.75	6	1.00	20	19.77	1.01	0.13
Kidney parenchyma	1	1.63	10	4.46*	3	1.73	4	2.15	18	6.45	2.79*	6.53
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	1.78	0.00	-1.01
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.34
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.16
<b>Soft tissue including heart</b>	0	0.00	3	6.85*	1	3.01	2	5.18	6	1.28	4.70*	2.67
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.15
<b>Melanoma of skin</b>	5	7.21*	10	3.92*	6	3.03*	8	3.54*	29	7.48	3.88*	12.17
<b>Eye, orbit</b>	1	18.67	2	10.59*	1	7.32	0	0.00	4	0.52	7.75*	1.97
<b>Brain, central nervous system</b>	1	2.92	1	0.81	3	3.27	1	1.09	6	3.41	1.76	1.46
<b>Thyroid</b>	0	0.00	2	3.58	0	0.00	0	0.00	2	1.46	1.37	0.30
<b>Lymphatic, hematopoietic</b>	5	2.09	11	1.24	5	0.72	6	0.76	27	26.15	1.03	0.48
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.41
Non-Hodgkin lymphoma	4	3.75*	4	1.01	1	0.32	2	0.55	11	11.85	0.93	-0.48
Myeloma	0	0.00	5	3.45*	1	0.87	2	1.54	8	4.29	1.86	2.10
Leukemia	1	1.16	2	0.63	3	1.21	2	0.72	8	9.29	0.86	-0.73
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.13
Chronic lymphocytic	1	2.83	1	0.77	1	0.97	1	0.89	4	3.80	1.05	0.11
Acute non-lymphocytic	0	0.00	0	0.00	1	1.21	1	1.05	2	3.10	0.64	-0.62
Chronic myeloid	0	0.00	1	2.42	0	0.00	0	0.00	1	1.23	0.81	-0.13

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,988 PYR and for male cancers on 8,690 PYR.

**Table 13.3.1:** Characteristics of patients with an initial cancer of the eye (non-melanoma, excluding retinoblastoma), both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	388	100.0	206	100.0	594	100.0
<b>Initial treatment</b>						
Any radiation	98	25.3	74	35.9	172	29.0
With surgery	65	16.8	53	25.7	118	19.9
Without surgery	33	8.5	21	10.2	54	9.1
No radiation	290	74.7	132	64.1	422	71.0
With surgery	259	66.8	108	52.4	367	61.8
Without surgery	31	8.0	24	11.7	55	9.3
<b>Race</b>						
White	338	87.1	167	81.1	505	85.0
Black	25	6.4	16	7.8	41	6.9
Other	18	4.6	16	7.8	34	5.7
Unknown	7	1.8	7	3.4	14	2.4
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	54	13.9	52	25.2	106	17.8
30–49	56	14.4	37	18.0	93	15.7
50–69	121	31.2	46	22.3	167	28.1
70–79	88	22.7	31	15.0	119	20.0
≥ 80	69	17.8	40	19.4	109	18.4
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	333	85.8	191	92.7	524	88.2
1st and 2nd cancers	44	11.3	11	5.3	55	9.3
1st, 2nd, and 3rd cancers	10	2.6	3	1.5	13	2.2
1st, 2nd, 3rd, and additional cancers	1	0.3	1	0.5	2	0.3
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	65.8	—	58.0	—	63.5	—
Median year of 1st cancer diagnosis	1988.3	—	1987.9	—	1988.3	—
Median person-years at risk	5.3	—	5.3	—	5.3	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	87.3	—	100.0	—	90.0
1st, 2nd, and additional cancers	—	87.3	—	100.0	—	90.0
1st cancer only	—	7.3	—	0.0	—	5.7

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

## Eye (Non-melanoma) Both Sexes

**Table 13.3.2:** Risk of subsequent primary cancers after cancer of the eye (non-melanoma, excluding retinoblastoma), both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	594	469	535	1,650	315	1,167	167	1,069	594	4,354		
<b>All subsequent cancers</b>	13	1.88	37	1.49*	18	0.99	19	1.30	87	64.65	1.35*	51.32
All excluding same site	13	1.88	37	1.49*	18	0.99	19	1.30	87	64.63	1.35*	51.38
<b>Buccal cavity, pharynx</b>	1	5.50	4	6.25*	2	4.59	1	3.12	8	1.58	5.07*	14.75
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.70
Tongue	0	0.00	0	0.00	0	0.00	1	16.48	1	0.29	3.39	1.62
Salivary gland	1	58.86	3	48.55*	2	45.10*	0	0.00	6	0.16	37.10*	13.41
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.89
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.13
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.30
Oropharynx	0	0.00	1	60.24	0	0.00	0	0.00	1	0.04	24.99	2.20
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.34
<b>Digestive system</b>	3	1.83	4	0.70	4	0.98	3	0.93	14	14.63	0.96	-1.45
Esophagus	1	13.01	0	0.00	0	0.00	0	0.00	1	0.70	1.43	0.69
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	1.55	0.00	-3.56
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.44
Colon	1	1.33	2	0.76	3	1.58	2	1.32	8	6.79	1.18	2.78
Rectum, rectosigmoid junction	0	0.00	2	2.04	1	1.46	0	0.00	3	2.46	1.22	1.24
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.25
Liver	1	19.07	0	0.00	0	0.00	0	0.00	1	0.48	2.07	1.19
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.41
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.80
Pancreas	0	0.00	0	0.00	0	0.00	1	2.68	1	1.69	0.59	-1.59
<b>Respiratory system</b>	4	3.39	11	2.59*	4	1.30	5	2.12	24	10.85	2.21*	30.19
Nose, nasal cavity, ear	0	0.00	0	0.00	1	37.38	0	0.00	1	0.09	10.66	2.08
Larynx	0	0.00	1	3.48	0	0.00	1	7.42	2	0.70	2.86	2.99
Lung, bronchus	4	3.69	10	2.55*	3	1.06	4	1.83	21	10.03	2.09*	25.19
<b>Female breast</b>	0	0.00	4	2.98	1	1.00	1	0.96	6	3.77	1.59	14.45
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.63	0.00	-10.51
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-1.21
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-5.08
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-3.19
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.17
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.59
<b>Male genital system</b>	0	0.00	6	0.97	3	0.64	5	1.41	14	16.08	0.87	-7.40
Prostate	0	0.00	6	0.98	3	0.65	5	1.43	14	15.89	0.88	-6.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.29
<b>Urinary system</b>	2	3.19	4	1.76	3	1.81	2	1.53	11	5.87	1.87	11.79
Urinary bladder	0	0.00	1	0.60	2	1.65	2	2.10	5	4.29	1.16	1.62
Kidney parenchyma	2	15.51*	3	6.38*	1	2.89	0	0.00	6	1.22	4.90*	10.97
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.80
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.27
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.14
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.61
<b>Kaposi sarcoma</b>	0	0.00	1	26.15	0	0.00	0	0.00	1	0.11	9.20	2.05
<b>Melanoma of skin</b>	0	0.00	1	1.83	0	0.00	0	0.00	1	1.49	0.67	-1.12
<b>Eye, orbit</b>	0	0.00	1	27.54	0	0.00	0	0.00	1	0.09	10.85	2.08
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-1.42
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.65
<b>Lymphatic, hematopoietic</b>	2	3.74	1	0.52	1	0.71	2	1.70	6	5.03	1.19	2.24
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	22.39	1	0.17	5.98	1.91
Non-Hodgkin lymphoma	1	4.46	1	1.23	1	1.63	1	1.89	4	2.18	1.84	4.18
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.81	0.00	-1.86
Leukemia	1	4.87	0	0.00	0	0.00	0	0.00	1	1.87	0.53	-2.00
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.15
Chronic lymphocytic	1	12.46	0	0.00	0	0.00	0	0.00	1	0.73	1.37	0.61
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-1.42
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.58

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,547 PYR and for male cancers on 2,808 PYR.

**Table 13.3.3:** Risk of subsequent primary cancers after cancer of the eye (non-melanoma, excluding retinoblastoma), females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2	1.39	9	1.82	3	0.83	6	1.59	20	13.77	1.45	40.26
All excluding same site	2	1.39	9	1.82	3	0.83	6	1.59	20	13.77	1.45	40.28
<b>Buccal cavity, pharynx</b>	0	0.00	1	11.20	0	0.00	0	0.00	1	0.24	4.13	4.90
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.35
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.19
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.54
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.06
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
Oropharynx	0	0.00	1	†	0	0.00	0	0.00	1	0.01	184.28*	6.43
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.10
<b>Digestive system</b>	0	0.00	0	0.00	1	1.13	2	2.28	3	3.40	0.88	-2.56
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.57
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-1.75
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.30
Colon	0	0.00	0	0.00	0	0.00	1	2.23	1	1.73	0.58	-4.70
Rectum, rectosigmoid junction	0	0.00	0	0.00	1	7.58	0	0.00	1	0.51	1.98	3.20
Rectum	0	0.00	0	0.00	1	11.44	0	0.00	1	0.34	2.98	4.30
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.27
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.47
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.50
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.53
Pancreas	0	0.00	0	0.00	0	0.00	1	8.51	1	0.44	2.26	3.61
<b>Respiratory system</b>	0	0.00	2	3.37	0	0.00	2	3.88	4	1.73	2.31	14.69
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
Larynx	0	0.00	0	0.00	0	0.00	1	69.92	1	0.05	19.73	6.14
Lung, bronchus	0	0.00	2	3.53	0	0.00	1	2.02	3	1.65	1.81	8.70
<b>Female breast</b>	0	0.00	4	2.98	1	1.00	1	0.96	6	3.77	1.59	14.45
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.63	0.00	-10.51
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-1.21
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-5.08
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-3.19
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.17
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.59
<b>Urinary system</b>	0	0.00	2	8.22	1	5.55	0	0.00	3	0.68	4.40	14.99
Urinary bladder	0	0.00	0	0.00	1	9.10	0	0.00	1	0.41	2.41	3.78
Kidney parenchyma	0	0.00	2	27.29*	0	0.00	0	0.00	2	0.21	9.50*	11.57
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.37
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.38
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.04
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-1.88
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.13
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.92
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.88
<b>Lymphatic, hematopoietic</b>	2	17.05*	0	0.00	0	0.00	1	3.20	3	1.12	2.67	12.13
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.28
Non-Hodgkin lymphoma	1	18.86	0	0.00	0	0.00	1	6.66	2	0.53	3.77	9.50
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-1.15
Leukemia	1	24.27	0	0.00	0	0.00	0	0.00	1	0.37	2.69	4.06
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.11
Chronic lymphocytic	1	66.61	0	0.00	0	0.00	0	0.00	1	0.14	7.28	5.58
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.84
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.33

\*P < 0.05. †O/E > 500. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Eye (Non-melanoma)

### Males

**Table 13.3.4:** Risk of subsequent primary cancers after cancer of the eye (non-melanoma, excluding retinoblastoma), males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	11	2.00	28	1.40	15	1.03	13	1.20	67	50.88	1.32*	57.42
All excluding same site	11	2.01	28	1.40	15	1.03	13	1.20	67	50.86	1.32*	57.49
<b>Buccal cavity, pharynx</b>	1	6.40	3	5.45*	2	5.37	1	3.89	7	1.34	5.24*	20.17
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-1.01
Tongue	0	0.00	0	0.00	0	0.00	1	21.38	1	0.24	4.15	2.70
Salivary gland	1	71.77	3	58.13*	2	54.28*	0	0.00	6	0.13	45.16*	20.90
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-1.09
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.16
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.40
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.12
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.48
<b>Digestive system</b>	3	2.40	4	0.90	3	0.94	1	0.43	11	11.24	0.98	-0.85
Esophagus	1	14.80	0	0.00	0	0.00	0	0.00	1	0.61	1.64	1.39
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	1.28	0.00	-4.55
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.52
Colon	1	1.80	2	1.00	3	2.07	1	0.94	7	5.06	1.38	6.90
Rectum, rectosigmoid junction	0	0.00	2	2.52	0	0.00	0	0.00	2	1.96	1.02	0.16
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.24
Liver	1	22.70	0	0.00	0	0.00	0	0.00	1	0.41	2.43	2.10
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.36
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.95
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	1.25	0.00	-4.45
<b>Respiratory system</b>	4	3.92*	9	2.46*	4	1.53	3	1.63	20	9.13	2.19*	38.73
Nose, nasal cavity, ear	0	0.00	0	0.00	1	46.03	0	0.00	1	0.07	13.43	3.30
Larynx	0	0.00	1	3.71	0	0.00	0	0.00	1	0.65	1.54	1.25
Lung, bronchus	4	4.29*	8	2.39*	3	1.25	3	1.77	18	8.38	2.15*	34.27
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.33
<b>Male genital system</b>	0	0.00	6	0.97	3	0.64	5	1.41	14	16.08	0.87	-7.40
Prostate	0	0.00	6	0.98	3	0.65	5	1.43	14	15.89	0.88	-6.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.29
<b>Urinary system</b>	2	3.60	2	0.98	2	1.35	2	1.79	8	5.19	1.54	10.03
Urinary bladder	0	0.00	1	0.66	1	0.90	2	2.38	4	3.88	1.03	0.43
Kidney parenchyma	2	18.43*	1	2.52	1	3.44	0	0.00	4	1.01	3.95*	10.64
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-1.05
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.36
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.16
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.73
<b>Kaposi sarcoma</b>	0	0.00	1	27.87	0	0.00	0	0.00	1	0.10	9.80	3.20
<b>Melanoma of skin</b>	0	0.00	1	2.23	0	0.00	0	0.00	1	1.20	0.83	-0.71
<b>Eye, orbit</b>	0	0.00	1	35.06	0	0.00	0	0.00	1	0.07	13.98	3.31
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-1.69
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.52
<b>Lymphatic, hematopoietic</b>	0	0.00	1	0.66	1	0.90	1	1.16	3	3.90	0.77	-3.21
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	33.48	1	0.12	8.09	3.12
Non-Hodgkin lymphoma	0	0.00	1	1.60	1	2.12	0	0.00	2	1.65	1.21	1.25
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-2.25
Leukemia	0	0.00	0	0.00	0	0.00	0	0.00	0	1.50	0.00	-5.33
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.17
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-2.12
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-1.75
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.72

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Chapter 14

## New Malignancies Following Cancer of the Brain and Central Nervous System

Peter D. Inskip, Ellen F. Heineman

### Synopsis

The incidence of multiple primary cancers was evaluated in a cohort of 31,336 persons diagnosed with a first primary cancer of the brain and central nervous system (CNS) during 1973-2000 and followed for an average of 3.4 years. The overall incidence of new malignancies was 11% higher than expected (O/E=1.11, O=496, EAR=4 per 10,000 person-years). The O/E ratio increased over the first 10 years of follow-up and then decreased. Although the risk of subsequent cancer was increased only slightly overall, considerably larger, statistically significant relative excesses were observed for several uncommon types, including cancers of the bone, soft tissue, brain and CNS, salivary gland, and thyroid gland, as well as acute non-lymphocytic leukemia and melanoma of the skin. Relative and absolute risks were markedly higher for those with first cancers diagnosed in childhood (age <17 years) than for those first diagnosed at older ages. The risk of new cancers was significantly increased following medulloblastoma, ependymoma, and astrocytoma, but not following glioblastoma or meningioma. Radiotherapy appeared to contribute to the excess of new malignancies of the bone, brain, and thyroid gland, whereas chemotherapy probably played a major role in the excess of subsequent leukemia. The etiology of the new soft tissue cancers and melanoma is unclear, but it may involve shared genetic susceptibility factors.

### Brain and Other Central Nervous System Cancers

Approximately 18,500 cancers of the brain and other central nervous system (CNS) are diagnosed each year in the U.S. (Jemal et al, 2005). Brain and other CNS cancers are relatively uncommon, accounting for 1.3% of all new cancer cases and 2.2% of cancer deaths. Most CNS tumors (94%) arise in the brain. Incidence is higher among males than females and higher among whites than blacks (Ries et al, 2004). The 5-year relative survival rate is 33.1%, but survival is inversely associated with age at diagnosis. Just 6% of persons diagnosed over the age of 65 live more than 5 years (Ries et al, 2004).

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).*

Treatments during 1973-2000 typically included surgery and radiation. Radiation was used more often in the treatment of brain cancer (74%) than for cancers in other parts of the CNS (47%). Because most cancers of the nervous system are intracranial and rarely metastasize outside of the CNS, the volume of tissue that receives high doses of radiation generally is limited and confined to the head or neck regions (Black, 1991a,b; Pollack, 1994). However, for medulloblastoma and anaplastic ependymoma, which may spread throughout the spinal axis, craniospinal irradiation sometimes is given (Pollack, 1994; Levin et al, 2001). Today, cranial radiotherapy often is deferred in very young children to avoid the harmful effects of radiation on the developing nervous system (Pollack, 1994; Packer, 1995). Few chemotherapy agents have been proven effective in the treatment of cancers of the brain and CNS (Levin et al, 2001). The following agents have been used: bleomycin, chloroethylnitrosoureas, cisplatin, cyclophosphamide, doxorubicin, etoposide, procarbazine, temozolomide, and vincristine (Greene et al, 1985; Duffner et al, 1998; Levin et al, 2001).

Very little is known about the etiology of cancers of the brain and CNS. Established risk factors include moderate to high doses of ionizing radiation and certain rare familial cancer syndromes, but these account for a very small percentage of cases (Inskip et al, 1995; Louis and von Deimling, 1995). There is inconsistent evidence linking brain cancer to certain occupational and dietary exposures, reproductive factors, and some medical conditions (Inskip et al, 1995; Preston-Martin and Mack, 1996; Wrensch et al, 2002).

### Results and Discussion

Among 31,336 persons who survived at least 2 months following a first cancer of the brain or CNS, 29,361 patients (93.7%) had brain cancers, and 1,975 (6.3%) had cancers in other parts of the CNS. A total of 496 new primary cancers were identified in 464 persons (O/E=1.11, 95% CI=1.01-1.21, EAR=4 per 10,000 person-years). Exclusive of new cancers of the brain and CNS, the observed and expected numbers of new malignancies were nearly equal (O/E=1.02, 95% CI=0.93-1.12). Risk was higher after a first cancer of the brain (O/E=1.15, O=408) than when the first cancer occurred elsewhere in the CNS (O/E=0.94, O=88). The relative risk (O/E)

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**Table 14.A:** Observed (O) numbers of new malignancies, and measures of relative risk (O/E) and excess absolute risk (EAR), by histopathological subtype of the first brain or other CNS cancer. Numbers of patients, mean age at diagnosis, duration of follow-up (mean PYR), and use of radiotherapy (RT) in treatment of the first cancer also are shown.

First primary tumor subtype	No. patients	Mean age (yr)	Mean PYR	Baseline RT (%)	O	O/E	95% CI	EAR (per 10 <sup>4</sup> PYR)
All types	31,336	48.0	3.38	72.0	496	1.11	1.01-1.21	4.47
Glioblastoma	12,169	59.8	0.91	81.0	75	0.81	0.63-1.01	-16.09
Pilocytic astrocytoma	960	16.6	6.72	25.3	9	1.55	0.71-2.93	4.92
Other astrocytoma	9,083	44.6	4.58	75.2	166	1.22	1.04-1.42	7.19
Oligodendroglioma	1,813	42.1	4.99	62.8	46	1.16	0.85-1.54	6.92
Mixed glioma	676	39.0	5.36	75.9	15	1.14	0.64-1.88	5.12
Ependymoma	1,055	31.1	6.84	57.8	46	1.41	1.03-1.88	18.53
Medulloblastoma/PNET	1,207	14.2	6.28	83.8	23	3.71	2.35-5.57	22.16
Malignant meningioma	591	60.3	5.97	39.8	39	0.85	0.61-1.16	-19.24
Other and unspecified	3,782	44.3	4.17	55.7	77	1.01	0.80-1.26	0.44

Notes: ICD-O Revision 2 morphology (M) codes: glioblastoma and gliosarcoma (M9440-9442); pilocytic astrocytoma (M9421); other astrocytoma (M9400-9420, 9424); oligodendroglioma (M9450-9451); mixed glioma (M9382); ependymoma (M9391-9394); medulloblastoma/PNET (M9470-9473); malignant meningioma (M9530-9539); includes patients surviving 2 months or more after diagnosis; EAR calculated as [(O-E)/PYR] × 10,000.

Abbreviations: RT=initial radiotherapy; PNET=primitive neuroectodermal tumor; O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000).

increased over the first 10 years of follow-up but then decreased. The risk of developing a second cancer within 25 years, adjusted for the competing risk of death from other causes, was 2.5% (95% CI=2.2%-2.8%). Risk for all new malignancies combined was higher for males than for females (O/E=1.18 versus 1.00) and higher for blacks than for whites (O/E=1.34 versus 1.10). Striking differences in the risk of subsequent tumors were apparent between persons diagnosed with cancer of the brain or CNS before age 17 years (mean age, 7.7 years; O/E=6.64, O=54, 95% CI=4.99-8.67, EAR=14) and those diagnosed at older ages (O/E=1.00, O=442, 95% CI=0.91-1.10).

With respect to the histopathology of the first cancer, the excess absolute risks were highest among persons first diagnosed with medulloblastoma or ependymoma; these tumors tend to be diagnosed at younger ages and have better-than-average survival, and they are often treated with radiation (Table 14.A). Intermediate excess absolute risks were observed for new cancers following an initial astrocytoma, oligodendroglioma, or mixed glioma. New malignancies occurred less often than expected following glioblastoma and malignant meningioma. These tumors tend to be diagnosed at older ages, and glioblastoma is associated with poor survival, so there is limited time for treatment-induced cancers to appear.

Significantly elevated subsequent cancer risks were observed only for relatively uncommon cancers, including those of the brain and CNS, bone, soft tissue, salivary gland, and thyroid gland, as well as for acute non-lymphocytic leukemia (ANLL) and melanoma of the skin. The highest relative risk was observed for bone cancer and the highest EAR for subsequent brain and CNS cancer. A statistically significant deficit was seen for breast cancer, and deficits approaching statistical significance were observed for cancers of the lung and prostate.

With the exception of melanoma, all of the subsequent cancers that occurred significantly in excess of expectation have been linked to medical irradiation in previous

studies, particularly for exposures occurring during childhood (Tucker et al, 1987, 1991; Ron et al, 1988, 1995; NRC, 1990; Neglia et al, 1991; Hawkins et al, 1996; Wong et al, 1997; Karlsson et al, 1998; Little et al, 1998; Schneider et al, 1998; Walter et al, 1998; Bhatia et al, 2002). However, evidence of radiogenic excesses in the present study was mixed. The risks for bone, soft tissue, brain, and thyroid cancer were higher among persons whose baseline treatment included radiation, whereas the risks for leukemia, salivary gland cancer, and melanoma of the skin were not (data not shown). Excess cancer incidence was apparent even within the first 5 years of follow-up, which is shorter than the minimal latent period for most radiation-related solid cancers (NRC, 1990). Although some of the subsequent brain cancers might have been misclassified recurrences rather than new primaries, the excess was greater after the first 5 years of follow-up than during the first 5 years. The relative risk for cancer of the salivary gland increased with time, which is compatible with a radiation effect, but the number of cases was small. The small number of long-term survivors limits the ability to assess late effects of treatment.

Although radiation is a well-established cause of leukemia, it probably was of limited importance in explaining the excess risk in this study cohort. Most patients given radiotherapy for their first cancer would have received radiation only to the skull, which contains a relatively small proportion of the body's active bone marrow after childhood (Cristy, 1981). Chemotherapy, which exposes marrow throughout the body, probably played a greater role. At least 7 of the 12 cases of acute myeloid leukemia received chemotherapy, based on the data covering the initial course of therapy. Nitrosoureas and other chemotherapy agents used in the treatment of brain cancer have been linked with increased occurrence of ANLL (Boice et al, 1983; Greene et al, 1985; Duffner et al, 1998).

Bone and soft tissue sarcoma are known sequelae of irradiation at high doses, typically in excess of 10 Gy

(Tucker et al, 1987; Hawkins et al, 1996; Wong et al, 1997). Risk drops off sharply outside of the irradiated field. Seven of the 12 subsequent bone cancers occurred in the skull or face, and all 7 had received radiotherapy. Chemotherapy with alkylating agents also has been linked to second primary bone sarcoma and might potentiate the effects of radiation or shorten the induction period of radiation-related tumors (Tucker et al, 1987; Hawkins et al, 1996). On the other hand, only 4 of the 13 soft tissue cancers occurred in the head or neck, 3 of which had received baseline radiotherapy. Few cases had chemotherapy recorded in SEER as part of their initial course of therapy. Thus, neither radiotherapy nor chemotherapy can be linked clearly to the excess occurrence of subsequent soft tissue cancers based on these data.

Radiotherapy probably contributed to the moderate excess of thyroid cancer. Brain cancers in children commonly occur in the cerebellum (Russell and Rubenstein, 1989), and radiation directed to the cerebellum can involve sizable incidental doses to the thyroid gland. Susceptibility to radiation-induced thyroid cancer is known to be greater among children than among adults (Ron et al, 1995), and the relative risk of thyroid cancer following brain or other CNS cancer among children was higher than among adults in the present study as well. However, if the increased incidence of thyroid cancer was due entirely to radiotherapy, one would expect the excess to show a stronger inverse association with age at exposure and to appear at least 5 or more years after irradiation. Close medical surveillance of cancer patients might have led to early detection of small thyroid cancers. It is not clear whether the greater relative excess of thyroid cancer among males compared with females reflects differences in radiation exposure to the thyroid gland, chance, or some other factor.

Shared genetic susceptibility might contribute to some of the observed associations (Malkin et al, 1992; Louis and von Deimling, 1995), particularly for sarcomas, leukemia, and new primary cancers of the brain and CNS. Li-Fraumeni syndrome is associated with brain cancer, soft tissue sarcoma, osteosarcoma, and leukemia, among other types of tumors (Hisada et al, 1998; Nichols et al, 2001), while astrocytoma, non-lymphocytic leukemia, and neurofibrosarcoma are associated with neurofibromatosis type 1 (Bader and Miller, 1978). The sarcomas that occurred following a first cancer of the brain and CNS tended to occur at young ages (median of 26 years for soft tissue, 25 years for bone). Five of the 13 cancers of soft tissue were neurofibrosarcomas or malignant schwannomas; the corresponding first cancers included 4 astrocytomas.

The numbers of specific types of subsequent cancers following different histopathologic types of first cancer of the brain and CNS were small, but there were several suggestive associations. Elevated risks following medulloblastoma were seen for leukemia ( $O/E=9.97$ ,  $O=3$ ), brain and CNS cancer ( $O/E=19.62$ ,  $O=5$ ), soft tissue sarcoma ( $O/E=21.61$ ,  $O=2$ ), and cancers of the digestive tract

( $O/E=6.50$ ,  $O=5$ ). The latter might be related to Turcot syndrome, which involves a genetic predisposition to colon polyps and brain tumors (Hamilton et al, 1995; Goldstein et al, 1997). There was a significantly increased risk of stomach cancer following glioblastoma ( $O/E=3.33$ ,  $O=6$ ), and 3 of the 6 cases occurred among blacks ( $O/E=29.48$ ). Subsequent colon cancers occurred more often than expected among persons with mixed glioma ( $O/E=5.53$ ,  $O=5$ ), most of which would be expected to be oligoastrocytoma (Kleihues and Cavenee, 1997). It is noteworthy that astrocytomas and oligodendrogliomas are among the tumors that have been associated with hereditary nonpolyposis colon cancer (Vasen et al, 1996). Contrary to earlier reports (Schoenberg et al, 1975; Malmer et al, 2000; Custer et al, 2002), neither breast cancer ( $O/E=0.72$ ,  $O=5$ ) nor colon cancer risk ( $O/E=0.86$ ,  $O=4$ ) was increased following malignant meningioma.

Cutaneous melanoma occurred more often than expected among brain cancer patients in SEER, which parallels a finding from Finland (Salminen et al, 1999). Melanoma is not established as a late effect of radiotherapy or chemotherapy, although the issue is unsettled. Whether the excess risk might signify a genetic disorder is unclear, but familial clustering of astrocytoma and cutaneous melanoma has been reported (Kaufman et al, 1993; Azizi et al, 1995; Paunu et al, 2002). It also is possible that the excess of melanoma is related to close medical surveillance of cancer patients.

The comparatively low incidence of new primary cancers of the respiratory tract and buccal cavity and other smoking-related cancers probably reflects a low prevalence of smoking in the study cohort, relative to the general population. Smoking does not appear to cause brain cancer, which tends to occur more often among persons of higher social class (Preston-Martin, 1989; Inskip et al, 1995, 2003), who smoke less than the general population.

In summary, excess risk of a new malignancy following a first cancer of the brain and CNS was relatively small for the cohort as a whole, but much larger relative and absolute risks were indicated among persons whose first cancer was diagnosed during childhood. Increases were not seen for the common adult cancers. Instead, cancers of the brain, bone, soft tissue, thyroid, and salivary glands, as well as leukemia, accounted for most of the excess. Radiotherapy for the first cancer appears to be linked to new bone and brain cancers and may have contributed to thyroid and salivary gland cancers as well. Chemotherapy and shared genetic susceptibility likely also played contributory roles, particularly for subsequent leukemias and sarcomas. The very high relative risks following a first cancer of childhood probably reflect a combination of low background risks, effects of treatment during a vulnerable period of life, and genetic predisposition. It will be important to document the cancer experience of childhood brain cancer survivors after they reach the ages at which the usual adult cancers become common. The risk of therapy-related subsequent cancers among glioblastoma patients is not a major clinical issue at this time, given their extremely poor survival.



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## Brain and Other CNS Both Sexes

**Table 14.1.1:** Characteristics of patients with an initial cancer of the brain or other central nervous system, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	17,734	100.0	13,602	100.0	31,336	100.0
<b>Initial treatment</b>						
Any radiation	13,162	74.2	9,392	69.0	22,554	72.0
With surgery	9,557	53.9	6,652	48.9	16,209	51.7
Without surgery	3,605	20.3	2,740	20.1	6,345	20.2
No radiation	4,572	25.8	4,210	31.0	8,782	28.0
With surgery	3,048	17.2	2,661	19.6	5,709	18.2
Without surgery	1,524	8.6	1,549	11.4	3,073	9.8
<b>Race</b>						
White	15,948	89.9	12,188	89.6	28,136	89.8
Black	1,007	5.7	823	6.1	1,830	5.8
Other	739	4.2	565	4.2	1,304	4.2
Unknown	40	0.2	26	0.2	66	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	4,064	22.9	3,200	23.5	7,264	23.2
30–49	4,379	24.7	2,892	21.3	7,271	23.2
50–69	6,632	37.4	4,583	33.7	11,215	35.8
70–79	2,131	12.0	2,170	16.0	4,301	13.7
≥ 80	528	3.0	757	5.6	1,285	4.1
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	17,451	98.4	13,421	98.7	30,872	98.5
1st and 2nd cancers	264	1.5	169	1.2	433	1.4
1st, 2nd, and 3rd cancers	18	0.1	12	0.1	30	0.1
1st, 2nd, 3rd, and additional cancers	1	0.0	0	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	51.5	—	53.7	—	52.3	—
Median year of 1st cancer diagnosis	1988.5	—	1988.6	—	1988.6	—
Median person-years at risk	0.9	—	0.9	—	0.9	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	83.4	—	85.6	—	84.3
1st, 2nd, and additional cancers	—	83.0	—	85.6	—	84.1
1st cancer only	—	4.9	—	3.3	—	4.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 14.1.2:** Risk of subsequent primary cancers after cancer of the brain or other central nervous system, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	113	0.92	173	1.18*	125	1.36*	85	0.98	496	448.67	1.11*	4.47
All excluding same site	107	0.88	161	1.12	109	1.21	72	0.84	449	441.52	1.02	0.71
<b>Buccal cavity, pharynx</b>	2	0.54	2	0.46	7	2.72*	3	1.36	14	12.88	1.09	0.11
Lip	0	0.00	0	0.00	1	3.37	0	0.00	1	1.61	0.62	-0.06
Tongue	1	1.31	1	1.08	0	0.00	0	0.00	2	2.75	0.73	-0.07
Salivary gland	0	0.00	1	2.55	2	8.09	2	8.55	5	1.17	4.27*	0.36
Mouth	0	0.00	0	0.00	3	4.63	1	1.86	4	3.28	1.22	0.07
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.06
Tonsil	1	2.59	0	0.00	1	3.43	0	0.00	2	1.41	1.42	0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.20	0.00	-0.11
<b>Digestive system</b>	23	0.92	28	1.03	18	1.10	16	1.08	85	83.57	1.02	0.14
Esophagus	0	0.00	0	0.00	1	1.16	1	1.26	2	4.46	0.45	-0.23
Stomach	7	2.79*	3	1.11	3	1.90	0	0.00	13	8.17	1.59	0.46
Small intestine	0	0.00	0	0.00	1	3.39	0	0.00	1	1.43	0.70	-0.04
Colon	13	1.19	15	1.28	5	0.71	9	1.42	42	36.04	1.17	0.56
Rectum, rectosigmoid junction	2	0.43	3	0.59	6	1.99	2	0.75	13	15.39	0.84	-0.23
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.11	0.00	-0.10
Liver	0	0.00	1	0.95	0	0.00	1	1.55	2	3.24	0.62	-0.12
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.06	0.00	-0.10
Bile ducts, other biliary	0	0.00	1	1.80	1	2.88	0	0.00	2	1.75	1.14	0.02
Pancreas	1	0.33	5	1.54	1	0.51	2	1.13	9	9.95	0.90	-0.09
<b>Respiratory system</b>	19	0.88	19	0.81	12	0.86	7	0.56	57	71.51	0.80	-1.37
Nose, nasal cavity, ear	0	0.00	1	4.14	1	6.77	0	0.00	2	0.72	2.78	0.12
Larynx	0	0.00	0	0.00	2	1.97	0	0.00	2	5.30	0.38	-0.31
Lung, bronchus	19	0.96	18	0.85	9	0.71	7	0.61	53	65.19	0.81	-1.15
<b>Female breast</b>	8	0.56	24	1.16	10	0.70	5	0.37*	47	62.79	0.75*	-3.28
<b>Female genital system</b>	5	0.74	4	0.42	5	0.82	4	0.70	18	28.01	0.64	-2.08
Cervix uteri	0	0.00	0	0.00	3	2.59	0	0.00	3	5.00	0.60	-0.42
Corpus uteri	3	0.89	3	0.71	1	0.38	1	0.41	8	12.71	0.63	-0.98
Ovary	2	1.03	1	0.36	0	0.00	3	1.68	6	8.42	0.71	-0.50
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.07
Vulva	0	0.00	0	0.00	1	4.58	0	0.00	1	0.99	1.01	0.00
<b>Male genital system</b>	12	0.57*	18	0.84	17	1.29	11	0.77	58	69.96	0.83	-2.07
Prostate	11	0.54*	16	0.80	17	1.39	10	0.75	54	65.81	0.82	-2.04
Testis	1	1.95	2	1.51	0	0.00	1	1.10	4	3.63	1.10	0.06
<b>Urinary system</b>	8	0.85	12	1.17	5	0.81	7	1.21	32	31.73	1.01	0.03
Urinary bladder	5	0.79	6	0.92	2	0.51	4	1.10	17	20.41	0.83	-0.32
Kidney parenchyma	3	1.16	4	1.27	2	1.02	3	1.62	12	9.55	1.26	0.23
Renal pelvis, other urinary	0	0.00	2	3.45	1	3.00	0	0.00	3	1.78	1.69	0.12
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.05
<b>Bone, joints</b>	0	0.00	8	23.30*	4	16.55*	0	0.00	12	0.97	12.38*	1.04
<b>Soft tissue including heart</b>	0	0.00	4	4.54*	7	12.39*	2	3.75	13	2.56	5.07*	0.99
<b>Kaposi sarcoma</b>	2	3.98	0	0.00	0	0.00	0	0.00	2	3.33	0.60	-0.13
<b>Melanoma of skin</b>	5	1.38	11	1.93	5	1.31	5	1.31	26	16.95	1.53*	0.85
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	6.90	1	0.81	1.23	0.02
<b>Brain, central nervous system</b>	6	3.49*	12	4.76*	16	10.30*	13	9.55*	47	7.15	6.57*	3.76
<b>Thyroid</b>	1	0.89	7	3.21*	5	3.30*	1	0.64	14	6.39	2.19*	0.72
<b>Lymphatic, hematopoietic</b>	8	0.83	21	1.67*	13	1.64	7	0.94	49	37.52	1.31	1.08
Hodgkin lymphoma	0	0.00	1	0.81	0	0.00	0	0.00	1	3.49	0.29	-0.24
Non-Hodgkin lymphoma	4	0.91	5	0.87	1	0.27	3	0.83	13	17.48	0.74	-0.42
Myeloma	2	1.40	1	0.63	2	2.06	1	1.11	6	4.89	1.23	0.11
Leukemia	2	0.62	14	3.55*	10	4.21*	3	1.41	29	11.66	2.49*	1.64
Acute lymphocytic	0	0.00	0	0.00	2	8.03	1	5.82	3	1.10	2.72	0.18
Chronic lymphocytic	1	0.84	2	1.60	3	3.99	1	1.47	7	3.87	1.81	0.30
Acute non-lymphocytic	0	0.00	8	6.02*	4	4.88*	1	1.31	13	3.98	3.27*	0.85
Chronic myeloid	0	0.00	4	7.17*	0	0.00	0	0.00	4	1.66	2.41	0.22

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 48,074 PYR and for male cancers on 57,847 PYR.

## Brain and Other CNS Females

**Table 14.1.3:** Risk of subsequent primary cancers after cancer of the brain or other central nervous system, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	13,602	7,974	64	1.00	49	1.16	43	1.07	193	192.83	1.00	0.04
All excluding same site	13,602	7,974	59	0.94	44	1.05	33	0.84	173	190.12	0.91	-3.56
<b>Buccal cavity, pharynx</b>	1	1.15	0	0.00	4	5.50*	1	1.53	6	3.39	1.77	0.54
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.04
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.16
Salivary gland	0	0.00	0	0.00	1	9.69	1	10.02	2	0.46	4.38	0.32
Mouth	0	0.00	0	0.00	2	8.84	0	0.00	2	1.08	1.86	0.19
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.04
Tonsil	1	11.67	0	0.00	1	14.71	0	0.00	2	0.32	6.23	0.35
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.02
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.05
<b>Digestive system</b>	6	0.66	12	1.11	8	1.17	8	1.29	34	33.00	1.03	0.21
Esophagus	0	0.00	0	0.00	1	5.30	1	5.75	2	0.93	2.15	0.22
Stomach	1	1.44	0	0.00	2	3.85	0	0.00	3	2.51	1.20	0.10
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.12
Colon	2	0.45	9	1.73	1	0.31	5	1.72	17	15.82	1.07	0.25
Rectum, rectosigmoid junction	2	1.29	1	0.54	3	2.55	1	0.95	7	5.64	1.24	0.28
Rectum	2	1.99	1	0.82	3	3.87	0	0.00	6	3.70	1.62	0.48
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.12
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.81	0.00	-0.17
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.15
Bile ducts, other biliary	0	0.00	1	4.40	0	0.00	0	0.00	1	0.71	1.41	0.06
Pancreas	1	0.85	1	0.73	1	1.15	1	1.26	4	4.20	0.95	-0.04
<b>Respiratory system</b>	10	1.68	5	0.67	3	0.61	3	0.63	21	23.00	0.91	-0.42
Nose, nasal cavity, ear	0	0.00	1	11.64	0	0.00	0	0.00	1	0.26	3.92	0.15
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-0.18
Lung, bronchus	10	1.77	4	0.57	3	0.64	3	0.67	20	21.82	0.92	-0.38
<b>Female breast</b>	8	0.56	24	1.16	10	0.70	5	0.37*	47	62.79	0.75*	-3.28
<b>Female genital system</b>	5	0.74	4	0.42	5	0.82	4	0.70	18	28.01	0.64	-2.08
Cervix uteri	0	0.00	0	0.00	3	2.59	0	0.00	3	5.00	0.60	-0.42
Corpus uteri	3	0.89	3	0.71	1	0.38	1	0.41	8	12.71	0.63	-0.98
Ovary	2	1.03	1	0.36	0	0.00	3	1.68	6	8.42	0.71	-0.50
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.07
Vulva	0	0.00	0	0.00	1	4.58	0	0.00	1	0.99	1.01	0.00
<b>Urinary system</b>	0	0.00	2	0.80	1	0.61	3	1.93	6	7.71	0.78	-0.36
Urinary bladder	0	0.00	0	0.00	0	0.00	2	2.43	2	4.20	0.48	-0.46
Kidney parenchyma	0	0.00	2	2.08	1	1.55	1	1.58	4	2.96	1.35	0.22
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.11
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.03
<b>Bone, joints</b>	0	0.00	2	15.53*	2	21.31*	0	0.00	4	0.37	10.85*	0.76
<b>Soft tissue including heart</b>	0	0.00	0	0.00	4	17.10*	0	0.00	4	1.02	3.94*	0.62
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.01
<b>Melanoma of skin</b>	1	0.82	2	0.87	1	0.60	3	1.76	7	6.88	1.02	0.02
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	15.96	1	0.32	3.08	0.14
<b>Brain, central nervous system</b>	0	0.00	5	5.32*	5	8.14*	10	18.09*	20	2.71	7.39*	3.60
<b>Thyroid</b>	0	0.00	1	0.67	3	2.77	0	0.00	4	4.43	0.90	-0.09
<b>Lymphatic, hematopoietic</b>	3	0.88	6	1.28	2	0.64	4	1.34	15	14.18	1.06	0.17
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.37	0.00	-0.29
Non-Hodgkin lymphoma	2	1.24	1	0.46	0	0.00	2	1.40	5	6.66	0.75	-0.35
Myeloma	1	1.88	0	0.00	0	0.00	1	2.65	2	1.95	1.03	0.01
Leukemia	0	0.00	5	3.51*	2	2.21	1	1.23	8	4.20	1.91	0.79
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.08
Chronic lymphocytic	0	0.00	1	2.38	1	3.78	1	4.18	3	1.29	2.32	0.36
Acute non-lymphocytic	0	0.00	3	5.67*	1	2.87	0	0.00	4	1.58	2.53	0.50
Chronic myeloid	0	0.00	1	4.93	0	0.00	0	0.00	1	0.61	1.65	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 14.1.4:** Risk of subsequent primary cancers after cancer of the brain or other central nervous system, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	76	0.99	109	1.31*	76	1.54*	42	0.90	303	255.85	1.18*	8.15
All excluding same site	70	0.93	102	1.25*	65	1.34*	39	0.85	276	251.40	1.10	4.25
<b>Buccal cavity, pharynx</b>	1	0.35	2	0.62	3	1.63	2	1.28	8	9.49	0.84	-0.26
Lip	0	0.00	0	0.00	1	3.88	0	0.00	1	1.43	0.70	-0.07
Tongue	1	1.76	1	1.49	0	0.00	0	0.00	2	1.98	1.01	0.00
Salivary gland	0	0.00	1	4.20	1	6.93	1	7.45	3	0.72	4.19	0.39
Mouth	0	0.00	0	0.00	1	2.37	1	2.96	2	2.21	0.91	-0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.09
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.09	0.00	-0.19
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.17
<b>Digestive system</b>	17	1.07	16	0.97	10	1.05	8	0.93	51	50.56	1.01	0.08
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	3.53	0.00	-0.61
Stomach	6	3.31*	3	1.61	1	0.94	0	0.00	10	5.66	1.77	0.75
Small intestine	0	0.00	0	0.00	1	5.87	0	0.00	1	0.85	1.18	0.03
Colon	11	1.69	6	0.92	4	1.06	4	1.17	25	20.22	1.24	0.83
Rectum, rectosigmoid junction	0	0.00	2	0.63	3	1.64	1	0.61	6	9.74	0.62	-0.65
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.09
Liver	0	0.00	1	1.26	0	0.00	1	2.10	2	2.44	0.82	-0.08
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.06
Bile ducts, other biliary	0	0.00	0	0.00	1	5.10	0	0.00	1	1.04	0.96	-0.01
Pancreas	0	0.00	4	2.13	0	0.00	1	1.03	5	5.76	0.87	-0.13
<b>Respiratory system</b>	9	0.57	14	0.88	9	1.00	4	0.51	36	48.51	0.74	-2.16
Nose, nasal cavity, ear	0	0.00	0	0.00	1	10.88	0	0.00	1	0.46	2.16	0.09
Larynx	0	0.00	0	0.00	2	2.39	0	0.00	2	4.46	0.45	-0.43
Lung, bronchus	9	0.64	14	0.98	6	0.75	4	0.57	33	43.37	0.76	-1.79
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.09
<b>Male genital system</b>	12	0.57*	18	0.84	17	1.29	11	0.77	58	69.96	0.83	-2.07
Prostate	11	0.54*	16	0.80	17	1.39	10	0.75	54	65.81	0.82	-2.04
Testis	1	1.95	2	1.51	0	0.00	1	1.10	4	3.63	1.10	0.06
<b>Urinary system</b>	8	1.07	10	1.29	4	0.88	4	0.94	26	24.02	1.08	0.34
Urinary bladder	5	0.97	6	1.16	2	0.66	2	0.71	15	16.20	0.93	-0.21
Kidney parenchyma	3	1.60	2	0.92	1	0.76	2	1.63	8	6.59	1.21	0.24
Renal pelvis, other urinary	0	0.00	2	5.01	1	4.51	0	0.00	3	1.23	2.44	0.31
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.07
<b>Bone, joints</b>	0	0.00	6	27.95*	2	13.53*	0	0.00	8	0.60	13.32*	1.28
<b>Soft tissue including heart</b>	0	0.00	4	7.45*	3	9.06*	2	6.53	9	1.55	5.81*	1.29
<b>Kaposi sarcoma</b>	2	4.08	0	0.00	0	0.00	0	0.00	2	3.28	0.61	-0.22
<b>Melanoma of skin</b>	4	1.67	9	2.64*	4	1.85	2	0.95	19	10.07	1.89*	1.54
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.49	0.00	-0.08
<b>Brain, central nervous system</b>	6	5.36*	7	4.43*	11	11.72*	3	3.71	27	4.45	6.07*	3.90
<b>Thyroid</b>	1	2.35	6	8.76*	2	4.63	1	2.42	10	1.96	5.11*	1.39
<b>Lymphatic, hematopoietic</b>	5	0.80	15	1.91*	11	2.29*	3	0.67	34	23.34	1.46*	1.84
Hodgkin lymphoma	0	0.00	1	1.31	0	0.00	0	0.00	1	2.12	0.47	-0.19
Non-Hodgkin lymphoma	2	0.72	4	1.11	1	0.44	1	0.46	8	10.82	0.74	-0.49
Myeloma	1	1.11	1	1.05	2	3.56	0	0.00	4	2.94	1.36	0.18
Leukemia	2	0.93	9	3.57*	8	5.44*	2	1.53	21	7.46	2.81*	2.34
Acute lymphocytic	0	0.00	0	0.00	2	12.69*	1	9.25	3	0.70	4.27	0.40
Chronic lymphocytic	1	1.21	1	1.20	2	4.11	0	0.00	4	2.58	1.55	0.24
Acute non-lymphocytic	0	0.00	5	6.25*	3	6.35*	1	2.29	9	2.40	3.75*	1.14
Chronic myeloid	0	0.00	3	8.45*	0	0.00	0	0.00	3	1.06	2.84	0.34

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Brain and Other CNS Both Sexes, <17 Years of Age

**Table 14.1.5:** Risk of subsequent primary cancers after cancer of the brain or other central nervous system, both sexes, <17 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4	8.24*	17	10.61*	18	10.77*	15	3.43*	54	8.13	6.64*	14.39
All excluding same site	3	7.77*	11	8.44*	13	8.93*	7	1.70	34	7.25	4.69*	8.39
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	2	61.44*	0	0.00	2	0.15	13.53*	0.58
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Salivary gland	0	0.00	0	0.00	1	78.90*	0	0.00	1	0.05	19.77	0.30
Mouth	0	0.00	0	0.00	1	168.74*	0	0.00	1	0.02	40.02	0.31
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Digestive system</b>	1	60.49	1	23.18	2	47.71*	1	4.74	5	0.31	16.00*	1.47
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Colon	1	†	0	0.00	0	0.00	0	0.00	1	0.09	10.57	0.28
Rectum, rectosigmoid junction	0	0.00	0	0.00	2	332.98*	0	0.00	2	0.05	39.45*	0.61
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.01
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Pancreas	0	0.00	1	†	0	0.00	1	68.70	2	0.02	101.07*	0.62
<b>Respiratory system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.04
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Lung, bronchus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.02
<b>Female breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.26
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.41
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.17
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.03
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.18
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
<b>Male genital system</b>	0	0.00	0	0.00	0	0.00	1	2.27	1	0.65	1.53	0.20
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Testis	0	0.00	0	0.00	0	0.00	1	2.30	1	0.64	1.57	0.21
<b>Urinary system</b>	0	0.00	0	0.00	1	30.84	0	0.00	1	0.22	4.53	0.24
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.02
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.05
Renal pelvis, other urinary	0	0.00	0	0.00	1	†	0	0.00	1	0.00	300.22*	0.31
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Bone, joints</b>	0	0.00	3	30.44*	2	20.20*	0	0.00	5	0.31	15.89*	1.47
<b>Soft tissue including heart</b>	0	0.00	2	22.64*	3	38.93*	1	8.66	6	0.31	19.38*	1.78
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.06
<b>Melanoma of skin</b>	1	111.04*	0	0.00	0	0.00	1	1.87	2	0.73	2.74	0.40
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	1	87.21*	1	0.06	17.23	0.30
<b>Brain, central nervous system</b>	1	10.07	6	20.09*	5	23.15*	8	30.76*	20	0.87	22.88*	6.00
<b>Thyroid</b>	0	0.00	0	0.00	1	7.95	1	2.38	2	0.62	3.23	0.43
<b>Lymphatic, hematopoietic</b>	1	5.07	5	7.76*	2	3.41	1	1.02	9	2.41	3.74*	2.07
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.84	0.00	-0.26
Non-Hodgkin lymphoma	1	32.45	0	0.00	0	0.00	1	3.12	2	0.60	3.31	0.44
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Leukemia	0	0.00	5	13.64*	2	9.08*	0	0.00	7	0.96	7.33*	1.90
Acute lymphocytic	0	0.00	0	0.00	2	14.88*	0	0.00	2	0.59	3.37	0.44
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Acute non-lymphocytic	0	0.00	3	38.78*	0	0.00	0	0.00	3	0.27	11.22*	0.86
Chronic myeloid	0	0.00	2	162.46*	0	0.00	0	0.00	2	0.07	29.57*	0.61

\*P < 0.05. †O/E > 500. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 14,484 PYR and for male cancers on 17,402 PYR.

**Table 14.1.6:** Risk of subsequent primary cancers after cancer of the brain or other central nervous system, both sexes, ≥17 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	109	0.89	156	1.07	107	1.19	70	0.85	442	440.55	1.00	0.20
All excluding same site	104	0.86	150	1.05	96	1.08	65	0.80	415	434.27	0.96	-2.60
<b>Buccal cavity, pharynx</b>	2	0.54	2	0.46	5	1.97	3	1.41	12	12.73	0.94	-0.10
Lip	0	0.00	0	0.00	1	3.38	0	0.00	1	1.60	0.62	-0.08
Tongue	1	1.31	1	1.09	0	0.00	0	0.00	2	2.72	0.73	-0.10
Salivary gland	0	0.00	1	2.62	1	4.26	2	9.63*	4	1.12	3.57	0.39
Mouth	0	0.00	0	0.00	2	3.11	1	1.91	3	3.26	0.92	-0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.09
Tonsil	1	2.59	0	0.00	1	3.44	0	0.00	2	1.41	1.42	0.08
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.05
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.20	0.00	-0.16
<b>Digestive system</b>	22	0.88	27	0.99	16	0.98	15	1.03	80	83.25	0.96	-0.44
Esophagus	0	0.00	0	0.00	1	1.16	1	1.26	2	4.45	0.45	-0.33
Stomach	7	2.79*	3	1.11	3	1.90	0	0.00	13	8.14	1.60	0.66
Small intestine	0	0.00	0	0.00	1	3.40	0	0.00	1	1.41	0.71	-0.06
Colon	12	1.10	15	1.28	5	0.71	9	1.44	41	35.94	1.14	0.68
Rectum, rectosigmoid junction	2	0.43	3	0.60	4	1.33	2	0.76	11	15.34	0.72	-0.59
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.10	0.00	-0.15
Liver	0	0.00	1	0.96	0	0.00	1	1.59	2	3.20	0.63	-0.16
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.14
Bile ducts, other biliary	0	0.00	1	1.80	1	2.89	0	0.00	2	1.74	1.15	0.03
Pancreas	1	0.33	4	1.24	1	0.52	1	0.57	7	9.93	0.70	-0.40
<b>Respiratory system</b>	19	0.88	19	0.81	12	0.87	7	0.56	57	71.37	0.80	-1.94
Nose, nasal cavity, ear	0	0.00	1	4.22	1	6.97	0	0.00	2	0.70	2.86	0.18
Larynx	0	0.00	0	0.00	2	1.97	0	0.00	2	5.29	0.38	-0.45
Lung, bronchus	19	0.96	18	0.85	9	0.71	7	0.61	53	65.12	0.81	-1.64
<b>Female breast</b>	8	0.56	24	1.16	10	0.70	5	0.38*	47	62.41	0.75	-4.59
<b>Female genital system</b>	5	0.74	4	0.43	5	0.83	4	0.76	18	27.42	0.66	-2.80
Cervix uteri	0	0.00	0	0.00	3	2.65	0	0.00	3	4.75	0.63	-0.52
Corpus uteri	3	0.89	3	0.71	1	0.38	1	0.42	8	12.67	0.63	-1.39
Ovary	2	1.03	1	0.36	0	0.00	3	1.85	6	8.15	0.74	-0.64
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.10
Vulva	0	0.00	0	0.00	1	4.63	0	0.00	1	0.98	1.02	0.01
<b>Male genital system</b>	12	0.57	18	0.84	17	1.30	10	0.72	57	69.30	0.82	-3.04
Prostate	11	0.54*	16	0.80	17	1.39	10	0.75	54	65.80	0.82	-2.92
Testis	1	1.99	2	1.57	0	0.00	0	0.00	3	3.00	1.00	0.00
<b>Urinary system</b>	8	0.85	12	1.18	4	0.65	7	1.23	31	31.51	0.98	-0.07
Urinary bladder	5	0.79	6	0.92	2	0.51	4	1.11	17	20.34	0.84	-0.45
Kidney parenchyma	3	1.17	4	1.30	2	1.03	3	1.66	12	9.40	1.28	0.35
Renal pelvis, other urinary	0	0.00	2	3.46	0	0.00	0	0.00	2	1.77	1.13	0.03
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.08
<b>Bone, joints</b>	0	0.00	5	20.42*	2	14.02*	0	0.00	7	0.65	10.70*	0.86
<b>Soft tissue including heart</b>	0	0.00	2	2.52	4	8.20*	1	2.39	7	2.26	3.10*	0.64
<b>Kaposi sarcoma</b>	2	3.98	0	0.00	0	0.00	0	0.00	2	3.14	0.64	-0.15
<b>Melanoma of skin</b>	4	1.11	11	1.95	5	1.36	4	1.22	24	16.22	1.48	1.05
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.10
<b>Brain, central nervous system</b>	5	3.09	6	2.70	11	8.23*	5	4.54*	27	6.28	4.30*	2.80
<b>Thyroid</b>	1	0.89	7	3.31*	4	2.88	0	0.00	12	5.77	2.08*	0.84
<b>Lymphatic, hematopoietic</b>	7	0.74	16	1.35	11	1.50	6	0.93	40	35.12	1.14	0.66
Hodgkin lymphoma	0	0.00	1	0.93	0	0.00	0	0.00	1	2.66	0.38	-0.22
Non-Hodgkin lymphoma	3	0.69	5	0.88	1	0.28	2	0.61	11	16.88	0.65	-0.79
Myeloma	2	1.40	1	0.63	2	2.06	1	1.12	6	4.88	1.23	0.15
Leukemia	2	0.65	9	2.51*	8	3.71*	3	1.59	22	10.71	2.06*	1.53
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	11.37	1	0.51	1.96	0.07
Chronic lymphocytic	1	0.84	2	1.60	3	4.00	1	1.48	7	3.87	1.81	0.42
Acute non-lymphocytic	0	0.00	5	3.99*	4	5.31*	1	1.50	10	3.71	2.70*	0.85
Chronic myeloid	0	0.00	2	3.67	0	0.00	0	0.00	2	1.59	1.25	0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 33,590 PYR and for male cancers on 40,445 PYR.





# Chapter 15

## New Malignancies Following Cancer of the Thyroid and Other Endocrine Glands

Cécile M. Ronckers, Peter McCarron, Eric A. Engels, Elaine Ron

### Synopsis

The risk of subsequent primary cancers was evaluated in 31,230 survivors of cancers of the thyroid and other endocrine glands, diagnosed between 1973 and 2000. We found an 11% increased risk of subsequent cancers among 29,456 survivors of thyroid cancer ( $O/E=1.11$ ,  $O=2,214$ ,  $EAR=8$  per 10,000 person-years). For up to 15 years after initial diagnosis, thyroid cancer patients were at increased risk of developing a subsequent thyroid cancer as well as a variety of other malignancies—including cancers of the salivary glands, trachea, female breast, prostate, scrotum, kidney parenchyma, adrenal glands, brain and central nervous system, and hematopoietic malignancies. Although some new cancers (e.g., leukemia) may be associated with radiotherapy, the pattern for others suggests the role of increased medical surveillance, shared risk factors, and/or genetic susceptibility. The overall risk of subsequent malignancy in 811 survivors of adrenal gland cancer (excluding neuroblastoma) was increased almost 2-fold ( $O/E=1.76$ ,  $O=57$ ,  $EAR=71$ ), with excesses observed for cancers of the lung, prostate, and bladder. Also seen was a pronounced excess of subsequent cancers that are characteristic of Li-Fraumeni syndrome among young patients with adrenal carcinoma. Following pheochromocytoma, only kidney cancer risk was elevated, with no overall increase in cancer risk. Among 963 survivors of thymus cancer, the overall risk of subsequent malignancy was elevated ( $O/E=1.53$ ,  $O=91$ ,  $EAR=60$ ), with increased risks observed for cancers of the salivary glands and digestive system, soft tissue sarcoma, and non-Hodgkin lymphoma. The latter may have been related to altered immunity associated with thymoma or to misclassified thymoma.

### Thyroid Cancer

Currently, thyroid cancer accounts for 1.9% of the estimated new cancer cases in the U.S., with rates increasing in recent decades (Howe et al, 2001; Jemal et al, 2005). Three in 4 patients are female, 83% are white, 5% are black, and 9% are of Asian descent. Most thyroid malignancies are papillary (78%) or follicular (15%) adenocarcinomas. The median age at thyroid cancer

diagnosis in our survey was 43.3 years, which is young compared with other malignancies, but age at diagnosis varies by histology. Treatment for differentiated thyroid cancer typically consists of surgery followed by iodine-131 ( $^{131}I$ ) ablation and sometimes includes subsequent external beam radiotherapy (Gimm, 2001). According to a 1996 survey, more than 50% of U.S. patients with differentiated thyroid cancer received treatment with  $^{131}I$ , whereas more than 70% of the relatively few patients with undifferentiated (primarily anaplastic) thyroid cancer received external beam radiotherapy (Hundahl et al, 2000). The overall 5- and 10-year relative survival rates are both close to 95%, although anaplastic thyroid cancer is among the most aggressive and fatal cancers, with a median survival of less than 6 months (Gimm, 2001).

Childhood radiation exposure to the head and neck area is a well-established risk factor for both papillary thyroid cancer and, to a lesser extent, follicular thyroid cancer (Ron et al, 1995). A history of benign thyroid nodules is associated with increased risk of papillary and follicular thyroid cancer (Franceschi et al, 1999). In women, there are weak associations with late menarche, late age at first birth (Negri et al, 1999), and oral contraceptive use (LaVecchia et al, 1999). Smoking is associated with a decreased risk (Mack et al, 2003). Papillary thyroid cancer has been associated with specific rearrangements of the *RET* proto-oncogene (Segev et al, 2003). Familial occurrences of non-medullary thyroid cancer have been described, although the role of genetic predisposition is unclear except for a few genetic syndromes, such as Cowden disease and familial adenomatous polyposis (Eng, 2000a).

Sparsely available epidemiologic data suggest that medullary thyroid cancer is associated with prior medical conditions such as thyroid nodules, hypertension, gallbladder disease, and allergies (Negri et al, 2002). Approximately 20% of medullary thyroid cancers show a familial tendency as part of the genetic syndrome

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as  $[(O-E)/PYR] \times 10,000$ ).*

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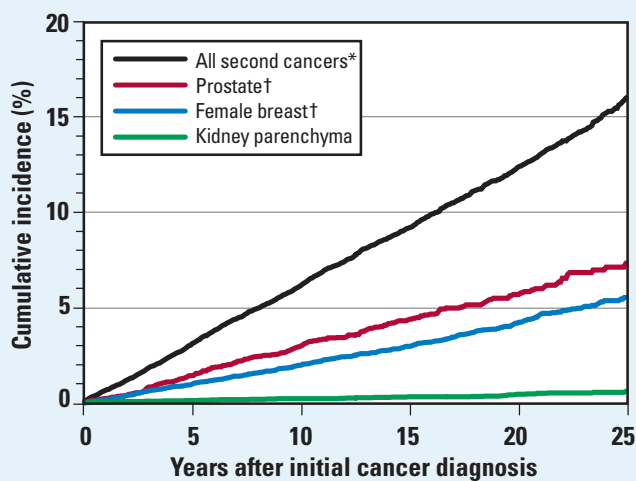
multiple endocrine neoplasia (MEN) type 2, caused by germline mutations of *RET* (Eng, 2000b).

### Results and Discussion

Of 29,456 thyroid cancer patients surviving 2 months or more, 95% were treated with surgery, and slightly more than one-third received radiotherapy. We observed a small overall increased risk of subsequent cancers (O/E=1.11, O=2,214, 95% CI=1.06-1.15, EAR=8 per 10,000 person-years). The cumulative incidence of developing any second cancer following thyroid cancer, adjusted for the competing risk of death from other causes, was 15.9% at 25 years (95% CI=15.0%-16.8%) (Figure 15.1). Risk varied by time since thyroid cancer diagnosis, with the highest risk (26%) seen in the first year, mainly for subsequent thyroid and stomach cancers. Increased medical surveillance may explain the elevated risks in the early years but not the persistent elevation throughout the follow-up period. Patients younger than 40 years of age at thyroid cancer diagnosis had a 39% increased risk of subsequent cancer, whereas the average increase was only 6% among thyroid patients 40 years or older (Figure 15.2). The relative risk for all malignancies combined was similar for males and females, but the excess absolute risk was 12 for males and 6 for females. There were no major differences in risk by race. The overall risks of subsequent cancer following papillary and follicular thyroid cancer were similar, whereas no increased risk was observed following medullary thyroid cancer. A total of 50 patients developed a new primary thyroid cancer according to the SEER registry coding definitions. In clinical practice, however, the majority of these new cases would be considered recurrences, except for the 5 cases that had clearly different histologies for the first and subsequent thyroid malignancies. Thus the risk estimate for subsequent thyroid cancer was likely inflated due to misdiagnosis of recurrent cancers as new primary cancers. When we repeated our analyses of subsequent cancer risk excluding all individuals with a second thyroid cancer, the overall result was similar (O/E=1.10).

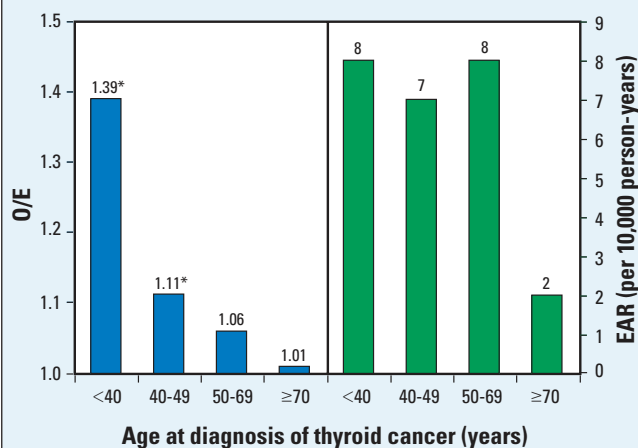
Breast cancer accounted for 36% of all cancers following thyroid cancer in females and constituted the highest absolute excess risk among women (EAR=4). The significantly elevated risk (O/E=1.21) was in agreement with some studies (Vassilopoulou-Sellin et al, 1999; Simon et al, 2002; Adjadj et al, 2003), but not all (Hall et al, 1990; Hemminki and Jiang, 2001; Sadetzki et al, 2003). Risk was elevated throughout the follow-up period, but it was most pronounced 1 to 5 years following thyroid cancer diagnosis. The reciprocal risk of thyroid cancer among breast cancer survivors was elevated 30%. The 1.4-fold increase in risk of developing breast cancer among women who were less than 40 years of age at thyroid cancer diagnosis suggests an influence of hormonal or genetic factors or both. This mechanism would be consistent with the elevated risk of endocrine-dependent cancers reported among first-degree relatives of patients with non-medullary thyroid cancer (Pal et al, 2001). Although Cowden disease features both breast

**Figure 15.1:** Cumulative incidence of developing a second cancer among patients with cancer of the thyroid, both sexes, SEER 1973-2000.



\* Cumulative incidence for all second cancers at 25 years is 20.3% for males and 14.2% for females.  
 † Prostate and female breast cancer curves are based on male and female thyroid cancer patients, respectively.

**Figure 15.2:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after thyroid cancer, both sexes, SEER 1973-2000.



\*P <0.05.  
 Notes: EAR = Excess number of subsequent cancers per 10,000 person-years. Observed number of subsequent cancers are 397, 423, 1,084 and 310, for age groups <40, 40-49, 50-69 and ≥70 years, respectively.

and follicular thyroid cancer (Eng, 2000b), the excess risk of subsequent breast cancer was similar following papillary or follicular thyroid cancer in our survey.

Among males, the highest absolute risk following thyroid cancer was observed for prostate cancer (EAR=9). The excess risk was restricted to the first 10 years after diagnosis of papillary thyroid cancer, which may reflect increased surveillance and detection of otherwise indolent prostate tumors. An increased risk of thyroid cancer following prostate cancer was also observed; however, the elevation in risk was concentrated in the first year following prostate cancer diagnosis.

In agreement with 2 other large studies (Hemminki and Jiang, 2001; Rubino et al, 2003), we found a more-than-2-fold increase in risk for kidney parenchyma cancer following papillary and follicular thyroid cancer. In addition, consistent with the findings of Hall et al (1990), we noted a 2-fold increase in risk of renal pelvis cancer, which appeared to be higher in males and in those with follicular thyroid cancer. Survivors of kidney parenchyma cancer had an almost 3-fold increased risk of thyroid cancer. The mechanisms underlying the complex of thyroid and kidney cancers are unclear but may reflect a heritable cancer syndrome, such as that described for the combination of papillary thyroid cancer and papillary renal neoplasia (Eng, 2000b). In our series, we could not evaluate risk for the renal papillary histologic type separately, because most of these tumors were registered under the more general category of renal cell carcinoma. On rare occasions, renal cancers may metastasize to the thyroid and may be hard to distinguish from primary thyroid cancer (Heffess et al, 2002).

Unlike most other malignancies, the predominant form of radiotherapy for thyroid cancer consists of  $^{131}\text{I}$  treatment rather than external beam radiation. Information on type of radiotherapy has been reported in SEER since 1988. Of 17,055 thyroid cancer patients diagnosed between 1988 and 2000, 6,745 (40%) were treated with  $^{131}\text{I}$ , 614 (4%) with beam radiation, and 185 (1%) with a combination of modalities, which suggests underreporting of  $^{131}\text{I}$  treatment. The thyroid receives the highest dose of iodine by far, but  $^{131}\text{I}$  also concentrates in other organs, such as the salivary glands, stomach, small intestine, and bladder (ICRP, 1987; Ron, 1997). Although the dose to the bone marrow is lower, leukemia has been reported following  $^{131}\text{I}$  therapy (Ron, 1997). However, bone marrow is known to be very sensitive to external radiation (Preston et al, 1994). Following  $^{131}\text{I}$  treatment, we found increased risks of stomach cancer (O/E=2.41, O=8) and non-chronic lymphocytic leukemia (O/E=3.69, O=11). For the combined group of non-chronic lymphocytic leukemia and cancers of the salivary glands, stomach, small intestine, and bladder, we found an almost 2-fold increased risk among patients treated with  $^{131}\text{I}$  (O/E=1.92, O=29). A pooled study of 4,225 European patients with thyroid cancer treated with  $^{131}\text{I}$  also showed increased risks for leukemia and salivary gland malignancies (Rubino et al, 2003).

The lower-than-expected rates of lung and bronchus carcinoma in survivors of thyroid cancer compared to the general U.S. population may reflect a low prevalence of smoking among thyroid cancer patients relative to the general population. Thyroid cancer is one of the few cancers reported to be inversely associated with smoking (Mack et al, 2003). Decreased O/E ratios were observed for most other smoking-related cancers, including cancers of the buccal cavity (excluding the salivary glands), larynx, esophagus, pancreas, cervix, and bladder, although not all risks were statistically significant. In contrast, based on 5 cases, a 14-fold increased risk of tracheal cancer was observed, possibly related to diag-

nostic misclassification of metastatic thyroid cancer presenting as endotracheal nodules (Datta and Lahiri, 2002).

An increased risk of adrenal cancer was seen (O/E=4.72, O=4), in particular following medullary thyroid cancer (O/E=70.42, O=2), consistent with MEN type 2, which features pheochromocytoma in addition to medullary thyroid cancer. In addition, an 8-fold increased risk for scrotal cancer was observed (O/E=11.58, O=3), as well as an increased reciprocal risk, but the reasons are unclear. In addition, female thyroid cancer patients had a 1.6-fold increased risk for brain cancer (O/E=1.64, O=24), although no clear pattern by brain tumor histologic subtype was observed. Finally, salivary gland cancers occurred in excess (O/E=2.78, O=13), but this did not appear to be a radiation effect.

## Cancer of the Adrenal Glands

Malignant neoplasms of the adrenal glands are extremely rare and heterogeneous tumors (Correa and Chen, 1995), accounting for less than 0.05% of cancers in the U.S. (We have excluded childhood neuroblastomas, which are discussed elsewhere in this volume.) Adrenal gland cancers occur almost as frequently in men as in women, and the median age at diagnosis is 54.6 years. The most common histologic subtypes for adults are adrenocortical carcinoma and pheochromocytoma, which arises in the medulla. The 5-year relative survival rate is 47.9%. The mainstay of treatment is surgical resection, often supplemented with adjuvant chemotherapy (Kopf et al, 2001).

The etiology of adrenocortical cancers is largely unknown, but there is limited evidence that cigarette smoking and oral contraceptive use increase risk (Hsing et al, 1996). Most cases are sporadic, except for a familial tendency for childhood cases, often arising in combination with other tumors constituting Li-Fraumeni syndrome (Li et al, 1988). Approximately 90% of pheochromocytomas are sporadic tumors, with the remaining 10% arising as a component of the genetic syndrome MEN type 2 (Klingler et al, 2001).

## Results and Discussion

Of 811 individuals with adrenal cancer who survived at least 2 months, 81% were diagnosed with carcinomas. Malignant pheochromocytoma occurred in 14%, and the remaining 5% presented with other histologic types. Overall, patients with adrenal gland cancers were at elevated risk of subsequent malignancies (O/E=1.76, O=57, 95% CI=1.33-2.27, EAR=71), with a 2-fold excess for men. The cumulative incidence of any second cancer following adrenal cancer was 8.3% at 15 years (95% CI=6.1%-10.8%). Increased risks were found for lung and bladder cancers for both sexes combined, and for prostate cancers among men. Together these cancers accounted for almost half of the subsequent malignancies. Among women, an elevated risk was observed only for melanoma (O/E=8.10, O=3), but the excess was found only in the first year following adrenal cancer diagnosis.



Analysis by histology highlighted differences in the risk of subsequent primary cancers. Among patients with adrenal carcinoma, there was a 2-fold overall increased risk of subsequent cancer (O/E=2.04, O=48), particularly in the first year after diagnosis. Increased risks were observed for smoking-related cancers, including lung (O/E=2.70) and bladder (O/E=5.50), which is consistent with the association reported between adrenal carcinoma and smoking (Hsing et al, 1996). There also was an elevated risk of prostate cancer (O/E=2.58), especially in the first year, suggesting an effect of increased medical surveillance. Patients younger than 45 years of age at adrenal carcinoma diagnosis had a particularly high risk of subsequent cancer (O/E=5.32, O=10), whereas among those 45 years and older the risk was lower (O/E=1.76, O=38). In particular, young patients had a 10-fold increased risk (O/E=10.89, O=5) for the combined group of tumors characteristic of Li-Fraumeni syndrome, notably adrenocortical cancer, breast cancer, bone and soft tissue sarcoma, brain tumor, and acute leukemia (Nichols et al, 2001).

Following pheochromocytoma, the overall risk of subsequent cancers was not elevated. However, based on only 2 cases, a significant excess risk was found for kidney parenchyma cancer (O/E=12.6), consistent with recent population-based findings (Hemminki and Jiang, 2001) and possibly related to the von Hippel-Lindau syndrome, which genetically predisposes to renal adenocarcinomas as well as pheochromocytoma.

## Cancer of the Thymus

The thymus is the site of maturation for T lymphocytes, which play a central role in adaptive immunity. The thymus is large in childhood and begins to atrophy in adolescence, although it maintains some activity throughout life (Douek et al, 1998). Malignant neoplasms of the thymus are rare (0.3 incident cases per 100,000 person-years) and occur slightly more often in men than women (Ries et al, 2004). The median age at diagnosis is 55.3 years. The most common histologic type is thymoma (85% of cases), a tumor of thymic epithelial cells frequently accompanied by a rich infiltrate of T lymphocytes. Although these tumors can be benign, SEER identifies only malignant thymomas (Engels and Pfeiffer, 2003). Carcinoid tumors make up another 4% of thymic malignancies, while no other histologic type constitutes more than 1% of cases. The mainstay of therapy for thymoma is surgery, with radiotherapy often given as adjuvant therapy or given alone when surgical resection is not possible (Hejna et al, 1999). Adjuvant chemotherapy is sometimes administered (Hejna et al, 1999). Overall survival is poor, with a relative 5-year survival rate of only 65.3%. Although the causes of thymic neoplasms are unknown, thymoma is frequently associated with autoimmune diseases, most notably myasthenia gravis and pure red cell aplasia (Müller-Hermelink and Marx, 2000).

## Results and Discussion

For 963 individuals surviving at least 2 months with a thymic malignancy, the overall risk of subsequent cancer was significantly elevated (O/E=1.53, O=91, 95% CI=1.23-1.88, EAR=60). Restricting analysis to the 815 patients with thymoma did not change the relative risk (O/E=1.54), which was similar in males and females. The cumulative incidence of any second cancer following thymus cancer was 12.7% at 15 years (95% CI=10.0%-15.7%).

Among all subjects, the risk for non-Hodgkin lymphoma (NHL) was elevated (O/E=4.81, O=10), consistent with previous surveys (Souadjan et al, 1968; Welsh et al, 2000), but a reciprocal relationship (O/E=0.64) was not seen. Altered immune function associated with thymoma may predispose to NHL, or the lymphoma excess may artifactually result from initial misclassification of thymoma (Ritter and Wick, 1999). Although all cases of NHL arose in patients treated with radiotherapy, the relevance of this finding is not clear.

A modest increase in cancers of the digestive tract was noted (O/E=1.84, O=24). However, no specific site entirely accounted for this finding, which also has been suggested in clinical surveys (Souadjan et al, 1968; Welsh et al, 2000; Pan et al, 2001). Risks for cancer of the liver and biliary tract were also increased (O/E=3.73). All 4 cases occurred in males (O/E=5.65), and 3 of them were hepatocellular carcinomas, which have been described previously as a new malignancy following thymoma (Welsh et al, 2000; Pan et al, 2001). Risk of soft tissue sarcoma was also elevated among individuals with thymoma (O/E=9.00), based on 2 cases (malignant fibrous histiocytoma and liposarcoma) at sites distant from the thymus. It is noteworthy that an elevated risk for malignant fibrous histiocytoma following thymoma has been described previously (Masaoka et al, 1994); the increased occurrence is possibly the result of shared susceptibility factors or perhaps chemotherapy (Zahm et al, 1996). Although the overall risk of subsequent cancers was elevated only among the 68% of patients receiving radiotherapy (O/E=1.72), there was no apparent radiotherapy effect for malignancies of tissues receiving substantial radiation doses (bone marrow, lung, and esophagus) (Travis et al, 2003).

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**Table 15.1.1:** Characteristics of patients with an initial cancer of the thyroid, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	7,406	100.0	22,050	100.0	29,456	100.0
<b>Initial treatment</b>						
Any radiation	3,196	43.2	8,022	36.4	11,218	38.1
With surgery	3,010	40.6	7,776	35.3	10,786	36.6
Without surgery	186	2.5	246	1.1	432	1.5
No radiation	4,210	56.8	14,028	63.6	18,238	61.9
With surgery	3,945	53.3	13,392	60.7	17,337	58.9
Without surgery	265	3.6	636	2.9	901	3.1
<b>Race</b>						
White	6,364	85.9	18,214	82.6	24,578	83.4
Black	311	4.2	1,225	5.6	1,536	5.2
Other	683	9.2	2,433	11.0	3,116	10.6
Unknown	48	0.6	178	0.8	226	0.8
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	1,020	13.8	4,601	20.9	5,621	19.1
30–49	3,033	41.0	10,021	45.4	13,054	44.3
50–69	2,574	34.8	5,391	24.4	7,965	27.0
70–79	603	8.1	1,439	6.5	2,042	6.9
≥ 80	176	2.4	598	2.7	774	2.6
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	6,737	91.0	20,717	94.0	27,454	93.2
1st and 2nd cancers	604	8.2	1,213	5.5	1,817	6.2
1st, 2nd, and 3rd cancers	53	0.7	105	0.5	158	0.5
1st, 2nd, 3rd, and additional cancers	12	0.2	15	0.1	27	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	47.6	—	42.0	—	43.3	—
Median year of 1st cancer diagnosis	1990.0	—	1990.4	—	1990.3	—
Median person-years at risk	7.4	—	8.0	—	7.9	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	97.5	—	98.3	—	98.0
1st, 2nd, and additional cancers	—	96.4	—	98.0	—	97.5
1st cancer only	—	2.1	—	1.2	—	1.5

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

# Thyroid Both Sexes

**Table 15.1.2:** Risk of subsequent primary cancers after cancer of the thyroid, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	29,456	23,251	160	1.26*	619	1.17*	590	1.11*	845	1.04	2,214	1,999.67	1.11*	7.64
All excluding same site			141	1.13	611	1.18*	584	1.12*	828	1.03	2,164	1,969.87	1.10*	6.92
<b>Buccal cavity, pharynx</b>			2	0.65	9	0.71	9	0.74	17	0.99	37	45.08	0.82	-0.29
Lip			0	0.00	0	0.00	0	0.00	1	0.60	1	4.50	0.22	-0.12
Tongue			2	3.07	0	0.00	2	0.76	1	0.26	5	9.82	0.51	-0.17
Salivary gland			0	0.00	4	3.09	3	2.41	6	3.29*	13	4.68	2.78*	0.30
Mouth			0	0.00	2	0.58	3	0.90	4	0.85	9	12.34	0.73	-0.12
Nasopharynx			0	0.00	0	0.00	0	0.00	3	3.07	3	2.71	1.11	0.01
Tonsil			0	0.00	1	0.79	0	0.00	1	0.58	2	4.52	0.44	-0.09
Oropharynx			0	0.00	1	3.03	0	0.00	0	0.00	1	1.18	0.84	-0.01
Hypopharynx			0	0.00	1	0.91	1	0.95	1	0.69	3	3.86	0.78	-0.03
<b>Digestive system</b>			30	1.24	97	0.97	104	1.03	143	0.92	374	380.23	0.98	-0.22
Esophagus			2	1.93	2	0.47	2	0.47	3	0.46	9	16.02	0.56	-0.25
Stomach			7	2.91*	11	1.12	13	1.36	12	0.87	43	35.54	1.21	0.27
Small intestine			1	2.61	4	2.49	2	1.22	2	0.74	9	6.34	1.42	0.09
Colon			9	0.84	51	1.14	56	1.24	66	0.94	182	171.05	1.06	0.39
Rectum, rectosigmoid junction			6	1.39	11	0.62	14	0.80	31	1.19	62	65.57	0.95	-0.13
Anus, anal canal			1	3.10	2	1.47	1	0.72	0	0.00	4	5.27	0.76	-0.05
Liver			0	0.00	5	1.40	4	1.11	5	0.85	14	13.91	1.01	0.00
Gallbladder			0	0.00	1	0.60	1	0.60	1	0.40	3	6.24	0.48	-0.12
Bile ducts, other biliary			2	3.86	0	0.00	2	0.89	4	1.06	8	8.71	0.92	-0.03
Pancreas			2	0.69	9	0.75	8	0.65	17	0.88	36	46.59	0.77	-0.38
<b>Respiratory system</b>			17	0.94	66	0.87	64	0.83	109	0.89	256	293.36	0.87*	-1.33
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	3	2.66	3	2.88	1.04	0.00
Larynx			1	0.89	5	1.09	1	0.23	3	0.48	10	16.32	0.61	-0.23
Lung, bronchus			15	0.90	60	0.85	62	0.86	101	0.88	238	273.33	0.87*	-1.26
<b>Female breast</b>			27	1.01	156	1.38*	140	1.21*	207	1.14	530	437.35	1.21*	4.36
<b>Female genital system</b>			12	0.96	43	0.84	53	1.06	57	0.78	165	186.45	0.88	-1.01
Cervix uteri			1	0.41	7	0.72	5	0.58	8	0.79	21	30.99	0.68	-0.47
Corpus uteri			3	0.54	16	0.69	29	1.27	25	0.71	73	86.60	0.84	-0.64
Ovary			5	1.39	18	1.20	17	1.14	15	0.67	55	55.82	0.99	-0.04
Vagina			1	6.76	0	0.00	0	0.00	1	1.07	2	2.30	0.87	-0.01
Vulva			1	2.37	1	0.57	1	0.55	3	1.03	6	6.93	0.87	-0.04
<b>Male genital system</b>			17	1.37	81	1.57*	74	1.42*	97	1.15	269	200.86	1.34*	10.02
Prostate			16	1.34	74	1.48*	74	1.46*	93	1.12	257	195.83	1.31*	9.00
Testis			0	0.00	4	2.98	0	0.00	3	3.09	7	3.73	1.88	0.48
<b>Urinary system</b>			10	1.35	41	1.34	42	1.35	66	1.35*	159	118.15	1.35*	1.46
Urinary bladder			4	0.86	16	0.83	16	0.83	26	0.85	62	73.64	0.84	-0.41
Kidney parenchyma			5	2.19	23	2.40*	21	2.16*	35	2.24*	84	37.22	2.26*	1.67
Renal pelvis, other urinary			1	2.13	2	1.03	5	2.59	5	1.70	13	7.29	1.78	0.20
Ureter			1	6.73	0	0.00	0	0.00	2	2.16	3	2.30	1.31	0.03
<b>Bone, joints</b>			0	0.00	2	2.76	0	0.00	4	4.72*	6	2.40	2.50	0.13
<b>Soft tissue including heart</b>			1	1.59	5	1.96	3	1.23	4	1.12	13	9.20	1.41	0.14
<b>Kaposi sarcoma</b>			1	2.81	0	0.00	0	0.00	0	0.00	1	4.60	0.22	-0.13
<b>Melanoma of skin</b>			8	1.91	25	1.43	19	1.12	26	1.07	78	62.98	1.24	0.54
<b>Eye, orbit</b>			0	0.00	1	1.20	2	2.52	0	0.00	3	2.99	1.00	0.00
<b>Brain, central nervous system</b>			2	1.21	12	1.77	12	1.85	11	1.21	37	24.00	1.54*	0.46
<b>Thyroid</b>			19	8.37*	8	0.88	6	0.74	17	1.65	50	29.80	1.68*	0.72
<b>Lymphatic, hematopoietic</b>			10	1.06	56	1.44*	50	1.29	63	1.05	179	146.86	1.22*	1.15
Hodgkin lymphoma			2	2.69	6	2.12	4	1.74	2	0.80	14	8.36	1.67	0.20
Non-Hodgkin lymphoma			6	1.36	14	0.76	19	1.01	32	1.06	71	71.83	0.99	-0.03
Myeloma			2	1.46	13	2.27*	9	1.55	8	0.86	32	22.21	1.44	0.35
Leukemia			0	0.00	23	1.93*	18	1.53	21	1.18	62	44.45	1.39*	0.63
Acute lymphocytic			0	0.00	0	0.00	4	7.72*	0	0.00	4	1.90	2.10	0.07
Chronic lymphocytic			0	0.00	3	0.73	8	1.93	8	1.24	19	15.71	1.21	0.12
Acute non-lymphocytic			0	0.00	15	3.43*	3	0.70	2	0.30	20	16.31	1.23	0.13
Chronic myeloid			0	0.00	2	1.12	2	1.15	5	1.94	9	6.53	1.38	0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 212,594 PYR and for male cancers on 67,987 PYR.

**Table 15.1.3:** Risk of subsequent primary cancers after cancer of the thyroid, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1,369	1.16*	417	1.06	256	0.97	172	1.10	2,214	1,999.67	1.11*	7.64
All excluding same site	1,336	1.15*	411	1.06	247	0.94	170	1.10	2,164	1,969.87	1.10*	6.92
<b>Buccal cavity, pharynx</b>	20	0.72	9	1.05	5	0.91	3	0.97	37	45.08	0.82	-0.29
Lip	0	0.00	1	1.21	0	0.00	0	0.00	1	4.50	0.22	-0.12
Tongue	4	0.67	0	0.00	1	0.81	0	0.00	5	9.82	0.51	-0.17
Salivary gland	7	2.45	3	3.34	2	3.42	1	2.92	13	4.68	2.78*	0.30
Mouth	5	0.66	3	1.27	0	0.00	1	1.18	9	12.34	0.73	-0.12
Nasopharynx	0	0.00	1	1.97	1	3.27	1	6.15	3	2.71	1.11	0.01
Tonsil	1	0.36	0	0.00	1	1.79	0	0.00	2	4.52	0.44	-0.09
Oropharynx	1	1.37	0	0.00	0	0.00	0	0.00	1	1.18	0.84	-0.01
Hypopharynx	2	0.83	1	1.36	0	0.00	0	0.00	3	3.86	0.78	-0.03
<b>Digestive system</b>	231	1.03	77	1.03	37	0.74	29	0.95	374	380.23	0.98	-0.22
Esophagus	6	0.63	2	0.64	0	0.00	1	0.77	9	16.02	0.56	-0.25
Stomach	31	1.42	8	1.17	1	0.23	3	1.16	43	35.54	1.21	0.27
Small intestine	7	1.92	1	0.79	0	0.00	1	1.80	9	6.34	1.42	0.09
Colon	116	1.15	30	0.89	22	0.97	14	1.01	182	171.05	1.06	0.39
Rectum, rectosigmoid junction	31	0.78	18	1.41	8	0.96	5	1.01	62	65.57	0.95	-0.13
Anus, anal canal	4	1.30	0	0.00	0	0.00	0	0.00	4	5.27	0.76	-0.05
Liver	9	1.12	5	1.82	0	0.00	0	0.00	14	13.91	1.01	0.00
Gallbladder	2	0.53	0	0.00	1	1.25	0	0.00	3	6.24	0.48	-0.12
Bile ducts, other biliary	4	0.81	2	1.14	1	0.81	1	1.27	8	8.71	0.92	-0.03
Pancreas	19	0.70	10	1.09	3	0.48	4	1.03	36	46.59	0.77	-0.38
<b>Respiratory system</b>	147	0.86	53	0.91	31	0.78	25	1.03	256	293.36	0.87*	-1.33
Nose, nasal cavity, ear	0	0.00	3	5.34*	0	0.00	0	0.00	3	2.88	1.04	0.00
Larynx	7	0.69	0	0.00	1	0.50	2	1.80	10	16.32	0.61	-0.23
Lung, bronchus	137	0.86	49	0.90	29	0.78	23	1.01	238	273.33	0.87*	-1.26
<b>Female breast</b>	323	1.26*	96	1.08	68	1.16	43	1.28	530	437.35	1.21*	4.36
<b>Female genital system</b>	108	0.95	32	0.88	16	0.68	9	0.69	165	186.45	0.88	-1.01
Cervix uteri	13	0.62	4	0.71	2	0.65	2	1.43	21	30.99	0.68	-0.47
Corpus uteri	48	0.93	17	1.00	5	0.44	3	0.45	73	86.60	0.84	-0.64
Ovary	40	1.19	6	0.54	6	0.83	3	0.75	55	55.82	0.99	-0.04
Vagina	1	0.73	1	2.19	0	0.00	0	0.00	2	2.30	0.87	-0.01
Vulva	3	0.75	1	0.72	1	1.05	1	1.74	6	6.93	0.87	-0.04
<b>Male genital system</b>	172	1.48*	49	1.25	29	1.01	19	1.12	269	200.86	1.34*	10.02
Prostate	164	1.46*	46	1.20	28	0.99	19	1.13	257	195.83	1.31*	9.00
Testis	4	1.45	2	3.42	1	3.59	0	0.00	7	3.73	1.88	0.48
<b>Urinary system</b>	93	1.35*	30	1.29	17	1.06	19	1.93*	159	118.15	1.35*	1.46
Urinary bladder	36	0.83	15	1.04	7	0.71	4	0.65	62	73.64	0.84	-0.41
Kidney parenchyma	49	2.27*	14	1.89*	8	1.56	13	4.20*	84	37.22	2.26*	1.67
Renal pelvis, other urinary	8	1.84	1	0.71	2	2.11	2	3.38	13	7.29	1.78	0.20
Ureter	1	0.73	0	0.00	1	3.36	1	5.36	3	2.30	1.31	0.03
<b>Bone, joints</b>	2	1.29	2	4.63	2	7.47	0	0.00	6	2.40	2.50	0.13
<b>Soft tissue including heart</b>	9	1.60	2	1.14	1	0.87	1	1.49	13	9.20	1.41	0.14
<b>Kaposi sarcoma</b>	1	0.32	0	0.00	0	0.00	0	0.00	1	4.60	0.22	-0.13
<b>Melanoma of skin</b>	52	1.35*	13	1.08	10	1.28	3	0.66	78	62.98	1.24	0.54
<b>Eye, orbit</b>	3	1.64	0	0.00	0	0.00	0	0.00	3	2.99	1.00	0.00
<b>Brain, central nervous system</b>	26	1.74*	3	0.66	3	1.03	5	3.07	37	24.00	1.54*	0.46
<b>Thyroid</b>	33	1.69*	6	1.10	9	2.79*	2	1.21	50	29.80	1.68*	0.72
<b>Lymphatic, hematopoietic</b>	116	1.33*	29	1.01	22	1.14	12	1.03	179	146.86	1.22*	1.15
Hodgkin lymphoma	12	2.04*	0	0.00	0	0.00	2	5.45	14	8.36	1.67	0.20
Non-Hodgkin lymphoma	39	0.93	15	1.05	9	0.92	8	1.34	71	71.83	0.99	-0.03
Myeloma	24	1.86*	5	1.13	2	0.66	1	0.54	32	22.21	1.44	0.35
Leukemia	41	1.54*	9	1.04	11	1.91	1	0.29	62	44.45	1.39*	0.63
Acute lymphocytic	4	3.28	0	0.00	0	0.00	0	0.00	4	1.90	2.10	0.07
Chronic lymphocytic	11	1.19	2	0.64	6	2.85*	0	0.00	19	15.71	1.21	0.12
Acute non-lymphocytic	18	1.85*	0	0.00	1	0.47	1	0.77	20	16.31	1.23	0.13
Chronic myeloid	4	1.01	3	2.36	2	2.42	0	0.00	9	6.53	1.38	0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 212,594 PYR and for male cancers on 67,987 PYR.

**Table 15.1.4:** Risk of subsequent primary cancers after cancer of the thyroid, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	107	1.29*	408	1.18*	389	1.10	564	1.02	1,468	1,337.02	1.10*	6.16
All excluding same site	91	1.13	402	1.18*	384	1.11*	552	1.01	1,429	1,311.00	1.09*	5.55
<b>Buccal cavity, pharynx</b>	0	0.00	6	0.96	4	0.64	12	1.30	22	23.20	0.95	-0.06
Lip	0	0.00	0	0.00	0	0.00	1	1.83	1	1.29	0.77	-0.01
Tongue	0	0.00	0	0.00	1	0.71	0	0.00	1	5.26	0.19	-0.20
Salivary gland	0	0.00	2	2.44	1	1.27	5	4.32*	8	2.96	2.70*	0.24
Mouth	0	0.00	1	0.51	2	1.02	4	1.36	7	7.32	0.96	-0.02
Nasopharynx	0	0.00	0	0.00	0	0.00	2	3.73	2	1.46	1.37	0.03
Tonsil	0	0.00	1	1.72	0	0.00	0	0.00	1	2.12	0.47	-0.05
Oropharynx	0	0.00	1	6.75	0	0.00	0	0.00	1	0.56	1.80	0.02
Hypopharynx	0	0.00	1	2.47	0	0.00	0	0.00	1	1.50	0.67	-0.02
<b>Digestive system</b>	18	1.21	59	0.95	68	1.06	96	0.93	241	243.69	0.99	-0.13
Esophagus	0	0.00	2	1.16	2	1.13	0	0.00	4	6.81	0.59	-0.13
Stomach	5	3.95*	6	1.15	9	1.72	4	0.50	24	19.68	1.22	0.20
Small intestine	1	4.12	2	1.94	1	0.93	2	1.09	6	4.19	1.43	0.09
Colon	5	0.71	33	1.12	35	1.15	46	0.94	119	115.98	1.03	0.14
Rectum, rectosigmoid junction	3	1.19	6	0.57	8	0.75	24	1.46	41	40.21	1.02	0.04
Rectum	2	1.20	5	0.72	5	0.71	19	1.73*	31	26.58	1.17	0.21
Anus, anal canal	0	0.00	2	1.94	0	0.00	0	0.00	2	4.09	0.49	-0.10
Liver	0	0.00	2	1.21	1	0.58	4	1.35	7	6.74	1.04	0.01
Gallbladder	0	0.00	0	0.00	1	0.72	1	0.48	2	5.17	0.39	-0.15
Bile ducts, other biliary	2	6.22	0	0.00	2	1.38	3	1.19	7	5.64	1.24	0.06
Pancreas	2	1.08	5	0.64	8	0.98	10	0.74	25	31.28	0.80	-0.30
<b>Respiratory system</b>	12	1.28	34	0.84	33	0.76	67	0.90	146	168.34	0.87	-1.05
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	2	2.80	2	1.77	1.13	0.01
Larynx	1	2.82	2	1.33	0	0.00	0	0.00	3	5.76	0.52	-0.13
Lung, bronchus	10	1.12	31	0.81	33	0.80	64	0.89	138	160.33	0.86	-1.05
<b>Female breast</b>	27	1.01	156	1.38*	140	1.21*	207	1.14	530	437.35	1.21*	4.36
<b>Female genital system</b>	12	0.96	43	0.84	53	1.06	57	0.78	165	186.45	0.88	-1.01
Cervix uteri	1	0.41	7	0.72	5	0.58	8	0.79	21	30.99	0.68	-0.47
Corpus uteri	3	0.54	16	0.69	29	1.27	25	0.71	73	86.60	0.84	-0.64
Ovary	5	1.39	18	1.20	17	1.14	15	0.67	55	55.82	0.99	-0.04
Vagina	1	6.76	0	0.00	0	0.00	1	1.07	2	2.30	0.87	-0.01
Vulva	1	2.37	1	0.57	1	0.55	3	1.03	6	6.93	0.87	-0.04
<b>Urinary system</b>	5	1.55	23	1.69*	20	1.40	32	1.33	80	55.16	1.45*	1.17
Urinary bladder	3	1.69	8	1.07	6	0.77	11	0.84	28	30.25	0.93	-0.11
Kidney parenchyma	2	1.66	15	2.92*	11	2.03*	20	2.19*	48	20.89	2.30*	1.28
Renal pelvis, other urinary	0	0.00	0	0.00	3	2.84	1	0.58	4	4.03	0.99	0.00
Ureter	0	0.00	0	0.00	0	0.00	1	1.93	1	1.21	0.82	-0.01
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	3	5.07*	3	1.64	1.83	0.06
<b>Soft tissue including heart</b>	0	0.00	3	1.79	2	1.23	3	1.24	8	6.12	1.31	0.09
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.02
<b>Melanoma of skin</b>	6	2.18	16	1.39	11	0.98	15	0.95	48	41.20	1.17	0.32
<b>Eye, orbit</b>	0	0.00	1	1.89	2	3.89	0	0.00	3	1.94	1.55	0.05
<b>Brain, central nervous system</b>	0	0.00	11	2.55*	8	1.90	8	1.32	27	15.62	1.73*	0.54
<b>Thyroid</b>	16	8.08*	6	0.75	5	0.70	12	1.34	39	26.02	1.50*	0.61
<b>Lymphatic, hematopoietic</b>	9	1.54	37	1.52*	36	1.46*	34	0.86	116	94.17	1.23*	1.03
Hodgkin lymphoma	2	3.93	3	1.55	4	2.57	1	0.60	10	5.67	1.76	0.20
Non-Hodgkin lymphoma	6	2.18	12	1.03	12	0.98	20	0.99	50	46.94	1.07	0.14
Myeloma	1	1.17	8	2.23	6	1.60	5	0.81	20	14.36	1.39	0.27
Leukemia	0	0.00	14	1.98*	14	1.96*	8	0.71	36	27.20	1.32	0.41
Acute lymphocytic	0	0.00	0	0.00	4	11.72*	0	0.00	4	1.26	3.18	0.13
Chronic lymphocytic	0	0.00	3	1.32	5	2.10	3	0.77	11	9.11	1.21	0.09
Acute non-lymphocytic	0	0.00	9	3.26*	3	1.09	0	0.00*	12	10.52	1.14	0.07
Chronic myeloid	0	0.00	1	0.91	2	1.84	3	1.83	6	4.09	1.47	0.09

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 15.1.5:** Risk of subsequent primary cancers after cancer of the thyroid, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	53	1.20	211	1.17*	201	1.14	281	1.07	746	662.65	1.13*	12.26
All excluding same site	50	1.14	209	1.16*	200	1.14	276	1.06	735	658.87	1.12*	11.20
<b>Buccal cavity, pharynx</b>	2	1.25	3	0.47	5	0.84	5	0.63	15	21.88	0.69	-1.01
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	3.21	0.00	-0.47
Tongue	2	6.21	0	0.00	1	0.82	1	0.59	4	4.56	0.88	-0.08
Salivary gland	0	0.00	2	4.21	2	4.40	1	1.50	5	1.72	2.91	0.48
Mouth	0	0.00	1	0.67	1	0.73	0	0.00	2	5.02	0.40	-0.44
Nasopharynx	0	0.00	0	0.00	0	0.00	1	2.27	1	1.26	0.80	-0.04
Tonsil	0	0.00	0	0.00	0	0.00	1	1.12	1	2.39	0.42	-0.20
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.09
Hypopharynx	0	0.00	0	0.00	1	1.55	1	1.18	2	2.36	0.85	-0.05
<b>Digestive system</b>	12	1.28	38	1.00	36	0.98	47	0.90	133	136.54	0.97	-0.52
Esophagus	2	3.20	0	0.00	0	0.00	3	0.83	5	9.22	0.54	-0.62
Stomach	2	1.76	5	1.09	4	0.93	8	1.37	19	15.87	1.20	0.46
Small intestine	0	0.00	2	3.46	1	1.77	0	0.00	3	2.15	1.40	0.13
Colon	4	1.08	18	1.18	21	1.42	20	0.94	63	55.07	1.14	1.17
Rectum, rectosigmoid junction	3	1.68	5	0.70	6	0.88	7	0.73	21	25.36	0.83	-0.64
Anus, anal canal	1	12.39	0	0.00	1	3.20	0	0.00	2	1.18	1.70	0.12
Liver	0	0.00	3	1.56	3	1.59	1	0.35	7	7.17	0.98	-0.02
Gallbladder	0	0.00	1	3.30	0	0.00	0	0.00	1	1.06	0.94	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	0.80	1	3.08	0.33	-0.31
Pancreas	0	0.00	4	0.93	0	0.00*	7	1.19	11	15.32	0.72	-0.63
<b>Respiratory system</b>	5	0.58	32	0.91	31	0.92	42	0.89	110	125.02	0.88	-2.21
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	2.41	1	1.11	0.90	-0.02
Larynx	0	0.00	3	0.97	1	0.35	3	0.78	7	10.56	0.66	-0.52
Lung, bronchus	5	0.64	29	0.91	29	0.95	37	0.86	100	112.99	0.89	-1.91
<b>Male breast</b>	0	0.00	1	2.88	0	0.00	1	1.97	2	1.28	1.57	0.11
<b>Male genital system</b>	17	1.37	81	1.57*	74	1.42*	97	1.15	269	200.86	1.34*	10.02
Prostate	16	1.34	74	1.48*	74	1.46*	93	1.12	257	195.83	1.31*	9.00
Testis	0	0.00	4	2.98	0	0.00	3	3.09	7	3.73	1.88	0.48
<b>Urinary system</b>	5	1.20	18	1.06	22	1.32	34	1.36	79	62.98	1.25	2.36
Urinary bladder	1	0.35	8	0.68	10	0.87	15	0.87	34	43.39	0.78	-1.38
Kidney parenchyma	3	2.78	8	1.80	10	2.31*	15	2.31*	36	16.33	2.20*	2.89
Renal pelvis, other urinary	1	4.40	2	2.17	2	2.28	4	3.23	9	3.26	2.76*	0.84
Ureter	1	13.25	0	0.00	0	0.00	1	2.44	2	1.08	1.85	0.13
<b>Bone, joints</b>	0	0.00	2	8.47	0	0.00	1	3.89	3	0.76	3.96	0.33
<b>Soft tissue including heart</b>	1	4.56	2	2.27	1	1.22	1	0.86	5	3.08	1.62	0.28
<b>Kaposi sarcoma</b>	1	3.00	0	0.00	0	0.00	0	0.00	1	4.24	0.24	-0.48
<b>Melanoma of skin</b>	2	1.39	9	1.52	8	1.39	11	1.27	30	21.78	1.38	1.21
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.05	0.00	-0.15
<b>Brain, central nervous system</b>	2	3.27	1	0.41	4	1.76	3	0.98	10	8.39	1.19	0.24
<b>Thyroid</b>	3	10.30*	2	1.76	1	0.99	5	3.71*	11	3.78	2.91*	1.06
<b>Lymphatic, hematopoietic</b>	1	0.28	19	1.30	14	0.99	29	1.42	63	52.68	1.20	1.52
Hodgkin lymphoma	0	0.00	3	3.37	0	0.00	1	1.22	4	2.69	1.49	0.19
Non-Hodgkin lymphoma	0	0.00	2	0.29	7	1.06	12	1.22	21	24.89	0.84	-0.57
Myeloma	1	1.91	5	2.34	3	1.44	3	0.96	12	7.85	1.53	0.61
Leukemia	0	0.00	9	1.87	4	0.86	13	1.97*	26	17.25	1.51	1.29
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	3	1.69	5	1.95	8	6.60	1.21	0.21
Acute non-lymphocytic	0	0.00	6	3.72*	0	0.00	2	0.89	8	5.80	1.38	0.32
Chronic myeloid	0	0.00	1	1.45	0	0.00	2	2.14	3	2.45	1.23	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Thyroid Both Sexes, <40 Years of Age

**Table 15.1.6:** Risk of subsequent primary cancers after cancer of the thyroid, both sexes, <40 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	12,547	10,126	28	3.06*	70	1.49*	85	1.33*	214	1.29*	397	286.20	1.39*	8.16
All excluding same site			18	2.18*	67	1.55*	82	1.37*	202	1.26*	369	272.05	1.36*	7.14
<b>Buccal cavity, pharynx</b>			0	0.00	1	1.15	2	1.54	8	2.13	11	6.09	1.81	0.36
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.03
Tongue			0	0.00	0	0.00	0	0.00	0	0.00	0	1.43	0.00	-0.11
Salivary gland			0	0.00	1	4.47	1	4.00	4	8.34*	6	1.00	5.99*	0.37
Mouth			0	0.00	0	0.00	1	3.71	3	3.36	4	1.35	2.97	0.20
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.05
Tonsil			0	0.00	0	0.00	0	0.00	1	2.04	1	0.70	1.42	0.02
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.01
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.02
<b>Digestive system</b>			1	1.79	6	1.86	6	1.14	28	1.48	41	28.02	1.46*	0.96
Esophagus			0	0.00	0	0.00	0	0.00	0	0.00	0	1.04	0.00	-0.08
Stomach			1	14.60	1	2.59	2	3.48	3	1.86	7	2.64	2.65*	0.32
Small intestine			0	0.00	0	0.00	0	0.00	1	1.91	1	0.82	1.21	0.01
Colon			0	0.00	3	2.36	3	1.48	13	1.77	19	10.87	1.75*	0.60
Rectum, rectosigmoid junction			0	0.00	0	0.00	1	0.91	7	1.75	8	5.85	1.37	0.16
Anus, anal canal			0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.06
Liver			0	0.00	2	12.78*	0	0.00	0	0.00	2	1.36	1.47	0.05
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.03
Bile ducts, other biliary			0	0.00	0	0.00	0	0.00	1	2.40	1	0.61	1.65	0.03
Pancreas			0	0.00	0	0.00	0	0.00	3	1.43	3	2.90	1.03	0.01
<b>Respiratory system</b>			2	7.13	1	0.55	3	0.85	17	1.07	23	21.46	1.07	0.11
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	1	4.31	1	0.42	2.38	0.04
Larynx			1	46.10	0	0.00	0	0.00	1	0.93	2	1.51	1.33	0.04
Lung, bronchus			1	4.31	1	0.64	3	0.96	15	1.04	20	19.35	1.03	0.05
<b>Female breast</b>			5	2.16	17	1.23	36	1.64*	77	1.35*	135	94.96	1.42*	3.76
<b>Female genital system</b>			3	1.90	11	1.42	7	0.72	15	0.69	36	40.58	0.89	-0.43
Cervix uteri			0	0.00	4	1.09	4	1.04	4	0.76	12	13.58	0.88	-0.15
Corpus uteri			0	0.00	3	2.12	2	0.85	5	0.60	10	12.34	0.81	-0.22
Ovary			2	4.48	4	1.80	1	0.34	4	0.59	11	12.33	0.89	-0.13
Vagina			1	82.39*	0	0.00	0	0.00	0	0.00	1	0.34	2.91	0.06
Vulva			0	0.00	0	0.00	0	0.00	1	1.53	1	1.20	0.83	-0.02
<b>Male genital system</b>			1	4.40	3	3.06	3	2.64	11	1.56	18	9.38	1.92*	2.96
Prostate			0	0.00	0	0.00	3	9.91*	9	1.46	12	6.53	1.84	1.88
Testis			0	0.00	3	3.30	0	0.00	2	2.50	5	2.74	1.83	0.78
<b>Urinary system</b>			1	4.86	1	0.84	3	1.56	13	1.89*	18	10.18	1.77*	0.58
Urinary bladder			0	0.00	0	0.00	2	2.23	4	1.18	6	4.95	1.21	0.08
Kidney parenchyma			1	9.89	1	1.69	1	1.04	9	2.81*	12	4.86	2.47*	0.53
Renal pelvis, other urinary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.03
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.01
<b>Bone, joints</b>			0	0.00	0	0.00	0	0.00	2	6.14	2	0.85	2.35	0.08
<b>Soft tissue including heart</b>			0	0.00	1	1.81	0	0.00	1	0.96	2	2.30	0.87	-0.02
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	3.05	0.00	-0.22
<b>Melanoma of skin</b>			3	2.82	7	1.40	5	0.88	12	1.23	27	21.45	1.26	0.41
<b>Eye, orbit</b>			0	0.00	0	0.00	1	7.70	0	0.00	1	0.55	1.81	0.03
<b>Brain, central nervous system</b>			1	3.33	6	4.44*	4	2.74	5	1.89	16	5.75	2.78*	0.75
<b>Thyroid</b>			10	11.42*	3	0.78	3	0.79	12	2.13*	28	14.15	1.98*	1.02
<b>Lymphatic, hematopoietic</b>			1	0.94	12	2.50*	11	2.04*	11	0.94	35	22.94	1.53*	0.89
Hodgkin lymphoma			1	2.54	4	2.64	2	1.66	2	1.63	9	4.33	2.08	0.34
Non-Hodgkin lymphoma			0	0.00	3	1.51	6	2.32	6	0.96	15	11.22	1.34	0.28
Myeloma			0	0.00	0	0.00	0	0.00	1	0.84	1	1.62	0.62	-0.05
Leukemia			0	0.00	5	4.31*	3	2.25	2	0.66	10	5.76	1.74	0.31
Acute lymphocytic			0	0.00	0	0.00	1	5.93	0	0.00	1	0.64	1.56	0.03
Chronic lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.99	0.00	-0.07
Acute non-lymphocytic			0	0.00	4	7.15*	1	1.64	0	0.00	5	2.49	2.00	0.18
Chronic myeloid			0	0.00	0	0.00	1	3.53	1	1.81	2	1.15	1.74	0.06

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 106,643 PYR and for male cancers on 29,113 PYR.

**Table 15.1.7:** Risk of subsequent primary cancers after cancer of the thyroid, both sexes, 40-49 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	16	1.03	99	1.33*	107	1.19	201	1.00	423	381.73	1.11*	6.96
All excluding same site	13	0.87	97	1.34*	105	1.19	198	0.99	413	374.87	1.10	6.43
<b>Buccal cavity, pharynx</b>	1	2.63	2	1.03	1	0.41	2	0.42	6	9.48	0.63	-0.59
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.71	0.00	-0.12
Tongue	1	12.11	0	0.00	1	1.82	1	0.91	3	2.15	1.40	0.14
Salivary gland	0	0.00	1	4.65	0	0.00	0	0.00	1	0.93	1.08	0.01
Mouth	0	0.00	1	2.02	0	0.00	0	0.00	1	2.54	0.39	-0.26
Nasopharynx	0	0.00	0	0.00	0	0.00	1	3.55	1	0.69	1.45	0.05
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.12	0.00	-0.19
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.14
<b>Digestive system</b>	2	1.19	15	1.67	11	0.88	26	0.76	54	57.25	0.94	-0.55
Esophagus	0	0.00	1	2.66	1	1.74	0	0.00	2	2.69	0.74	-0.12
Stomach	1	5.70	1	1.15	2	1.82	0	0.00	4	4.95	0.81	-0.16
Small intestine	0	0.00	1	4.29	1	3.46	0	0.00	2	1.23	1.62	0.13
Colon	1	1.54	7	1.99	2	0.40	12	0.82	22	23.80	0.92	-0.30
Rectum, rectosigmoid junction	0	0.00	4	2.12	2	0.76	5	0.79	11	11.21	0.98	-0.04
Anus, anal canal	0	0.00	1	4.11	0	0.00	0	0.00	1	1.14	0.88	-0.02
Liver	0	0.00	0	0.00	1	1.92	2	1.39	3	2.44	1.23	0.09
Gallbladder	0	0.00	0	0.00	0	0.00	1	1.92	1	0.86	1.16	0.02
Bile ducts, other biliary	0	0.00	0	0.00	1	3.99	1	1.33	2	1.22	1.64	0.13
Pancreas	0	0.00	0	0.00	1	0.69	4	0.96	5	6.78	0.74	-0.30
<b>Respiratory system</b>	1	0.75	8	1.05	13	1.11	19	0.57*	41	54.01	0.76	-2.19
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.09
Larynx	0	0.00	1	1.74	0	0.00	1	0.52	2	3.42	0.58	-0.24
Lung, bronchus	1	0.84	7	1.01	13	1.22	18	0.58*	39	49.89	0.78	-1.84
<b>Female breast</b>	3	0.51	37	1.38	31	1.08	59	1.21	130	109.94	1.18	4.47
<b>Female genital system</b>	3	1.38	9	0.88	11	0.96	17	0.85	40	43.78	0.91	-0.84
Cervix uteri	1	1.64	1	0.42	0	0.00	1	0.45	3	7.19	0.42	-0.93
Corpus uteri	0	0.00	4	0.98	6	1.13	11	1.04	21	20.77	1.01	0.05
Ovary	1	1.47	3	0.94	4	1.14	3	0.50	11	13.34	0.82	-0.52
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.10
Vulva	1	15.68	0	0.00	1	3.39	0	0.00	2	1.23	1.62	0.17
<b>Male genital system</b>	0	0.00	3	1.77	3	0.86	17	0.86	23	25.20	0.91	-1.53
Prostate	0	0.00	3	2.16	3	0.91	16	0.82	22	24.40	0.90	-1.67
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.42
<b>Urinary system</b>	1	1.74	4	1.32	10	2.37*	23	1.99*	38	19.39	1.96*	3.14
Urinary bladder	0	0.00	1	0.66	1	0.45	10	1.49	12	10.75	1.12	0.21
Kidney parenchyma	1	3.66	3	2.16	8	4.44*	12	2.85*	24	7.68	3.12*	2.75
Renal pelvis, other urinary	0	0.00	0	0.00	1	5.18	1	1.62	2	0.96	2.08	0.18
Ureter	0	0.00	0	0.00	0	0.00	1	5.32	1	0.27	3.74	0.12
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	5.28	1	0.46	2.16	0.09
<b>Soft tissue including heart</b>	0	0.00	0	0.00	3	6.65*	2	2.44	5	1.81	2.77	0.54
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.13
<b>Melanoma of skin</b>	1	1.11	8	2.12	8	2.21	4	0.70	21	13.99	1.50	1.18
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.10
<b>Brain, central nervous system</b>	0	0.00	3	2.61	6	4.79*	3	1.33	12	4.92	2.44*	1.19
<b>Thyroid</b>	3	5.46*	2	0.92	2	1.07	3	1.32	10	6.86	1.46	0.53
<b>Lymphatic, hematopoietic</b>	1	0.97	6	1.23	6	1.03	16	1.19	29	25.13	1.15	0.65
Hodgkin lymphoma	1	9.61	1	2.51	1	2.91	0	0.00	3	1.32	2.28	0.28
Non-Hodgkin lymphoma	0	0.00	0	0.00	3	0.97	9	1.29	12	13.22	0.91	-0.21
Myeloma	0	0.00	3	5.60*	0	0.00	1	0.47	4	3.55	1.13	0.08
Leukemia	0	0.00	2	1.49	2	1.23	6	1.58	10	7.04	1.42	0.50
Acute lymphocytic	0	0.00	0	0.00	1	10.62	0	0.00	1	0.36	2.75	0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	3	2.08	3	2.36	1.27	0.11
Acute non-lymphocytic	0	0.00	2	3.79	1	1.68	0	0.00	3	2.59	1.16	0.07
Chronic myeloid	0	0.00	0	0.00	0	0.00	2	3.75	2	1.12	1.79	0.15

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 44,929 PYR and for male cancers on 14,394 PYR.

## Thyroid Both Sexes, 50-69 Years of Age

**Table 15.1.8:** Risk of subsequent primary cancers after cancer of the thyroid, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	64	1.05	323	1.20*	308	1.07	389	0.96	1,084	1,024.08	1.06	8.41
All excluding same site	60	0.99	320	1.20*	307	1.07	387	0.96	1,074	1,016.62	1.06	8.05
<b>Buccal cavity, pharynx</b>	1	0.57	4	0.55	4	0.58	7	0.88	16	23.93	0.67	-1.11
Lip	0	0.00	0	0.00	0	0.00	1	1.08	1	2.50	0.40	-0.21
Tongue	1	2.66	0	0.00	1	0.68	0	0.00	2	5.11	0.39	-0.44
Salivary gland	0	0.00	2	3.47	1	1.73	2	2.48	5	2.10	2.39	0.41
Mouth	0	0.00	1	0.49	1	0.52	1	0.44	3	6.74	0.45	-0.52
Nasopharynx	0	0.00	0	0.00	0	0.00	2	5.58	2	1.20	1.66	0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	2.34	0.00	-0.33
Oropharynx	0	0.00	1	4.61	0	0.00	0	0.00	1	0.69	1.44	0.04
Hypopharynx	0	0.00	0	0.00	1	1.41	1	1.36	2	2.37	0.84	-0.05
<b>Digestive system</b>	15	1.33	43	0.83	62	1.07	80	0.90	200	209.93	0.95	-1.39
Esophagus	2	3.36	0	0.00	0	0.00	3	0.82	5	9.63	0.52	-0.65
Stomach	3	2.82	4	0.83	8	1.49	7	0.87	22	19.31	1.14	0.38
Small intestine	1	5.30	3	3.59	0	0.00	1	0.74	5	3.28	1.52	0.24
Colon	3	0.63	22	0.99	38	1.47*	35	0.84	98	94.38	1.04	0.51
Rectum, rectosigmoid junction	4	1.82	5	0.51	8	0.78	19	1.36	36	36.20	0.99	-0.03
Anus, anal canal	1	6.23	1	1.43	0	0.00	0	0.00	2	2.54	0.79	-0.08
Liver	0	0.00	1	0.51	1	0.46	3	0.94	5	7.74	0.65	-0.38
Gallbladder	0	0.00	0	0.00	1	1.06	0	0.00	1	3.37	0.30	-0.33
Bile ducts, other biliary	1	4.50	0	0.00	1	0.81	2	0.90	4	4.71	0.85	-0.10
Pancreas	0	0.00	7	1.11	5	0.69	9	0.79	21	26.29	0.80	-0.74
<b>Respiratory system</b>	8	0.77	50	1.07	37	0.73	66	0.97	161	175.79	0.92	-2.07
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	2	3.59	2	1.46	1.37	0.08
Larynx	0	0.00	4	1.31	1	0.35	1	0.33	6	9.74	0.62	-0.52
Lung, bronchus	8	0.84	45	1.04	35	0.74	61	0.95	149	164.19	0.91	-2.13
<b>Female breast</b>	9	0.72	77	1.46*	57	1.09	66	0.97	209	185.74	1.13	4.63
<b>Female genital system</b>	4	0.67	19	0.77	30	1.28	23	0.81	76	82.41	0.92	-1.28
Cervix uteri	0	0.00	2	0.69	1	0.42	3	1.28	6	8.37	0.72	-0.47
Corpus uteri	2	0.61	6	0.45*	17	1.34	7	0.47*	32	44.26	0.72	-2.44
Ovary	2	1.20	10	1.44	11	1.62	8	0.93	31	24.03	1.29	1.39
Vagina	0	0.00	0	0.00	0	0.00	1	2.24	1	1.09	0.92	-0.02
Vulva	0	0.00	1	1.44	0	0.00	2	1.45	3	3.03	0.99	-0.01
<b>Male genital system</b>	8	1.25	46	1.49*	53	1.41*	61	1.11	168	129.68	1.30*	18.18
Prostate	8	1.27	44	1.44*	53	1.42*	60	1.10	165	128.59	1.28*	17.27
Testis	0	0.00	1	6.84	0	0.00	1	14.73	2	0.35	5.71	0.78
<b>Urinary system</b>	3	0.81	30	1.78*	24	1.29	28	1.01	85	66.76	1.27*	2.56
Urinary bladder	1	0.44	13	1.25	11	0.93	10	0.55	35	42.73	0.82	-1.08
Kidney parenchyma	2	1.62	15	2.80*	10	1.79	14	1.85*	41	19.71	2.08*	2.99
Renal pelvis, other urinary	0	0.00	2	1.91	3	2.49	4	2.16	9	4.32	2.08	0.66
Ureter	0	0.00	0	0.00	0	0.00	1	1.65	1	1.40	0.71	-0.06
<b>Bone, joints</b>	0	0.00	2	7.91	0	0.00	0	0.00	2	0.86	2.33	0.16
<b>Soft tissue including heart</b>	1	4.03	2	1.91	0	0.00	1	0.66	4	3.86	1.04	0.02
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.08
<b>Melanoma of skin</b>	4	2.54	7	1.09	5	0.81	7	0.85	23	22.39	1.03	0.09
<b>Eye, orbit</b>	0	0.00	1	2.40	1	2.48	0	0.00	2	1.44	1.39	0.08
<b>Brain, central nervous system</b>	1	1.35	2	0.64	1	0.33	3	0.77	7	10.83	0.65	-0.54
<b>Thyroid</b>	4	6.13*	3	1.21	1	0.48	2	0.89	10	7.46	1.34	0.36
<b>Lymphatic, hematopoietic</b>	4	0.98	27	1.49	25	1.25	34	1.11	90	73.03	1.23	2.38
Hodgkin lymphoma	0	0.00	0	0.00	1	1.65	0	0.00	1	2.16	0.46	-0.16
Non-Hodgkin lymphoma	3	1.51	6	0.68	8	0.82	16	1.06	33	35.77	0.92	-0.39
Myeloma	1	1.48	7	2.28	8	2.30	5	0.94	21	12.55	1.67*	1.19
Leukemia	0	0.00	14	2.52*	8	1.30	13	1.35	35	22.55	1.55*	1.75
Acute lymphocytic	0	0.00	0	0.00	2	10.44*	0	0.00	2	0.68	2.94	0.19
Chronic lymphocytic	0	0.00	3	1.35	4	1.61	5	1.34	12	8.90	1.35	0.43
Acute non-lymphocytic	0	0.00	7	3.64*	0	0.00	2	0.57	9	8.02	1.12	0.14
Chronic myeloid	0	0.00	2	2.65	1	1.24	2	1.57	5	3.02	1.66	0.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 50,185 PYR and for male cancers on 21,081 PYR.

**Table 15.1.9:** Risk of subsequent primary cancers after cancer of the thyroid, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	52	1.27	127	0.93	90	1.03	41	0.96	310	307.67	1.01	1.64
All excluding same site	50	1.22	127	0.94	90	1.03	41	0.96	308	306.34	1.01	1.17
<b>Buccal cavity, pharynx</b>	0	0.00	2	0.79	2	1.31	0	0.00	4	5.57	0.72	-1.11
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.59
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.12	0.00	-0.79
Salivary gland	0	0.00	0	0.00	1	5.31	0	0.00	1	0.65	1.53	0.24
Mouth	0	0.00	0	0.00	1	2.10	0	0.00	1	1.72	0.58	-0.50
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.14
Tonsil	0	0.00	1	5.83	0	0.00	0	0.00	1	0.35	2.86	0.46
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.09
Hypopharynx	0	0.00	1	5.04	0	0.00	0	0.00	1	0.39	2.55	0.43
<b>Digestive system</b>	12	1.12	33	0.91	25	1.01	9	0.67	79	85.03	0.93	-4.23
Esophagus	0	0.00	1	0.84	1	1.34	0	0.00	2	2.66	0.75	-0.46
Stomach	2	1.82	5	1.35	1	0.40	2	1.52	10	8.64	1.16	0.95
Small intestine	0	0.00	0	0.00	1	3.49	0	0.00	1	1.00	1.00	0.00
Colon	5	0.98	19	1.08	13	1.05	6	0.87	43	42.00	1.02	0.71
Rectum, rectosigmoid junction	2	1.21	2	0.37	3	0.86	0	0.00	7	12.31	0.57	-3.73
Anus, anal canal	0	0.00	0	0.00	1	5.04	0	0.00	1	0.71	1.41	0.20
Liver	0	0.00	2	1.88	2	2.95	0	0.00	4	2.37	1.69	1.14
Gallbladder	0	0.00	1	1.41	0	0.00	0	0.00	1	1.66	0.60	-0.46
Bile ducts, other biliary	1	3.99	0	0.00	0	0.00	0	0.00	1	2.18	0.46	-0.83
Pancreas	2	1.51	2	0.45	2	0.65	1	0.58	7	10.62	0.66	-2.55
<b>Respiratory system</b>	6	0.99	7	0.36*	11	0.95	7	1.46	31	42.11	0.74	-7.80
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.32
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.65	0.00	-1.16
Lung, bronchus	5	0.87	7	0.38*	11	1.00	7	1.53	30	39.90	0.75	-6.95
<b>Female breast</b>	10	1.64	25	1.24	16	1.21	5	0.70	56	46.71	1.20	8.57
<b>Female genital system</b>	2	0.75	4	0.46	5	0.92	2	0.69	13	19.68	0.66	-6.17
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.85	0.00	-1.71
Corpus uteri	1	0.75	3	0.71	4	1.61	2	1.68	10	9.23	1.08	0.71
Ovary	0	0.00	1	0.38	1	0.58	0	0.00	2	6.12	0.33	-3.80
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.40
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	1.47	0.00	-1.35
<b>Male genital system</b>	8	1.45	29	1.61*	15	1.50	8	2.60*	60	36.59	1.64*	68.88
Prostate	8	1.46	27	1.51	15	1.51	8	2.63*	58	36.31	1.60*	63.82
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.10
<b>Urinary system</b>	5	1.73	6	0.62	5	0.80	2	0.67	18	21.81	0.83	-2.68
Urinary bladder	3	1.50	2	0.30	2	0.45	2	0.95	9	15.22	0.59	-4.37
Kidney parenchyma	1	1.48	4	1.79	2	1.43	0	0.00	7	4.96	1.41	1.43
Renal pelvis, other urinary	1	4.59	0	0.00	1	2.14	0	0.00	2	1.64	1.22	0.26
Ureter	1	13.48	0	0.00	0	0.00	0	0.00	1	0.55	1.82	0.32
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	32.20	1	0.23	4.39	0.54
<b>Soft tissue including heart</b>	0	0.00	2	3.83	0	0.00	0	0.00	2	1.23	1.62	0.54
<b>Kaposi sarcoma</b>	1	38.28	0	0.00	0	0.00	0	0.00	1	0.24	4.22	0.54
<b>Melanoma of skin</b>	0	0.00	3	1.36	1	0.67	3	3.83	7	5.14	1.36	1.31
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.27
<b>Brain, central nervous system</b>	0	0.00	1	0.87	1	1.45	0	0.00	2	2.50	0.80	-0.35
<b>Thyroid</b>	2	10.28*	0	0.00	0	0.00	0	0.00	2	1.33	1.50	0.47
<b>Lymphatic, hematopoietic</b>	4	1.23	11	0.99	8	1.07	2	0.51	25	25.75	0.97	-0.53
Hodgkin lymphoma	0	0.00	1	3.99	0	0.00	0	0.00	1	0.55	1.83	0.32
Non-Hodgkin lymphoma	3	2.05	5	1.00	2	0.59	1	0.57	11	11.62	0.95	-0.43
Myeloma	1	1.72	3	1.53	1	0.77	1	1.54	6	4.49	1.34	1.06
Leukemia	0	0.00	2	0.52	5	1.88	0	0.00	7	9.10	0.77	-1.47
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.15
Chronic lymphocytic	0	0.00	0	0.00	4	4.01*	0	0.00	4	3.45	1.16	0.38
Acute non-lymphocytic	0	0.00	2	1.47	1	1.07	0	0.00	3	3.20	0.94	-0.14
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.25	0.00	-0.88

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 10,837 PYR and for male cancers on 3,399 PYR.

## Adrenal Gland Both Sexes

**Table 15.2.1:** Characteristics of patients with an initial cancer of the adrenal gland excluding neuroblastoma, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	389	100.0	422	100.0	811	100.0
<b>Initial treatment</b>						
Any radiation	82	21.1	55	13.0	137	16.9
With surgery	41	10.5	37	8.8	78	9.6
Without surgery	41	10.5	18	4.3	59	7.3
No radiation	307	78.9	367	87.0	674	83.1
With surgery	221	56.8	286	67.8	507	62.5
Without surgery	86	22.1	81	19.2	167	20.6
<b>Race</b>						
White	334	85.9	359	85.1	693	85.5
Black	26	6.7	36	8.5	62	7.6
Other	28	7.2	27	6.4	55	6.8
Unknown	1	0.3	0	0.0	1	0.1
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	43	11.1	66	15.6	109	13.4
30–49	118	30.3	103	24.4	221	27.3
50–69	167	42.9	180	42.7	347	42.8
70–79	52	13.4	58	13.7	110	13.6
≥ 80	9	2.3	15	3.6	24	3.0
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	357	91.8	401	95.0	758	93.5
1st and 2nd cancers	28	7.2	21	5.0	49	6.0
1st, 2nd, and 3rd cancers	4	1.0	0	0.0	4	0.5
1st, 2nd, 3rd, and additional cancers	0	0.0	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	55.4	—	54.3	—	54.6	—
Median year of 1st cancer diagnosis	1987.2	—	1989.0	—	1988.2	—
Median person-years at risk	1.1	—	1.7	—	1.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	93.8	—	90.5	—	92.5
1st, 2nd, and additional cancers	—	93.8	—	90.5	—	92.5
1st cancer only	—	6.3	—	0.0	—	3.8

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 15.2.2:** Risk of subsequent primary cancers after cancer of the adrenal gland excluding neuroblastoma, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	12	3.01*	18	1.59	13	1.49	14	1.65	57	32.47	1.76*	71.36
All excluding same site	12	3.01*	18	1.59	12	1.38	14	1.66	56	32.46	1.73*	68.49
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.85	0.00	-2.46
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.30
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.52
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.21
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.66
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.26
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.07
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.25
<b>Digestive system</b>	2	2.46	1	0.44	3	1.73	4	2.39	10	6.49	1.54	10.22
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.99
Stomach	0	0.00	1	4.62	0	0.00	0	0.00	1	0.61	1.64	1.14
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.31
Colon	0	0.00	0	0.00	1	1.28	2	2.66	3	2.89	1.04	0.31
Rectum, rectosigmoid junction	1	6.71	0	0.00	0	0.00	1	3.55	2	1.14	1.76	2.51
Anus, anal canal	0	0.00	0	0.00	1	49.39	0	0.00	1	0.08	13.05	2.69
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.67
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.25
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.39
Pancreas	1	10.10	0	0.00	0	0.00	1	4.79	2	0.80	2.50	3.49
<b>Respiratory system</b>	2	2.87	7	3.57*	2	1.34	1	0.69	12	5.59	2.15*	18.65
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	81.24*	1	0.05	20.90	2.77
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-1.08
Lung, bronchus	2	3.13	7	3.88*	2	1.45	0	0.00	11	5.16	2.13*	17.00
<b>Female breast</b>	1	1.71	3	1.70	0	0.00	1	0.88	5	4.74	1.05	1.36
<b>Female genital system</b>	0	0.00	0	0.00	1	1.90	0	0.00	1	2.02	0.49	-5.40
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-1.41
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-5.30
Ovary	0	0.00	0	0.00	1	6.25	0	0.00	1	0.60	1.66	2.09
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.14
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.41
<b>Male genital system</b>	3	5.11*	4	2.43	1	0.68	3	1.91	11	5.27	2.09*	37.11
Prostate	3	5.24*	4	2.49	1	0.69	3	1.93	11	5.18	2.12*	37.71
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.39
<b>Urinary system</b>	1	3.57	2	2.55	3	4.86	2	3.18	8	2.31	3.46*	16.56
Urinary bladder	1	5.50	2	3.97	2	4.96	1	2.41	6	1.50	3.99*	13.08
Kidney parenchyma	0	0.00	0	0.00	1	5.61	1	5.56	2	0.67	2.99	3.87
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.40
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.13
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	115.19*	1	0.04	28.56	2.81
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.40
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.22
<b>Melanoma of skin</b>	2	19.37*	0	0.00	1	4.34	0	0.00	3	0.87	3.44	6.19
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.14
<b>Brain, central nervous system</b>	1	19.91	0	0.00	0	0.00	0	0.00	1	0.38	2.64	1.81
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.82
<b>Lymphatic, hematopoietic</b>	0	0.00	1	1.20	1	1.55	2	3.14	4	2.41	1.66	4.63
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	39.86	1	0.11	9.33	2.60
Non-Hodgkin lymphoma	0	0.00	0	0.00	1	3.29	0	0.00	1	1.13	0.88	-0.39
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-1.16
Leukemia	0	0.00	1	3.75	0	0.00	1	5.03	2	0.77	2.61	3.59
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	131.92*	1	0.03	28.90	2.81
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.86
Acute non-lymphocytic	0	0.00	1	11.12	0	0.00	0	0.00	1	0.26	3.82	2.15
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.31

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 1,894 PYR and for male cancers on 1,543 PYR.



## Adrenal Gland Females

**Table 15.2.3:** Risk of subsequent primary cancers after cancer of the adrenal gland excluding neuroblastoma, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4	2.14	6	1.07	5	1.22	6	1.62	21	15.27	1.37	30.23
All excluding same site	4	2.14	6	1.07	5	1.22	6	1.62	21	15.27	1.38	30.27
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-1.41
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.08
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.32
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.16
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.46
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.13
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.10
<b>Digestive system</b>	0	0.00	0	0.00	2	2.42	1	1.34	3	3.01	1.00	-0.05
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.49
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-1.18
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.27
Colon	0	0.00	0	0.00	1	2.46	0	0.00	1	1.46	0.68	-2.45
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	8.81	1	0.48	2.07	2.73
Rectum	0	0.00	0	0.00	0	0.00	1	13.14	1	0.32	3.16	3.61
Anus, anal canal	0	0.00	0	0.00	1	79.42*	0	0.00	1	0.05	21.33	5.03
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.39
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.32
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.34
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-2.12
<b>Respiratory system</b>	1	4.01	2	2.60	0	0.00	1	1.83	4	2.15	1.86	9.78
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	198.47*	1	0.02	49.64	5.17
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.38
Lung, bronchus	1	4.22	2	2.73	0	0.00	0	0.00	3	2.05	1.46	5.02
<b>Female breast</b>	1	1.71	3	1.70	0	0.00	1	0.88	5	4.74	1.05	1.36
<b>Female genital system</b>	0	0.00	0	0.00	1	1.90	0	0.00	1	2.02	0.49	-5.40
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-1.41
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	1.00	0.00	-5.30
Ovary	0	0.00	0	0.00	1	6.25	0	0.00	1	0.60	1.66	2.09
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.14
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.41
<b>Urinary system</b>	0	0.00	1	4.08	1	5.34	1	5.88	3	0.68	4.40	12.24
Urinary bladder	0	0.00	1	7.38	1	9.49	0	0.00	2	0.38	5.26	8.55
Kidney parenchyma	0	0.00	0	0.00	0	0.00	1	15.79	1	0.25	3.96	3.95
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.26
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.08
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	245.25*	1	0.02	59.50	5.19
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.35
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	-0.02
<b>Melanoma of skin</b>	2	44.43*	0	0.00	1	9.98	0	0.00	3	0.37	8.10*	13.88
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.90
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-1.06
<b>Lymphatic, hematopoietic</b>	0	0.00	0	0.00	0	0.00	1	3.64	1	1.11	0.90	-0.57
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	87.92*	1	0.05	20.95	5.03
Non-Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-2.87
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-1.01
Leukemia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-1.72
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.09
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.62
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.63
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.24

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 15.2.4:** Risk of subsequent primary cancers after cancer of the adrenal gland excluding neuroblastoma, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	8	3.78*	12	2.10*	8	1.74	8	1.68	36	17.20	2.09*	121.86
All excluding same site	8	3.78*	12	2.10*	7	1.52	8	1.68	35	17.19	2.04*	115.42
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-3.76
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.57
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.77
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.27
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.90
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.16
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.41
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.42
<b>Digestive system</b>	2	4.44	1	0.84	1	1.11	3	3.22	7	3.48	2.01	22.82
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-1.61
Stomach	0	0.00	1	7.29	0	0.00	0	0.00	1	0.39	2.59	3.98
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.36
Colon	0	0.00	0	0.00	0	0.00	2	5.12	2	1.43	1.40	3.70
Rectum, rectosigmoid junction	1	11.42	0	0.00	0	0.00	0	0.00	1	0.65	1.53	2.25
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.19
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-1.01
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.16
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.45
Pancreas	1	19.18	0	0.00	0	0.00	1	9.31	2	0.40	5.00	10.37
<b>Respiratory system</b>	1	2.23	5	4.20*	2	2.20	0	0.00	8	3.44	2.32*	29.53
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.18
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-1.94
Lung, bronchus	1	2.48	5	4.66*	2	2.43	0	0.00	8	3.11	2.58*	31.72
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.22
<b>Male genital system</b>	3	5.11*	4	2.43	1	0.68	3	1.91	11	5.27	2.09*	37.11
Prostate	3	5.24*	4	2.49	1	0.69	3	1.93	11	5.18	2.12*	37.71
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.39
<b>Urinary system</b>	1	5.01	1	1.86	2	4.65	1	2.18	5	1.63	3.07	21.86
Urinary bladder	1	7.29	1	2.71	1	3.35	1	3.12	4	1.12	3.56	18.64
Kidney parenchyma	0	0.00	0	0.00	1	9.10	0	0.00	1	0.42	2.40	3.78
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.56
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.19
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.12
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.47
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.47
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-3.25
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.17
<b>Brain, central nervous system</b>	1	36.00	0	0.00	0	0.00	0	0.00	1	0.21	4.80	5.13
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.52
<b>Lymphatic, hematopoietic</b>	0	0.00	1	2.29	1	2.93	1	2.77	3	1.30	2.30	11.01
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.39
Non-Hodgkin lymphoma	0	0.00	0	0.00	1	6.48	0	0.00	1	0.59	1.69	2.65
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-1.35
Leukemia	0	0.00	1	6.72	0	0.00	1	8.29	2	0.44	4.52	10.10
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	241.65*	1	0.02	54.45	6.36
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-1.15
Acute non-lymphocytic	0	0.00	1	20.95	0	0.00	0	0.00	1	0.14	6.99	5.55
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.39

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

## Thymus Both Sexes

**Table 15.3.1:** Characteristics of patients with an initial cancer of the thymus, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	545	100.0	418	100.0	963	100.0
<b>Initial treatment</b>						
Any radiation	372	68.3	286	68.4	658	68.3
With surgery	259	47.5	191	45.7	450	46.7
Without surgery	113	20.7	95	22.7	208	21.6
No radiation	173	31.7	132	31.6	305	31.7
With surgery	117	21.5	90	21.5	207	21.5
Without surgery	56	10.3	42	10.0	98	10.2
<b>Race</b>						
White	385	70.6	287	68.7	672	69.8
Black	63	11.6	64	15.3	127	13.2
Other	96	17.6	62	14.8	158	16.4
Unknown	1	0.2	5	1.2	6	0.6
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	47	8.6	30	7.2	77	8.0
30–49	181	33.2	116	27.8	297	30.8
50–69	236	43.3	176	42.1	412	42.8
70–79	65	11.9	72	17.2	137	14.2
≥ 80	16	2.9	24	5.7	40	4.2
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	496	91.0	386	92.3	882	91.6
1st and 2nd cancers	43	7.9	30	7.2	73	7.6
1st, 2nd, and 3rd cancers	5	0.9	1	0.2	6	0.6
1st, 2nd, 3rd, and additional cancers	1	0.2	1	0.2	2	0.2
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	53.5	—	57.2	—	55.3	—
Median year of 1st cancer diagnosis	1990.0	—	1991.2	—	1990.5	—
Median person-years at risk	3.8	—	3.5	—	3.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	100.0	—	96.9	—	98.8
1st, 2nd, and additional cancers	—	100.0	—	96.9	—	98.8
1st cancer only	—	0.0	—	0.0	—	0.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 15.3.2:** Risk of subsequent primary cancers after cancer of the thymus, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	9	1.30	34	1.45*	30	1.79*	18	1.46	91	59.55	1.53*	59.59
All excluding same site	9	1.30	34	1.45*	30	1.79*	18	1.46	91	59.52	1.53*	59.65
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	2	4.47	0	0.00	2	1.62	1.23	0.72
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.36
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.63
Salivary gland	0	0.00	0	0.00	2	54.22*	0	0.00	2	0.14	14.76*	3.53
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.42	0.00	-0.79
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.20
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.31
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.09
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.33
<b>Digestive system</b>	2	1.31	8	1.55	8	2.18	6	2.23	24	13.04	1.84*	20.77
Esophagus	0	0.00	0	0.00	1	4.97	2	14.98*	3	0.71	4.23	4.34
Stomach	0	0.00	2	3.42	3	7.61*	0	0.00	5	1.43	3.50*	6.77
Small intestine	1	44.70	0	0.00	0	0.00	0	0.00	1	0.20	5.04	1.52
Colon	0	0.00	2	0.92	3	1.90	3	2.50	8	5.59	1.43	4.56
Rectum, rectosigmoid junction	0	0.00	3	3.38	0	0.00	0	0.00	3	2.21	1.36	1.50
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.25
Liver	0	0.00	1	4.10	1	5.84	1	8.47	3	0.60	4.97	4.54
Gallbladder	1	47.11	0	0.00	0	0.00	0	0.00	1	0.17	5.81	1.57
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.56
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	1.56	0.00	-2.96
<b>Respiratory system</b>	2	1.64	4	0.96	4	1.37	5	2.43	15	10.38	1.45	8.76
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.18
Larynx	0	0.00	1	3.39	1	5.10	0	0.00	2	0.70	2.86	2.46
Lung, bronchus	2	1.79	3	0.78	3	1.11	5	2.62	13	9.56	1.36	6.52
<b>Female breast</b>	1	1.22	4	1.50	1	0.53	0	0.00	6	6.69	0.90	-3.02
<b>Female genital system</b>	0	0.00	1	0.85	1	1.24	1	1.88	3	2.87	1.04	0.55
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-1.73
Corpus uteri	0	0.00	0	0.00	1	2.54	1	3.81	2	1.40	1.43	2.60
Ovary	0	0.00	1	2.95	0	0.00	0	0.00	1	0.84	1.18	0.68
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.19
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.52
<b>Male genital system</b>	2	1.68	4	0.93	5	1.57	4	1.57	15	11.21	1.34	12.73
Prostate	2	1.71	4	0.95	5	1.60	4	1.59	15	11.03	1.36	13.34
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.36
<b>Urinary system</b>	0	0.00	2	1.16	1	0.81	1	1.03	4	4.42	0.90	-0.80
Urinary bladder	0	0.00	1	0.89	1	1.23	1	1.52	3	2.92	1.03	0.16
Kidney parenchyma	0	0.00	1	2.03	0	0.00	0	0.00	1	1.24	0.81	-0.45
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.51
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.16
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.11
<b>Soft tissue including heart</b>	0	0.00	1	9.90	1	14.25	0	0.00	2	0.25	7.89	3.31
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.27
<b>Melanoma of skin</b>	0	0.00	1	1.85	1	2.64	0	0.00	2	1.39	1.44	1.15
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.15
<b>Brain, central nervous system</b>	0	0.00	0	0.00	1	5.75	0	0.00	1	0.63	1.58	0.69
<b>Thyroid</b>	0	0.00	2	10.58*	0	0.00	0	0.00	2	0.45	4.46	2.94
<b>Lymphatic, hematopoietic</b>	2	3.89	7	4.02*	5	4.02*	1	1.06	15	4.45	3.37*	20.00
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.32
Non-Hodgkin lymphoma	2	8.42	3	3.72	4	6.86*	1	2.21	10	2.08	4.81*	15.01
Myeloma	0	0.00	1	3.32	0	0.00	0	0.00	1	0.77	1.30	0.44
Leukemia	0	0.00	3	5.36*	1	2.53	0	0.00	4	1.43	2.80	4.88
Acute lymphocytic	0	0.00	0	0.00	1	76.15	0	0.00	1	0.05	20.57	1.80
Chronic lymphocytic	0	0.00	1	4.79	0	0.00	0	0.00	1	0.54	1.87	0.88
Acute non-lymphocytic	0	0.00	2	10.20*	0	0.00	0	0.00	2	0.50	3.99	2.84
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.39

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,302 PYR and for male cancers on 2,976 PYR.



# Chapter 16

## New Malignancies Following Hodgkin Lymphoma, Non-Hodgkin Lymphoma, and Myeloma

Graça M. Dores, Timothy R. Coté, Lois B. Travis

### Synopsis

The risk of subsequent primary cancer was evaluated in more than 100,000 patients diagnosed with Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), or myeloma between 1973 and 2000. The overall risk of new cancer was significantly increased among 2-month survivors of HL (O/E=2.22,<sup>1</sup> O=1,336, EAR=49 per 10,000 person-years) and NHL (O/E=1.14,<sup>1</sup> O=5,490, EAR=19), but not among 2-month survivors of myeloma (O/E=0.98,<sup>1</sup> O=1,216). Subsequent cancer risk increased with time to reach 3-fold and 1.5-fold among 20-year survivors of HL and NHL, respectively. The relative risk of developing a new neoplasm was significantly increased among patients with HL in all age groups, whereas increased risk for a subsequent cancer was restricted to NHL patients diagnosed before age 70 years. Excluding sex-specific sites, lung cancer accounted for the largest excess of subsequent cancer after HL and NHL, likely reflecting the effects of radiotherapy, chemotherapy, and tobacco use. Women given radiotherapy for HL had a significantly increased 3-fold risk of breast cancer and risk remained significantly elevated in 20-year survivors. The increased risk of breast cancer was restricted to women treated for HL before age 40 years. Radiotherapy for HL contributed to the increased risk of subsequent primary cancers of the salivary gland, thyroid, stomach, uterine corpus, bone, and soft tissue. Radiotherapy as well as chemotherapy was associated with an elevated risk of bladder cancer following NHL. Excess acute non-lymphocytic leukemias following HL, NHL, and myeloma were most likely due to the effects of alkylating agent chemotherapy. Immune dysfunction may have played a role in the significantly elevated risks of malignant melanoma and lip cancer among both HL and NHL survivors. Increased reciprocal risks of HL and NHL may reflect the lymphoid etiology of both malignancies, misclassification, immune defects, or the role of

Epstein-Barr virus, an etiologic agent in subtypes of both lymphomas. The significantly elevated risk of Kaposi sarcoma following both HL and NHL suggested an effect of human immunodeficiency virus (HIV) infection or immune defects, which are shared risk factors for all three cancers. Human papillomavirus infection probably contributed to the excess anal cancers seen following HL and subgroups of NHL.

### Hodgkin Lymphoma

Hodgkin lymphoma (HL) accounts for only 0.5% of estimated incident cancers in the U.S. (Jemal et al, 2005), but it is the third most common malignancy in persons younger than 20 years of age. In developed countries, the incidence rates for HL peak between the ages of 15 and 34 years and again after age 55 years, a bimodal distribution suggesting 2 distinct etiologic entities (Mueller, 1996). Incidence rates for HL are 25% higher in males than females and 21% higher in whites than blacks. Radiotherapy and chemotherapy, alone or in combination, constitute standard treatment, which is determined largely by disease stage (Yung and Linch, 2003). Radiotherapy most frequently consists of mantle, inverted-Y, or pelvic fields. Since the 1970s, the use of radiotherapy in HL has diminished, particularly in the treatment of early-stage disease, and radiation field size and dose have decreased (Yahalom, 2002). In the late 1970s, mechlorethamine-containing combination chemotherapy (e.g., mechlorethamine, vincristine, procarbazine, and prednisone) began to be replaced by chemotherapy regimens associated with fewer adverse sequelae (e.g., doxorubicin, bleomycin, vinblastine, and dacarbazine). Improvements in treatment over the past 30 years have resulted in a 13% increase in 5-year survival rates since the 1970s, with current 5- and 10-year relative survival rates of 85.3% and 78.4%, respectively. Death rates were 50% higher in males than females and similar in whites and blacks. Overall, HL accounts for an estimated 0.2% of cancer deaths in the U.S. (Jemal et al, 2005).

<sup>1</sup>Observed-to-expected ratios for Hodgkin lymphoma, non-Hodgkin lymphoma, and myeloma exclude subsequent primary Hodgkin lymphoma, non-Hodgkin lymphoma, and myeloma, respectively.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

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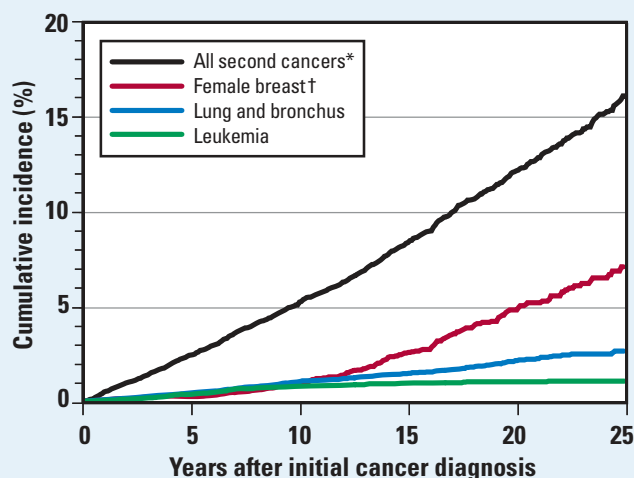
The etiology of HL is largely unknown, although reported risk factors include higher maternal educational or socioeconomic status, smaller sibship size, certain occupational exposures (e.g., woodworking), immunodeficiency, and possibly genetic influences (Mueller, 1996). Evidence linking Epstein-Barr virus (EBV) with HL appears most convincing for the mixed cellularity type, especially in children and the elderly (Yung and Linch, 2003).

### Results and Discussion

Among 17,516 2-month survivors of HL, 1,336 subsequent cancers were observed (O/E=2.22 excluding subsequent HL, 95% CI=2.10-2.34, EAR=49 per 10,000 person-years). The cumulative incidence of second cancer following HL in the presence of the competing risk of death due to other causes was 16.1% at 25 years (95% CI=15.0%-17.3%) (Figure 16.1). The risk of developing a new malignancy did not differ by race. Overall relative risk of subsequent cancer was higher in females (O/E=2.60, EAR=56) than males (O/E=1.96, EAR=43); however, excluding sex-specific cancer sites, the excess absolute risk of subsequent cancer was lower for females (O/E=2.93, EAR=35) than males (O/E=2.42, EAR=46). The relative risk of developing a new malignant neoplasm was significantly increased among HL patients of all ages at diagnosis, with the highest relative risk seen among those diagnosed at younger ages, but with the largest excess absolute risk occurring among those diagnosed at ages 40-59 years (EAR=106) (Figure 16.2). Significantly elevated relative risks were observed in each time interval following HL diagnosis and increased in magnitude to 3-fold (O/E=3.24) among 20-year survivors (P trend <0.0001). Confirming previous studies, we found significant excesses of non-Hodgkin lymphoma (NHL), malignant melanoma, and leukemia, as well as cancers of the lip, tongue, salivary gland, stomach, colon, liver, lung, female breast, thyroid, bone, and soft tissue (Metayer et al, 2000; Dong and Hemminki, 2001; van Leeuwen and Travis, 2001; Dores et al, 2002). New findings included significant 2- to 7-fold excesses for Kaposi sarcoma (KS) as well as cancers of the anus, uterine corpus, and ureter. Risk of prostate cancer was significantly decreased.

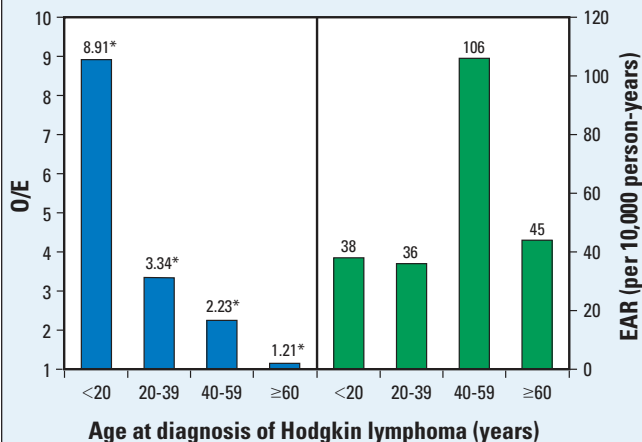
Excluding sex-specific sites, lung cancer accounted for the largest excess of subsequent neoplasms occurring after HL. Significantly elevated risks were observed in both sexes and among all age groups. Overall increased risks of lung cancer were apparent in both irradiated and nonirradiated patients, consistent with several analytic studies implicating either radiotherapy or chemotherapy (Swerdlow et al, 2001; Travis et al, 2002). In the largest investigation to date, alkylating agent chemotherapy used to treat HL was associated with a dose-dependent increase in lung cancer risk, with significant excesses beginning 1-4 years after treatment and continuing for up to 15 years (Travis et al, 2002). Risk also rose with increasing radiation dose to the lung, starting 5-9 years after treatment and persisting for more than 20 years.

**Figure 16.1:** Cumulative incidence of developing a second cancer among patients with Hodgkin lymphoma, both sexes, SEER 1973-2000.



\* Cumulative incidence for all second cancers at 25 years is 14.1% for males and 18.9% for females.  
† Female breast cancer curve is based on female Hodgkin lymphoma patients only.

**Figure 16.2:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after Hodgkin lymphoma, both sexes, SEER 1973-2000.



\* P <0.05.  
Notes: All subsequent cancers excluding Hodgkin lymphoma. EAR = Excess number of subsequent cancers per 10,000 person-years. Observed number of subsequent cancers are 128, 435, 480 and 293, for age groups <20, 20-39, 40-59 and ≥60 years, respectively.

Smoking appeared to multiply all treatment-associated risks. Nearly all HL patients who developed lung cancer were smokers (Travis et al, 2002), although few studies have linked tobacco use with HL (Briggs et al, 2002).

Women treated with radiotherapy for HL experienced a significant 3-fold increase in the risk of breast cancer, which persisted among 20-year survivors (O/E=5.46). Significantly elevated risks were confined to females treated at ages younger than 20 years and 20-39 years, consistent with the increased sensitivity of the breast to ionizing radiation exposure at young ages (Preston et al, 2002). Our findings are consistent with the elevated breast cancer risk described in previous surveys of HL,

other medically irradiated populations, and atomic bomb survivors (Travis et al, 2003). In a large international study of young women treated for HL, breast cancer risk increased with increasing radiation dose to the breast, reaching an 8-fold increase in risk at a dose higher than 40 Gy; radiation-related risk persisted for more than 25 years (Travis et al, 2003). In contrast, the risk of breast cancer decreased with increasing number of cycles of alkylating agents, with corollary findings implicating treatment-induced ovarian failure (Travis et al, 2003; van Leeuwen et al, 2003).

Leukemias accounted for the third largest absolute number of subsequent primary cancers in our series, with acute non-lymphocytic leukemia (ANLL) constituting 80% of leukemia cases and associated with a significantly elevated 19-fold risk. The risk of subsequent ANLL was highest within the first 10 years after diagnosis of HL, and an elevated risk persisted in the 10-14 and 15-19 year time intervals. Previous studies of HL have attributed excess leukemias primarily to either initial or salvage treatment with alkylating agent chemotherapy (especially mechlorethamine and procarbazine) (van Leeuwen and Travis, 2001). Radiotherapy alone for HL appears associated with little or no increased risk of leukemia, and the risk following combination radiation and chemotherapy does not seem to exceed the risk after chemotherapy alone (van Leeuwen and Travis, 2001). Based on small numbers, the risks of acute lymphocytic leukemia and chronic myelogenous leukemia (CML) were also significantly elevated in our series. These types of leukemia have been linked previously to prior chemotherapy and radiation exposure (van Leeuwen and Travis, 2001).

The increased risks of cancers of the salivary gland, thyroid, stomach, uterine corpus, bone, and soft tissue appeared related to treatment. Radiation is an established risk factor for salivary gland cancer (Land et al, 1996), especially mucoepidermoid tumors, which constituted 67% of salivary neoplasms in our series, compared with 24% in the general population. The thyroid also is an established site for radiogenic cancer, particularly when exposure occurs prior to age 20 years (Ron et al, 1995). In our series, significantly increased risks of thyroid cancer were limited to patients younger than 40 years of age at HL diagnosis, although some studies have described elevated risks in older HL patients, albeit based on small numbers (van Leeuwen and Travis, 2001; Dores et al, 2002). Some surveys—but not all—have found significant excesses of stomach cancer following HL, with the largest risk following both chemotherapy and radiotherapy (van Leeuwen and Travis, 2001). Significant excesses of uterine corpus cancer in our series were evident among 10-year survivors of HL who initially received radiation, consistent with the location of the uterus in pelvic radiotherapy fields. Similar increases in the risk of uterine corpus cancer have been observed among long-term survivors of cervical cancer treated with radiotherapy (Boice et al, 1988). The excess we observed for bone cancer is consistent with the increased risks associ-

ated with radiotherapy and chemotherapy for childhood cancer (Hawkins et al, 1996; van Leeuwen and Travis, 2001). In previous studies of HL among children and adults, significantly increased risks of sarcomas of bone and soft tissue have been reported (Metayer et al, 2000; van Leeuwen and Travis, 2001; Dores et al, 2002).

The increased risk of NHL following HL may be due, at least in part, to the cellular immune dysfunction that is evident prior to the diagnosis of HL and that may persist for years (Poppema, 1996). In addition, misclassification of HL as NHL and the derivation of HL and NHL from common lymphoid precursors may contribute to the association. Immunologic susceptibility to human papillomavirus (HPV) infection may account for excess cancers of the tongue and anus in our series (Herrero et al, 2003). Defective immune mechanisms may underlie the elevated risks of malignant melanoma and lip cancer in our study, as well as in other immunosuppressed populations (Frisch et al, 2001), although heightened medical surveillance may play a role.

A significantly elevated risk of KS was restricted to the first 5 years after HL diagnosis. Because KS and NHL are acquired immune deficiency syndrome (AIDS)-defining cancers, the excess of both malignancies that we observed among HL survivors may be influenced by underlying human immunodeficiency virus (HIV) infection, which is also known to increase the risk of HL. In addition, although human herpesvirus-8 is the causal agent in KS, the risk of KS among HIV-infected individuals (Goedert, 2000), as well as organ transplant recipients (Schwartz, 2001), increases with the level of immune suppression.

The significantly increased 2-fold risk of liver cancer following HL in our study may reflect hepatitis C virus (HCV) infection acquired through transfusion of blood products before effective screening measures were available. Eighty-nine percent of hepatocellular carcinomas (O=9) were detected in patients diagnosed with HL prior to 1992, when second-generation testing for HCV was instituted.

## Non-Hodgkin Lymphoma

NHL is the seventh most frequent cancer in the U.S., constituting an estimated 4.1% of new malignant neoplasms (Jemal et al, 2005). The incidence of NHL has increased significantly in the last few decades, but reasons for this increase remain unclear (Groves et al, 2000; Evans and Hancock, 2003). Between 1975 and 2000 the overall incidence rate of NHL in the SEER Program increased by more than 70%. Incidence rates for NHL are 48% higher in males than females and 38% higher in whites than blacks. Standard treatment options for NHL include radiotherapy and/or chemotherapy and are based largely on stage and histology (Evans and Hancock, 2003). Therapeutic regimens have recently been expanded to include monoclonal antibodies, biologic response modifiers, and antimicrobial agents (Evans and Hancock, 2003). The 5-year relative survival rate for patients with

NHL is 59.1%. Between 1996 and 2000 death rates were 52% higher in males than females and 53% higher in whites than blacks. Overall, NHL accounts for an estimated 3.4% of cancer deaths in the U.S. (Jemal et al, 2005).

Risk factors for NHL likely vary by histologic type and may include acquired and congenital immunodeficiency states, selected viral infections (HIV, EBV, HCV), pesticides and other agricultural exposures, lifestyle factors (diet, tobacco, hair dyes), and genetic susceptibility (Groves et al, 2000; Evans and Hancock, 2003).

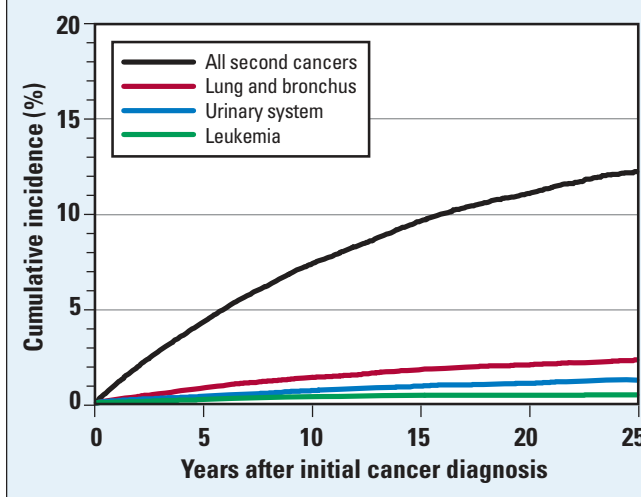
### Results and Discussion

Overall, 5,490 subsequent cancers were observed among 73,958 2-month survivors of NHL, reflecting an overall 14% elevated risk compared with the general population (O/E=1.14 excluding subsequent NHL, 95% CI=1.11-1.17, EAR=19). Second cancer incidence reached 12.3% within 25 years (95% CI=11.9%-12.7%) (Figure 16.3). The risk of developing a new malignancy did not differ significantly by race or gender. Subsequent cancer risk was significantly elevated in patients of ages less than 30, 30-49, and 50-69 years at NHL diagnosis, with the highest relative risk seen among those diagnosed under age 30 years, but with the largest excess absolute risk occurring among those ages 30-49 years (EAR=35) (Figure 16.4).

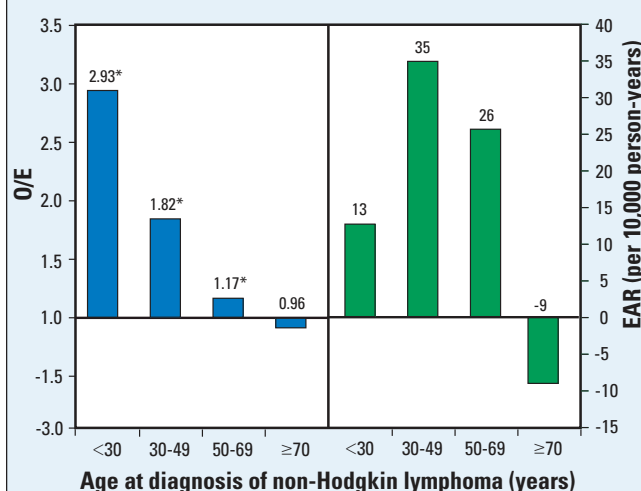
The relative risk of all new cancers increased with time since diagnosis to 1.47 among 20-year survivors of NHL (P trend <0.0001). Significantly increased risks of new malignancies were observed for malignant melanoma, KS, HL, and ANLL, as well as cancers of the buccal cavity, lip, salivary gland, mouth, lung, vagina, urinary bladder, kidney, and bone. Significant deficits were reported for cancers of the female breast and prostate, as well as for myeloma and chronic lymphocytic leukemia (CLL). (Patients diagnosed with myeloma or CLL following NHL are presumed not to have developed a new second primary, according to SEER rules.) An earlier survey of the SEER database reported a reciprocally elevated risk of cutaneous melanoma and NHL (Goggins et al, 2001). In addition, our results corroborate findings in other previous surveys of NHL, which have reported significant excesses of cutaneous melanoma, KS, HL, ANLL, and cancers of the buccal cavity, lip, lung, urinary bladder, and kidney, as well as significant deficits of breast and prostate cancers (Travis et al, 1991, 1992, 1993; Brennan et al, 2000, 2005; Cannon et al, 2000; Dong and Hemminki, 2001).

Lung cancer accounted for the largest excess of subsequent cancers after NHL in both sexes, with overall increased risks noted in some—but not all—prior surveys (Travis et al, 1991, 1993; Brennan et al, 2000, 2005; Dong and Hemminki, 2001). A general upswing in the risk of lung cancer with time since NHL diagnosis was observed in our study, with 70% excesses among 20-year survivors (P trend <0.01). Given the overlap in treatment used for NHL and HL, similar therapeutic agents, as well as smoking, are likely involved in the lung cancer excesses seen after both tumors (Travis et al, 2002). In addition, tobacco use probably contributes to the excess risks

**Figure 16.3:** Cumulative incidence of developing a second cancer among patients with non-Hodgkin lymphoma, both sexes, SEER 1973-2000.



**Figure 16.4:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, SEER 1973-2000.



\*P <0.05.

Notes: All subsequent cancers excluding non-Hodgkin lymphoma. EAR = Excess number of subsequent cancers per 10,000 person-years. Observed number of subsequent cancers are 59, 631, 2,956 and 1,844, for age groups <30, 30-49, 50-69 and ≥70 years, respectively.

observed for cancers of the lip, mouth, urinary bladder, and kidney, and may increase the risk of the follicular subtype of NHL (Stagnaro et al, 2001; Morton et al, 2005).

Significant excesses of ANLL were restricted to the first 15 years after NHL diagnosis, as reported in prior surveys (Travis et al, 1993). Previous studies have documented the leukemogenic effects of radiotherapy and alkylating agent chemotherapy for NHL, in particular, mechlorethamine, procarbazine, and chlorambucil (Travis et al, 1994, 1996). Radiotherapy for NHL appeared related to the increased risks for bladder cancers and bone sarcomas in our series. Among patients who initially received radiotherapy, significantly increased risks of bladder cancer were confined to 10-year survivors



(O/E=2.25), a pattern consistent with previous studies of NHL (Travis et al, 1995) and with other surveys of radiogenic bladder cancer (UNSCEAR, 2000). In patients treated with chemotherapy, elevated risks of bladder cancer were noted in the follow-up intervals 5-9 years and 10 or more years after diagnosis, possibly due to treatment with cyclophosphamide, a known bladder carcinogen (Travis et al, 1995). In a previous analytic study of NHL patients, cyclophosphamide increased the risk of bladder cancer in a dose-dependent manner and had an additional effect when combined with radiotherapy (Travis et al, 1995).

The immunosuppressive state associated with NHL (Evans and Hancock, 2003) may contribute to the increased risks observed for cutaneous melanoma, HL, and lip cancer (Frisch et al, 2001; Goggins et al, 2001). Although diagnostic misclassification of HL and NHL may affect risk estimates, one population-based study of NHL in which histopathological materials for all cases were independently reviewed revealed a significant 3-fold excess of HL (Travis et al, 1992). EBV infection, an established cofactor in several subtypes of NHL and HL, may contribute to the 5-fold increased risk of HL in our study. The elevated 13-fold risk of KS, based on 113 cases, probably reflects underlying HIV infection in some NHL patients, particularly because significant excesses were not evident prior to 1980 (the pre-HIV era). Individuals with AIDS have a 150- to 200-fold increased risk of NHL, which is associated with the degree of immune suppression (Goedert, 2000). In a reciprocal fashion, the significantly increased risks of NHL following HL, KS, and malignant melanoma in the SEER database point to the role of shared etiologic factors, possibly immune-related.

Based on small numbers, significantly increased risks of vaginal cancers were limited to women diagnosed with NHL at ages 50-69 years, and excesses of anal cancers were limited to males diagnosed at ages 30-49 years. Vaginal and anal cancers have been linked to HPV infection and occur excessively in persons with HIV infection.

A significant deficit of prostate cancer was restricted to the period from 2 to 12 months after NHL and likely reflects the residual effect of detecting cases with screening within 2 months of diagnosis of NHL. The significantly increased 4-fold risk of kidney cancer observed between 2 and 12 months after NHL diagnosis suggests a role for medical surveillance; the subsequent increase in risk 5-9 years after NHL diagnosis was unrelated to initial treatment and may reflect medical surveillance or chance observation.

## Myeloma

Myeloma accounts for an estimated 1.2% of all cancers in the U.S. and 2% of all cancer deaths (Jemal et al, 2005). The incidence of myeloma rises sharply with age, with only 8% of cases reported to the SEER Program in patients younger than age 50 years. Males are approximately 50% more likely to be diagnosed with myeloma than females, and blacks have a 2-fold higher incidence compared with whites. For more than 30 years, the stan-

dard treatment for myeloma has consisted of intermittent courses of melphalan and prednisone, although chemotherapy that includes cyclophosphamide, vinca alkaloids, anthracyclines, and nitrosoureas has also been used (Barlogie et al, 2004). Radiation therapy may provide potentially curative treatment for patients with localized disease (solitary plasmacytoma), but radiation is otherwise generally reserved for palliation of skeletal lesions. Immunomodulatory agents, monoclonal antibodies, and autologous and allogeneic bone marrow transplantation are among the newer treatment options (Barlogie et al, 2004). The 5-year relative survival rate for patients with myeloma is 31.9%. Between 1996 and 2000, death rates were 47% higher in males than females and twice as high in blacks as in whites.

The etiology of myeloma remains largely unexplained. Studies in atomic bomb survivors and individuals exposed to therapeutic and diagnostic radiation have reported an effect of radiation, but the studies are inconsistent (Herrington et al, 1996). Occupational exposures, such as benzene, herbicides, and pesticides, have also been associated with myeloma (Herrington et al, 1996).

## Results and Discussion

Among 23,838 patients who survived 2 months or more following a diagnosis of myeloma, the overall risk of developing a subsequent primary cancer was not increased (O/E=0.98 excluding subsequent myeloma, O=1,216, 95% CI=0.93-1.04). Approximately 6.1% (95% CI=5.8%-6.5%) of myeloma patients developed a second cancer within 20 years. The increased risk of developing a new malignancy was limited to individuals diagnosed with myeloma at ages younger than 70 years (O/E=1.09, EAR=12); subsequent cancer risk did not differ by gender, race, or initial therapy. Significantly elevated risks were noted for KS, ANLL, and CML, while significant deficits were observed for CLL as well as cancers of the buccal cavity and pharynx, esophagus, female breast, and prostate. The increased risks for KS and leukemia are consistent with earlier surveys, but we did not observe the significant excesses of NHL or bladder cancer reported previously (Cannon et al, 2000; Finnish Leukaemia Group, 2000; Dong and Hemminki, 2001).

Leukemias accounted for the largest cancer excesses following a diagnosis of myeloma, with ANLL constituting 80% of leukemia cases. Risks for ANLL were significantly elevated 1-4, 5-9, and 10-14 years after initial diagnosis, consistent with previous surveys (Finnish Leukaemia Group, 2000; Dong and Hemminki, 2001). Increased risks of ANLL likely reflect treatment for myeloma with alkylating agents, which are often given for 6 to 12 months or longer (Barlogie et al, 2004). The significantly increased 2.5-fold risk of CML that we observed is likely due to the antecedent chemotherapy and/or radiotherapy, in accord with prior studies (van Leeuwen and Travis, 2001).

A significantly increased risk of KS was observed, as was reported in another large survey (Cannon et al, 2000), although an excess of myeloma following KS was not

noted in the SEER data. Whether human herpesvirus-8, the etiologic agent of KS, may be associated with some cases of myeloma is not clear (Berenson and Vescio, 1999; Tarte et al, 1999). The significantly increased risk of kidney cancer was confined to the 1-year period following the diagnosis of myeloma, which suggests a surveillance effect.

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## Hodgkin Lymphoma Both Sexes

**Table 16.1.1:** Characteristics of patients with an initial Hodgkin lymphoma, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	9,769	100.0	7,747	100.0	17,516	100.0
<b>Initial treatment</b>						
Any radiation	4,825	49.4	4,376	56.5	9,201	52.5
With surgery	1,208	12.4	1,070	13.8	2,278	13.0
Without surgery	3,617	37.0	3,306	42.7	6,923	39.5
No radiation	4,944	50.6	3,371	43.5	8,315	47.5
With surgery	998	10.2	697	9.0	1,695	9.7
Without surgery	3,946	40.4	2,674	34.5	6,620	37.8
<b>Race</b>						
White	8,662	88.7	6,914	89.2	15,576	88.9
Black	801	8.2	593	7.7	1,394	8.0
Other	252	2.6	204	2.6	456	2.6
Unknown	54	0.6	36	0.5	90	0.5
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	4,019	41.1	3,713	47.9	7,732	44.1
30–49	3,243	33.2	2,165	27.9	5,408	30.9
50–69	1,801	18.4	1,099	14.2	2,900	16.6
70–79	529	5.4	516	6.7	1,045	6.0
≥ 80	177	1.8	254	3.3	431	2.5
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	9,101	93.2	7,188	92.8	16,289	93.0
1st and 2nd cancers	618	6.3	507	6.5	1,125	6.4
1st, 2nd, and 3rd cancers	49	0.5	46	0.6	95	0.5
1st, 2nd, 3rd, and additional cancers	1	0.0	6	0.1	7	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	33.8	—	30.8	—	32.3	—
Median year of 1st cancer diagnosis	1987.5	—	1988.1	—	1987.8	—
Median person-years at risk	6.5	—	7.1	—	6.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	97.8	—	97.3	—	97.6
1st, 2nd, and additional cancers	—	97.6	—	96.6	—	97.1
1st cancer only	—	1.9	—	2.1	—	2.0

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 16.1.2:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	76	1.40*	325	1.74*	338	2.11*	598	2.88*	1,337	608.94	2.20*	48.59
All excluding same site	76	1.41*	324	1.75*	338	2.13*	598	2.90*	1,336	603.01	2.22*	48.92
<b>Buccal cavity, pharynx</b>	1	0.61	15	2.70*	19	4.15*	21	3.70*	56	17.44	3.21*	2.57
Lip	1	4.14	3	3.89	4	6.82*	1	1.59	9	2.23	4.04*	0.45
Tongue	0	0.00	3	2.61	4	4.03*	7	5.32*	14	3.78	3.70*	0.68
Salivary gland	0	0.00	3	5.78*	5	11.25*	10	17.58*	18	1.68	10.72*	1.09
Mouth	0	0.00	3	2.11	3	2.63	1	0.74	7	4.34	1.61	0.18
Nasopharynx	0	0.00	0	0.00	1	4.57	0	0.00	1	0.83	1.21	0.01
Tonsil	0	0.00	1	1.72	0	0.00	1	1.38	2	1.97	1.01	0.00
Oropharynx	0	0.00	0	0.00	2	16.13*	0	0.00	2	0.48	4.21	0.10
Hypopharynx	0	0.00	1	1.91	0	0.00	1	2.05	2	1.59	1.26	0.03
<b>Digestive system</b>	10	0.91	34	0.95	40	1.37	92	2.61*	176	111.19	1.58*	4.33
Esophagus	0	0.00	1	0.52	3	1.86	5	2.40	9	6.18	1.46	0.19
Stomach	2	1.75	6	1.65	4	1.39	22	6.64*	34	10.97	3.10*	1.54
Small intestine	0	0.00	3	5.18*	0	0.00	2	2.77	5	1.98	2.52	0.20
Colon	5	1.03	13	0.83	20	1.59	33	2.23*	71	47.89	1.48*	1.54
Rectum, rectosigmoid junction	1	0.50	7	1.07	4	0.76	2	0.31	14	20.22	0.69	-0.41
Anus, anal canal	0	0.00	0	0.00	2	5.09	5	8.64*	7	1.52	4.59*	0.37
Liver	0	0.00	1	0.78	2	1.80	7	4.50*	10	4.31	2.32*	0.38
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.32	0.00	-0.09
Bile ducts, other biliary	1	4.55	0	0.00	0	0.00	2	2.55	3	2.33	1.29	0.04
Pancreas	1	0.76	3	0.71	5	1.46	11	2.64*	20	13.16	1.52	0.46
<b>Respiratory system</b>	10	1.13	62	2.08*	76	3.11*	103	3.47*	251	92.74	2.71*	10.56
Nose, nasal cavity, ear	0	0.00	1	3.28	0	0.00	1	3.11	2	0.97	2.05	0.07
Larynx	0	0.00	3	1.30	2	1.07	7	3.14*	12	7.09	1.69	0.33
Lung, bronchus	10	1.25	56	2.07*	72	3.25*	95	3.52*	233	84.27	2.76*	9.93
<b>Female breast</b>	5	0.82	16	0.74	33	1.65*	136	4.54*	190	77.61	2.45*	16.55
<b>Female genital system</b>	0	0.00	15	1.42	14	1.52	34	2.78*	63	35.08	1.80*	4.11
Cervix uteri	0	0.00	3	1.27	2	0.89	6	2.20	11	7.94	1.39	0.45
Corpus uteri	0	0.00	5	1.15	8	2.26	19	3.94*	32	14.03	2.28*	2.64
Ovary	0	0.00	6	1.93	3	1.07	8	2.09	17	10.62	1.60	0.94
Vagina	0	0.00	0	0.00	0	0.00	1	7.42	1	0.42	2.40	0.09
Vulva	0	0.00	0	0.00	1	2.89	0	0.00	1	1.33	0.75	-0.05
<b>Male genital system</b>	10	1.15	25	0.82	20	0.75	25	0.69	80	102.07	0.78*	-2.69
Prostate	10	1.23	21	0.75	19	0.78	23	0.68	73	94.47	0.77*	-2.62
Testis	0	0.00	4	1.78	1	0.49	1	0.49	6	6.87	0.87	-0.11
<b>Urinary system</b>	3	0.75	14	1.03	16	1.41	22	1.53	55	43.24	1.27	0.78
Urinary bladder	1	0.37	8	0.89	12	1.64	12	1.34	33	27.91	1.18	0.34
Kidney parenchyma	2	1.85	4	1.05	3	0.89	7	1.49	16	12.98	1.23	0.20
Renal pelvis, other urinary	0	0.00	2	2.52	1	1.62	3	4.34	6	2.35	2.55	0.24
Ureter	0	0.00	2	7.93	0	0.00	3	14.34*	5	0.73	6.81*	0.28
<b>Bone, joints</b>	0	0.00	3	6.80*	0	0.00	5	13.72*	8	1.27	6.28*	0.45
<b>Soft tissue including heart</b>	2	6.28	3	2.62	9	9.12*	17	13.94*	31	3.67	8.44*	1.82
<b>Kaposi sarcoma</b>	7	16.68*	6	3.26*	2	1.00	1	0.42	16	6.63	2.41*	0.63
<b>Melanoma of skin</b>	3	1.58	13	1.73	12	1.65	15	1.49	43	26.70	1.61*	1.09
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.08	0.00	-0.07
<b>Brain, central nervous system</b>	0	0.00	6	1.94	4	1.50	1	0.31	11	9.80	1.12	0.08
<b>Thyroid</b>	1	1.30	4	1.30	4	1.37	23	6.07*	32	10.55	3.03*	1.43
<b>Lymphatic, hematopoietic</b>	24	5.07*	97	5.87*	82	5.79*	79	4.51*	282	52.94	5.33*	15.29
Hodgkin lymphoma	0	0.00	1	0.48	0	0.00	0	0.00	1	5.93	0.17*	-0.33
Non-Hodgkin lymphoma	19	9.32*	41	5.60*	29	4.38*	55	6.23*	144	24.80	5.81*	7.95
Myeloma	1	1.62	3	1.46	1	0.58	3	1.36	8	6.59	1.21	0.09
Leukemia	4	2.65	52	10.29*	52	12.58*	21	4.27*	129	15.61	8.26*	7.57
Acute lymphocytic	0	0.00	2	5.56	2	7.24	3	10.49*	7	1.03	6.82*	0.40
Chronic lymphocytic	0	0.00	1	0.60	3	2.21	1	0.61	5	5.18	0.96	-0.01
Acute non-lymphocytic	2	3.83	43	24.27*	43	29.46*	14	8.07*	102	5.49	18.59*	6.44
Chronic myeloid	1	4.49	1	1.31	2	3.08	3	3.82	7	2.42	2.89*	0.31

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 67,933 PYR and for male cancers on 81,914 PYR.

# Hodgkin Lymphoma

## Both Sexes, Long-term Follow-up

**Table 16.1.3:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	739	1.84*	279	2.59*	206	3.19*	113	3.22*	1,337	608.94	2.20*	48.59
All excluding same site	738	1.86*	279	2.61*	206	3.21*	113	3.24*	1,336	603.01	2.22*	48.92
<b>Buccal cavity, pharynx</b>	35	2.97*	6	2.02	12	6.85*	3	3.13	56	17.44	3.21*	2.57
Lip	8	5.00*	1	2.86	0	0.00	0	0.00	9	2.23	4.04*	0.45
Tongue	7	2.84*	2	2.99	5	12.15*	0	0.00	14	3.78	3.70*	0.68
Salivary gland	8	7.21*	2	6.69	6	34.21*	2	21.09*	18	1.68	10.72*	1.09
Mouth	6	2.01	0	0.00	1	2.42	0	0.00	7	4.34	1.61	0.18
Nasopharynx	1	1.79	0	0.00	0	0.00	0	0.00	1	0.83	1.21	0.01
Tonsil	1	0.80	0	0.00	0	0.00	1	7.30	2	1.97	1.01	0.00
Oropharynx	2	6.30	0	0.00	0	0.00	0	0.00	2	0.48	4.21	0.10
Hypopharynx	1	0.91	1	3.83	0	0.00	0	0.00	2	1.59	1.26	0.03
<b>Digestive system</b>	84	1.11	38	2.04*	39	3.63*	15	2.55*	176	111.19	1.58*	4.33
Esophagus	4	0.98	2	1.86	2	3.09	1	2.76	9	6.18	1.46	0.19
Stomach	12	1.57	8	4.51*	9	8.96*	5	9.36*	34	10.97	3.10*	1.54
Small intestine	3	2.38	0	0.00	1	4.39	1	7.62	5	1.98	2.52	0.20
Colon	38	1.15	18	2.27*	11	2.46*	4	1.68	71	47.89	1.48*	1.54
Rectum, rectosigmoid junction	12	0.87	1	0.30	1	0.52	0	0.00	14	20.22	0.69	-0.41
Anus, anal canal	2	2.12	1	3.51	3	16.18*	1	9.22	7	1.52	4.59*	0.37
Liver	3	1.09	3	3.90	3	6.15*	1	3.35	10	4.31	2.32*	0.38
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.32	0.00	-0.09
Bile ducts, other biliary	1	0.65	0	0.00	2	8.23	0	0.00	3	2.33	1.29	0.04
Pancreas	9	1.00	4	1.82	6	4.69*	1	1.43	20	13.16	1.52	0.46
<b>Respiratory system</b>	148	2.35*	48	3.07*	34	3.74*	21	4.23*	251	92.74	2.71*	10.56
Nose, nasal cavity, ear	1	1.53	0	0.00	0	0.00	1	19.01	2	0.97	2.05	0.07
Larynx	5	1.03	6	5.07*	0	0.00	1	2.72	12	7.09	1.69	0.33
Lung, bronchus	138	2.41*	42	2.96*	34	4.11*	19	4.20*	233	84.27	2.76*	9.93
<b>Female breast</b>	54	1.13	59	3.99*	50	5.20*	27	4.88*	190	77.61	2.45*	16.55
<b>Female genital system</b>	29	1.27	17	2.70*	9	2.34*	8	3.83*	63	35.08	1.80*	4.11
Cervix uteri	5	0.96	3	1.98	1	1.20	2	5.29	11	7.94	1.39	0.45
Corpus uteri	13	1.41	10	4.20*	5	3.27*	4	4.39*	32	14.03	2.28*	2.64
Ovary	9	1.32	4	2.05	3	2.48	1	1.52	17	10.62	1.60	0.94
Vagina	0	0.00	0	0.00	0	0.00	1	46.17	1	0.42	2.40	0.09
Vulva	1	1.17	0	0.00	0	0.00	0	0.00	1	1.33	0.75	-0.05
<b>Male genital system</b>	55	0.84	13	0.71	7	0.61	5	0.79	80	102.07	0.78*	-2.69
Prostate	50	0.83	11	0.64	7	0.65	5	0.82	73	94.47	0.77*	-2.62
Testis	5	1.04	1	0.81	0	0.00	0	0.00	6	6.87	0.87	-0.11
<b>Urinary system</b>	33	1.14	8	1.07	7	1.58	7	2.84*	55	43.24	1.27	0.78
Urinary bladder	21	1.11	4	0.85	4	1.47	4	2.66	33	27.91	1.18	0.34
Kidney parenchyma	9	1.09	3	1.27	2	1.34	2	2.34	16	12.98	1.23	0.20
Renal pelvis, other urinary	3	1.81	1	2.67	1	4.84	1	9.10	6	2.35	2.55	0.24
Ureter	2	3.81	1	8.69	1	16.19	1	30.89	5	0.73	6.81*	0.28
<b>Bone, joints</b>	3	3.30	2	9.85*	1	9.13	2	38.56*	8	1.27	6.28*	0.45
<b>Soft tissue including heart</b>	14	5.71*	8	12.36*	5	13.25*	4	20.50*	31	3.67	8.44*	1.82
<b>Kaposi sarcoma</b>	15	3.52*	1	0.66	0	0.00	0	0.00	16	6.63	2.41*	0.63
<b>Melanoma of skin</b>	28	1.68*	7	1.35	5	1.59	3	1.78	43	26.70	1.61*	1.09
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.08	0.00	-0.07
<b>Brain, central nervous system</b>	10	1.51	1	0.58	0	0.00	0	0.00	11	9.80	1.12	0.08
<b>Thyroid</b>	9	1.33	10	4.97*	9	7.64*	4	6.68*	32	10.55	3.03*	1.43
<b>Lymphatic, hematopoietic</b>	203	5.73*	50	5.37*	18	3.34*	11	3.94*	282	52.94	5.33*	15.29
Hodgkin lymphoma	1	0.23	0	0.00	0	0.00	0	0.00	1	5.93	0.17*	-0.33
Non-Hodgkin lymphoma	89	5.57*	33	7.17*	12	4.33*	10	6.90*	144	24.80	5.81*	7.95
Myeloma	5	1.14	1	0.88	2	2.92	0	0.00	8	6.59	1.21	0.09
Leukemia	108	10.10*	16	6.06*	4	2.67	1	1.28	129	15.61	8.26*	7.57
Acute lymphocytic	4	5.40*	2	12.29*	0	0.00	1	25.58	7	1.03	6.82*	0.40
Chronic lymphocytic	4	1.13	1	1.15	0	0.00	0	0.00	5	5.18	0.96	-0.01
Acute non-lymphocytic	88	23.45*	11	11.83*	3	5.71*	0	0.00	102	5.49	18.59*	6.44
Chronic myeloid	4	2.44	2	4.70	1	4.15	0	0.00	7	2.42	2.89*	0.31

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 67,933 PYR and for male cancers on 81,914 PYR.

**Table 16.1.4:** Risk of subsequent primary cancers after Hodgkin lymphoma, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	27	1.29	126	1.77*	145	2.30*	320	3.80*	618	239.29	2.58*	55.75
All excluding same site	27	1.31	125	1.78*	145	2.33*	320	3.82*	617	236.89	2.60*	55.95
<b>Buccal cavity, pharynx</b>	0	0.00	4	3.20	8	7.67*	10	7.70*	22	3.97	5.54*	2.65
Lip	0	0.00	0	0.00	1	15.60	0	0.00	1	0.24	4.17	0.11
Tongue	0	0.00	0	0.00	0	0.00	3	9.71*	3	0.90	3.34	0.31
Salivary gland	0	0.00	1	5.27	4	23.87*	6	28.55*	11	0.62	17.72*	1.53
Mouth	0	0.00	2	5.03	2	6.22	1	2.57	5	1.23	4.06*	0.55
Nasopharynx	0	0.00	0	0.00	1	20.17	0	0.00	1	0.19	5.29	0.12
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.05
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.03
<b>Digestive system</b>	6	1.46	12	0.94	12	1.15	31	2.51*	61	39.58	1.54*	3.15
Esophagus	0	0.00	0	0.00	0	0.00	1	2.97	1	1.09	0.92	-0.01
Stomach	2	6.18	1	1.02	0	0.00	6	6.71*	9	2.98	3.02*	0.89
Small intestine	0	0.00	3	14.60*	0	0.00	0	0.00	3	0.71	4.20	0.34
Colon	3	1.48	5	0.80	8	1.58	14	2.39*	30	19.20	1.56*	1.59
Rectum, rectosigmoid junction	0	0.00	2	0.94	1	0.58	1	0.48	4	6.64	0.60	-0.39
Rectum	0	0.00	2	1.43	0	0.00	1	0.71	3	4.40	0.68	-0.21
Anus, anal canal	0	0.00	0	0.00	1	5.43	2	7.32	3	0.72	4.17	0.34
Liver	0	0.00	0	0.00	1	4.18	0	0.00	1	0.91	1.10	0.01
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.12
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	3.53	1	0.85	1.17	0.02
Pancreas	1	1.93	1	0.62	1	0.76	4	2.57	7	5.00	1.40	0.30
<b>Respiratory system</b>	5	2.20	14	1.82	26	3.89*	31	3.49*	76	25.50	2.98*	7.43
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.05
Larynx	0	0.00	1	3.50	0	0.00	1	3.16	2	0.93	2.15	0.16
Lung, bronchus	5	2.32	11	1.51	26	4.11*	30	3.56*	72	24.16	2.98*	7.04
<b>Female breast</b>	5	0.82	16	0.74	33	1.65*	136	4.54*	190	77.61	2.45*	16.55
<b>Female genital system</b>	0	0.00	15	1.42	14	1.52	34	2.78*	63	35.08	1.80*	4.11
Cervix uteri	0	0.00	3	1.27	2	0.89	6	2.20	11	7.94	1.39	0.45
Corpus uteri	0	0.00	5	1.15	8	2.26	19	3.94*	32	14.03	2.28*	2.64
Ovary	0	0.00	6	1.93	3	1.07	8	2.09	17	10.62	1.60	0.94
Vagina	0	0.00	0	0.00	0	0.00	1	7.42	1	0.42	2.40	0.09
Vulva	0	0.00	0	0.00	1	2.89	0	0.00	1	1.33	0.75	-0.05
<b>Urinary system</b>	0	0.00	4	1.42	3	1.25	5	1.61	12	9.18	1.31	0.42
Urinary bladder	0	0.00	2	1.26	2	1.52	4	2.46	8	5.02	1.59	0.44
Kidney parenchyma	0	0.00	1	0.99	1	1.10	0	0.00	2	3.51	0.57	-0.22
Renal pelvis, other urinary	0	0.00	1	4.69	0	0.00	1	5.29	2	0.64	3.12	0.20
Ureter	0	0.00	1	15.76	0	0.00	1	18.92	2	0.19	10.70*	0.27
<b>Bone, joints</b>	0	0.00	2	12.45*	0	0.00	4	27.84*	6	0.48	12.58*	0.81
<b>Soft tissue including heart</b>	0	0.00	2	4.73	6	16.18*	7	15.32*	15	1.37	10.96*	2.01
<b>Kaposi sarcoma</b>	0	0.00	1	37.17	0	0.00	1	36.05	2	0.09	22.99*	0.28
<b>Melanoma of skin</b>	0	0.00	3	1.00	6	1.99	4	0.97	13	10.89	1.19	0.31
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.06
<b>Brain, central nervous system</b>	0	0.00	2	1.87	1	1.07	0	0.00	3	3.43	0.87	-0.06
<b>Thyroid</b>	1	1.90	3	1.40	3	1.45	21	7.86*	28	7.41	3.78*	3.03
<b>Lymphatic, hematopoietic</b>	10	5.91*	47	8.20*	28	5.74*	26	4.40*	111	18.21	6.09*	13.66
Hodgkin lymphoma	0	0.00	1	1.15	0	0.00	0	0.00	1	2.41	0.42	-0.21
Non-Hodgkin lymphoma	5	6.88*	19	7.66*	8	3.65*	16	5.49*	48	8.32	5.77*	5.84
Myeloma	1	4.38	1	1.38	1	1.63	3	3.99	6	2.32	2.59	0.54
Leukemia	4	7.88*	26	15.70*	19	13.85*	7	4.28*	56	5.17	10.83*	7.48
Acute lymphocytic	0	0.00	1	8.42	1	10.61	1	9.76	3	0.35	8.57*	0.39
Chronic lymphocytic	0	0.00	1	1.99	2	4.97	0	0.00	3	1.54	1.94	0.21
Acute non-lymphocytic	2	10.41*	23	35.51*	15	27.55*	5	7.61*	45	2.04	22.04*	6.32
Chronic myeloid	1	13.39	0	0.00	1	4.58	1	3.76	3	0.81	3.70	0.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Hodgkin Lymphoma

## Males

**Table 16.1.5:** Risk of subsequent primary cancers after Hodgkin lymphoma, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	49	1.47*	199	1.72*	193	1.98*	278	2.26*	719	369.65	1.95*	42.65
All excluding same site	49	1.48*	199	1.74*	193	2.00*	278	2.27*	719	366.13	1.96*	43.08
<b>Buccal cavity, pharynx</b>	1	0.80	11	2.55*	11	3.11*	11	2.51*	34	13.48	2.52*	2.51
Lip	1	4.58	3	4.31	3	5.75*	1	1.81	8	1.99	4.02*	0.73
Tongue	0	0.00	3	3.43	4	5.29*	4	3.97*	11	2.88	3.81*	0.99
Salivary gland	0	0.00	2	6.08	1	3.61	4	11.15*	7	1.06	6.61*	0.73
Mouth	0	0.00	1	0.98	1	1.22	0	0.00	2	3.11	0.64	-0.13
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.08
Tonsil	0	0.00	1	2.13	0	0.00	1	1.65	2	1.62	1.23	0.05
Oropharynx	0	0.00	0	0.00	2	19.84*	0	0.00	2	0.39	5.17	0.20
Hypopharynx	0	0.00	1	2.23	0	0.00	1	2.39	2	1.36	1.47	0.08
<b>Digestive system</b>	4	0.58	22	0.95	28	1.50	61	2.67*	115	71.61	1.61*	5.30
Esophagus	0	0.00	1	0.64	3	2.27	4	2.29	8	5.09	1.57	0.36
Stomach	0	0.00	5	1.88	4	1.92	16	6.62*	25	7.98	3.13*	2.08
Small intestine	0	0.00	0	0.00	0	0.00	2	4.33	2	1.27	1.58	0.09
Colon	2	0.71	8	0.85	12	1.59	19	2.13*	41	28.69	1.43*	1.50
Rectum, rectosigmoid junction	1	0.75	5	1.13	3	0.84	1	0.23	10	13.58	0.74	-0.44
Anus, anal canal	0	0.00	0	0.00	1	4.78	3	9.83*	4	0.80	4.98*	0.39
Liver	0	0.00	1	1.01	1	1.15	7	5.60*	9	3.40	2.65*	0.68
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.06
Bile ducts, other biliary	1	7.33	0	0.00	0	0.00	1	2.00	2	1.48	1.35	0.06
Pancreas	0	0.00	2	0.76	4	1.90	7	2.68*	13	8.16	1.59	0.59
<b>Respiratory system</b>	5	0.76	48	2.17*	50	2.82*	72	3.46*	175	67.25	2.60*	13.15
Nose, nasal cavity, ear	0	0.00	1	4.76	0	0.00	1	4.57	2	0.67	3.01	0.16
Larynx	0	0.00	2	0.99	2	1.23	6	3.13*	10	6.16	1.62	0.47
Lung, bronchus	5	0.85	45	2.27*	46	2.90*	65	3.50*	161	60.11	2.68*	12.32
<b>Male breast</b>	0	0.00	1	4.54	0	0.00	1	3.95	2	0.72	2.76	0.16
<b>Male genital system</b>	10	1.15	25	0.82	20	0.75	25	0.69	80	102.07	0.78*	-2.69
Prostate	10	1.23	21	0.75	19	0.78	23	0.68	73	94.47	0.77*	-2.62
Testis	0	0.00	4	1.78	1	0.49	1	0.49	6	6.87	0.87	-0.11
<b>Urinary system</b>	3	0.95	10	0.93	13	1.46	17	1.51	43	34.06	1.26	1.09
Urinary bladder	1	0.46	6	0.82	10	1.66	8	1.09	25	22.89	1.09	0.26
Kidney parenchyma	2	2.55	3	1.07	2	0.81	7	2.05	14	9.46	1.48	0.55
Renal pelvis, other urinary	0	0.00	1	1.72	1	2.23	2	3.98	4	1.71	2.34	0.28
Ureter	0	0.00	1	5.30	0	0.00	2	12.79*	3	0.55	5.48*	0.30
<b>Bone, joints</b>	0	0.00	1	3.56	0	0.00	1	4.53	2	0.80	2.51	0.15
<b>Soft tissue including heart</b>	2	9.98*	1	1.38	3	4.87	10	13.12*	16	2.30	6.95*	1.67
<b>Kaposi sarcoma</b>	7	17.00*	5	2.76	2	1.01	0	0.00	14	6.54	2.14*	0.91
<b>Melanoma of skin</b>	3	2.59	10	2.23*	6	1.41	11	1.86	30	15.81	1.90*	1.73
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.08
<b>Brain, central nervous system</b>	0	0.00	4	1.97	3	1.74	1	0.49	8	6.37	1.26	0.20
<b>Thyroid</b>	0	0.00	1	1.07	1	1.18	2	1.79	4	3.14	1.27	0.10
<b>Lymphatic, hematopoietic</b>	14	4.61*	50	4.63*	54	5.82*	53	4.57*	171	34.72	4.92*	16.64
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	3.53	0.00	-0.43
Non-Hodgkin lymphoma	14	10.68*	22	4.54*	21	4.75*	39	6.60*	96	16.48	5.82*	9.71
Myeloma	0	0.00	2	1.50	0	0.00	0	0.00	2	4.27	0.47	-0.28
Leukemia	0	0.00	26	7.66*	33	11.95*	14	4.26*	73	10.44	6.99*	7.64
Acute lymphocytic	0	0.00	1	4.15	1	5.49	2	10.91*	4	0.68	5.92*	0.41
Chronic lymphocytic	0	0.00	0	0.00	1	1.05	1	0.86	2	3.64	0.55	-0.20
Acute non-lymphocytic	0	0.00	20	17.79*	28	30.60*	9	8.35*	57	3.45	16.54*	6.54
Chronic myeloid	0	0.00	1	1.94	1	2.32	2	3.85	4	1.61	2.48	0.29

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 16.1.6:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, <20 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	0	0.00	14	6.37*	22	6.77*	92	9.34*	128	15.70	8.15*	37.59
All excluding same site	0	0.00	14	7.64*	22	7.76*	92	9.84*	128	14.36	8.91*	38.04
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	3	15.48*	3	0.30	9.98*	0.90
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.02
Salivary gland	0	0.00	0	0.00	0	0.00	3	65.63*	3	0.08	35.81*	0.98
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.02
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Digestive system</b>	0	0.00	0	0.00	1	8.96	11	16.76*	12	0.84	14.34*	3.74
Esophagus	0	0.00	0	0.00	0	0.00	1	48.56	1	0.02	42.89	0.33
Stomach	0	0.00	0	0.00	0	0.00	4	56.94*	4	0.09	44.94*	1.31
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Colon	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.10
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	7.27	1	0.17	5.98	0.28
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	31.64	1	0.03	28.80	0.32
Liver	0	0.00	0	0.00	0	0.00	1	28.30	1	0.06	17.28	0.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Pancreas	0	0.00	0	0.00	1	144.42*	2	39.21*	3	0.06	47.52*	0.98
<b>Respiratory system</b>	0	0.00	0	0.00	0	0.00	3	10.11*	3	0.39	7.74*	0.87
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Lung, bronchus	0	0.00	0	0.00	0	0.00	3	12.97*	3	0.28	10.90*	0.91
<b>Female breast</b>	0	0.00	0	0.00	3	21.10*	39	23.49*	42	1.83	22.94*	27.61
<b>Female genital system</b>	0	0.00	1	5.99	1	3.00	2	1.75	4	1.67	2.39	1.60
Cervix uteri	0	0.00	0	0.00	0	0.00	1	1.76	1	0.80	1.26	0.14
Corpus uteri	0	0.00	0	0.00	0	0.00	1	6.29	1	0.18	5.55	0.56
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.40
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Vulva	0	0.00	0	0.00	1	132.36*	0	0.00	1	0.05	21.66	0.66
<b>Male genital system</b>	0	0.00	1	4.45	0	0.00	0	0.00	1	1.38	0.72	-0.25
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.02
Testis	0	0.00	1	4.53	0	0.00	0	0.00	1	1.34	0.75	-0.22
<b>Urinary system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.13
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.06
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.06
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Bone, joints</b>	0	0.00	3	30.44*	0	0.00	2	26.00*	5	0.28	18.14*	1.58
<b>Soft tissue including heart</b>	0	0.00	1	11.89	3	33.37*	4	25.61*	8	0.35	22.92*	2.56
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.23
<b>Melanoma of skin</b>	0	0.00	0	0.00	3	7.07*	3	2.41	6	1.93	3.11*	1.36
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
<b>Brain, central nervous system</b>	0	0.00	0	0.00	2	9.57*	0	0.00	2	0.84	2.39	0.39
<b>Thyroid</b>	0	0.00	1	4.53	1	2.88	12	15.00*	14	1.40	10.00*	4.22
<b>Lymphatic, hematopoietic</b>	0	0.00	7	9.78*	7	8.69*	9	5.99*	23	3.18	7.24*	6.64
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.35	0.00	-0.45
Non-Hodgkin lymphoma	0	0.00	2	13.52*	2	9.51*	6	8.86*	10	1.07	9.39*	2.99
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Leukemia	0	0.00	5	25.08*	5	27.98*	3	9.94*	13	0.73	17.78*	4.11
Acute lymphocytic	0	0.00	1	10.56	0	0.00	0	0.00	1	0.25	4.04	0.25
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Acute non-lymphocytic	0	0.00	4	51.64*	5	62.54*	3	22.83*	12	0.31	39.22*	3.91
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 14,548 PYR and for male cancers on 15,324 PYR.



# Hodgkin Lymphoma

## Both Sexes, 20-39 Years of Age

**Table 16.1.7:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, 20-39 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	16	3.23*	66	2.72*	78	2.46*	276	3.80*	436	133.60	3.26*	36.04
All excluding same site	16	3.46*	65	2.82*	78	2.54*	276	3.84*	435	130.28	3.34*	36.32
<b>Buccal cavity, pharynx</b>	1	9.33	3	5.34*	5	5.88*	14	5.95*	23	3.87	5.94*	2.28
Lip	1	61.83	1	12.37	1	9.52	0	0.00	3	0.41	7.29*	0.31
Tongue	0	0.00	0	0.00	0	0.00	6	10.06*	6	0.95	6.33*	0.60
Salivary gland	0	0.00	2	16.45*	3	22.20*	6	24.51*	11	0.53	20.83*	1.25
Mouth	0	0.00	0	0.00	1	5.81	0	0.00	1	0.81	1.24	0.02
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.03
Tonsil	0	0.00	0	0.00	0	0.00	1	2.62	1	0.55	1.83	0.05
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	1	6.27	1	0.21	4.78	0.09
<b>Digestive system</b>	1	3.14	2	1.13	5	1.74	29	3.12*	37	14.26	2.59*	2.71
Esophagus	0	0.00	0	0.00	0	0.00	1	1.69	1	0.80	1.25	0.02
Stomach	0	0.00	0	0.00	3	9.48*	11	12.71*	14	1.43	9.80*	1.50
Small intestine	0	0.00	0	0.00	0	0.00	1	3.63	1	0.45	2.20	0.07
Colon	1	7.95	1	1.46	1	0.94	7	2.10	10	5.20	1.92	0.57
Rectum, rectosigmoid junction	0	0.00	1	3.01	0	0.00	0	0.00	1	2.89	0.35	-0.22
Anus, anal canal	0	0.00	0	0.00	1	9.18	2	7.03	3	0.47	6.38*	0.30
Liver	0	0.00	0	0.00	0	0.00	2	3.72	2	0.79	2.53	0.14
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	5.05	1	0.30	3.32	0.08
Pancreas	0	0.00	0	0.00	0	0.00	3	2.91	3	1.49	2.01	0.18
<b>Respiratory system</b>	0	0.00	0	0.00	11	5.77*	40	5.36*	51	10.54	4.84*	4.82
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	7.71	1	0.24	4.10	0.09
Larynx	0	0.00	0	0.00	1	5.11	1	1.37	2	1.04	1.92	0.11
Lung, bronchus	0	0.00	0	0.00	8	4.97*	38	5.80*	46	9.09	5.06*	4.40
<b>Female breast</b>	0	0.00	4	1.00	7	1.05	79	4.86*	90	27.59	3.26*	16.00
<b>Female genital system</b>	0	0.00	4	1.53	5	1.53	24	3.91*	33	12.56	2.63*	5.24
Cervix uteri	0	0.00	2	1.50	1	0.69	5	2.92	8	4.78	1.68	0.83
Corpus uteri	0	0.00	0	0.00	2	3.03	11	5.21*	13	3.22	4.04*	2.51
Ovary	0	0.00	2	2.66	2	2.06	7	3.59*	11	3.83	2.88*	1.84
Vagina	0	0.00	0	0.00	0	0.00	1	18.68	1	0.11	9.32	0.23
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.10
<b>Male genital system</b>	0	0.00	2	1.11	2	1.10	7	1.06	11	10.68	1.03	0.07
Prostate	0	0.00	0	0.00	1	3.29	6	1.14	7	5.66	1.24	0.30
Testis	0	0.00	2	1.16	1	0.67	1	0.80	4	4.90	0.82	-0.20
<b>Urinary system</b>	0	0.00	2	2.47	1	0.76	8	1.92	11	6.43	1.71	0.54
Urinary bladder	0	0.00	0	0.00	0	0.00	4	1.85	4	3.33	1.20	0.08
Kidney parenchyma	0	0.00	2	5.62	1	1.67	3	1.61	6	2.88	2.08	0.37
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	1	7.10	1	0.22	4.49	0.09
Ureter	0	0.00	0	0.00	0	0.00	1	32.05	1	0.05	21.77	0.11
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	2	10.69*	2	0.56	3.55	0.17
<b>Soft tissue including heart</b>	0	0.00	1	2.63	5	12.96*	11	18.79*	17	1.44	11.79*	1.85
<b>Kaposi sarcoma</b>	5	17.67*	3	2.14	2	1.22	1	0.59	11	5.03	2.19*	0.71
<b>Melanoma of skin</b>	0	0.00	5	1.72	4	1.17	6	1.08	15	12.52	1.20	0.30
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.04
<b>Brain, central nervous system</b>	0	0.00	1	1.04	1	0.99	0	0.00	2	3.75	0.53	-0.21
<b>Thyroid</b>	1	2.56	3	1.75	3	1.71	10	4.29*	17	6.19	2.75*	1.29
<b>Lymphatic, hematopoietic</b>	8	9.40*	34	9.22*	27	6.82*	37	5.36*	106	15.40	6.88*	10.80
Hodgkin lymphoma	0	0.00	1	0.81	0	0.00	0	0.00	1	3.31	0.30	-0.28
Non-Hodgkin lymphoma	7	21.64*	15	9.50*	7	3.50*	26	6.78*	55	7.74	7.11*	5.63
Myeloma	0	0.00	0	0.00	0	0.00	2	3.35	2	0.86	2.32	0.14
Leukemia	1	5.47	18	22.74*	20	23.18*	9	5.46*	48	3.49	13.77*	5.31
Acute lymphocytic	0	0.00	0	0.00	0	0.00	3	21.30*	3	0.43	6.99*	0.31
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.07
Acute non-lymphocytic	1	11.99	16	45.35*	18	49.90*	6	10.08*	41	1.39	29.45*	4.72
Chronic myeloid	0	0.00	0	0.00	1	4.97	0	0.00	1	0.74	1.34	0.03

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 39,010 PYR and for male cancers on 44,896 PYR.

**Table 16.1.8:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, 40-59 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	20	1.62	131	2.41*	143	2.39*	186	2.08*	480	216.25	2.22*	106.15
All excluding same site	20	1.63	131	2.42*	143	2.40*	186	2.08*	480	215.46	2.23*	106.47
<b>Buccal cavity, pharynx</b>	0	0.00	6	2.58	11	4.89*	4	1.63	21	7.60	2.76*	5.39
Lip	0	0.00	1	4.04	2	8.47	1	3.58	4	0.82	4.85*	1.28
Tongue	0	0.00	2	3.94	4	8.03*	1	1.84	7	1.67	4.20*	2.15
Salivary gland	0	0.00	0	0.00	1	6.63	1	5.04	2	0.54	3.68	0.59
Mouth	0	0.00	1	1.62	2	3.43	1	1.62	4	1.97	2.03	0.82
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.14
Tonsil	0	0.00	1	3.29	0	0.00	0	0.00	1	0.94	1.06	0.02
Oropharynx	0	0.00	0	0.00	2	28.13*	0	0.00	2	0.24	8.39	0.71
Hypopharynx	0	0.00	1	4.21	0	0.00	0	0.00	1	0.81	1.24	0.08
<b>Digestive system</b>	1	0.46	13	1.33	22	2.01*	41	2.48*	77	39.39	1.95*	15.13
Esophagus	0	0.00	1	1.40	3	3.78	3	2.70	7	2.77	2.52*	1.70
Stomach	0	0.00	3	2.99	1	0.94	6	3.91*	10	3.84	2.61*	2.48
Small intestine	0	0.00	3	15.20*	0	0.00	1	3.35	4	0.75	5.34*	1.31
Colon	1	1.24	4	1.08	10	2.31*	18	2.60*	33	15.78	2.09*	6.93
Rectum, rectosigmoid junction	0	0.00	2	1.00	3	1.35	1	0.33	6	7.69	0.78	-0.68
Anus, anal canal	0	0.00	0	0.00	1	6.47	2	10.26*	3	0.55	5.48*	0.99
Liver	0	0.00	0	0.00	1	2.07	4	5.53*	5	1.73	2.90	1.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.15
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.31
Pancreas	0	0.00	0	0.00	3	2.31	5	2.50	8	4.72	1.69	1.32
<b>Respiratory system</b>	3	1.35	38	3.75*	40	3.50*	49	2.98*	130	40.23	3.23*	36.13
Nose, nasal cavity, ear	0	0.00	1	9.36	0	0.00	0	0.00	1	0.36	2.76	0.26
Larynx	0	0.00	1	0.99	1	0.96	4	3.30	6	3.50	1.72	1.01
Lung, bronchus	3	1.53	36	4.00*	39	3.81*	45	2.99*	123	36.27	3.39*	34.91
<b>Female breast</b>	2	1.05	4	0.53	11	1.60	14	1.67	31	24.67	1.26	7.18
<b>Female genital system</b>	0	0.00	3	0.94	7	2.43	8	2.31	18	10.37	1.74*	8.65
Cervix uteri	0	0.00	1	1.86	1	2.61	0	0.00	2	1.40	1.43	0.68
Corpus uteri	0	0.00	2	1.29	5	3.40*	7	3.75*	14	5.27	2.66*	9.89
Ovary	0	0.00	0	0.00	1	1.16	1	0.96	2	3.09	0.65	-1.24
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.12
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.35
<b>Male genital system</b>	0	0.00	9	1.33	6	0.57	11	0.50*	26	40.59	0.64*	-9.10
Prostate	0	0.00	9	1.40	6	0.58	10	0.46*	25	39.73	0.63*	-9.20
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.35
<b>Urinary system</b>	2	2.20	6	1.46	7	1.50	12	1.72	27	16.68	1.62*	4.15
Urinary bladder	0	0.00	4	1.64	5	1.73	6	1.32	15	10.42	1.44	1.84
Kidney parenchyma	2	5.91	1	0.68	2	1.29	4	1.93	9	5.44	1.66	1.43
Renal pelvis, other urinary	0	0.00	1	5.07	0	0.00	2	5.59	3	0.82	3.65	0.88
Ureter	0	0.00	1	18.44	0	0.00	2	17.36*	3	0.25	12.07*	1.11
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	12.96	1	0.25	4.00	0.30
<b>Soft tissue including heart</b>	1	12.82	0	0.00	1	3.65	2	5.91	4	0.99	4.03*	1.21
<b>Kaposi sarcoma</b>	2	18.17*	2	5.77	0	0.00	0	0.00	4	0.75	5.32*	1.31
<b>Melanoma of skin</b>	2	3.37	7	2.97*	3	1.39	5	1.99	17	7.63	2.23*	3.77
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.15
<b>Brain, central nervous system</b>	0	0.00	2	2.18	1	1.18	1	1.03	4	2.97	1.35	0.41
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	1	1.86	1	2.02	0.50	-0.41
<b>Lymphatic, hematopoietic</b>	7	6.78*	35	8.09*	31	7.00*	28	4.49*	101	16.02	6.30*	34.20
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-0.32
Non-Hodgkin lymphoma	6	11.46*	15	6.89*	12	5.47*	21	6.94*	54	7.92	6.82*	18.54
Myeloma	1	7.57	2	3.35	1	1.48	1	0.94	5	2.47	2.03	1.02
Leukemia	0	0.00	18	14.26*	18	13.44*	6	3.08*	42	4.84	8.67*	14.95
Acute lymphocytic	0	0.00	1	16.73	2	35.92*	0	0.00	3	0.19	15.59*	1.13
Chronic lymphocytic	0	0.00	0	0.00	1	1.81	1	1.24	2	1.94	1.03	0.02
Acute non-lymphocytic	0	0.00	14	34.91*	14	33.37*	3	4.59	31	1.57	19.75*	11.84
Chronic myeloid	0	0.00	1	5.30	0	0.00	2	7.70	3	0.68	4.40	0.93

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 8,826 PYR and for male cancers on 16,021 PYR.

# Hodgkin Lymphoma

## Both Sexes, ≥60 Years of Age

**Table 16.1.9:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, ≥60 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	2,829		1,953		876		332		2,829			
<b>Person-years in interval</b>	1,884		5,118		2,824		1,397		11,222			
<b>All subsequent cancers</b>	40	1.09	114	1.08	95	1.45*	44	1.24	293	243.39	1.20*	44.21
All excluding same site	40	1.10	114	1.08	95	1.45*	44	1.25	293	242.91	1.21*	44.64
<b>Buccal cavity, pharynx</b>	0	0.00	6	2.28	3	2.11	0	0.00	9	5.67	1.59	2.96
Lip	0	0.00	1	2.27	1	4.18	0	0.00	2	0.96	2.09	0.93
Tongue	0	0.00	1	1.96	0	0.00	0	0.00	1	1.10	0.91	-0.09
Salivary gland	0	0.00	1	4.42	1	7.21	0	0.00	2	0.52	3.82	1.32
Mouth	0	0.00	2	2.87	0	0.00	0	0.00	2	1.51	1.32	0.43
Nasopharynx	0	0.00	0	0.00	1	21.15	0	0.00	1	0.19	5.29	0.72
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.42
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.14
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.50
<b>Digestive system</b>	8	0.94	19	0.78	12	0.79	11	1.26	50	56.70	0.88	-5.97
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	2.58	0.00	-2.30
Stomach	2	2.29	3	1.24	0	0.00	1	1.19	6	5.61	1.07	0.35
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.74	0.00	-0.66
Colon	3	0.77	8	0.71	9	1.25	8	1.86	28	26.60	1.05	1.24
Rectum, rectosigmoid junction	1	0.66	4	0.95	1	0.40	0	0.00	6	9.47	0.63	-3.09
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.42
Liver	0	0.00	1	1.33	1	2.13	0	0.00	2	1.74	1.15	0.23
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.74
Bile ducts, other biliary	1	5.73	0	0.00	0	0.00	1	4.54	2	1.24	1.61	0.68
Pancreas	1	0.97	3	1.03	1	0.54	1	0.92	6	6.88	0.87	-0.78
<b>Respiratory system</b>	7	1.09	24	1.29	25	2.26*	11	2.01	67	41.59	1.61*	22.65
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.30
Larynx	0	0.00	2	1.68	0	0.00	2	7.68	4	2.51	1.59	1.33
Lung, bronchus	7	1.18	20	1.16	25	2.43*	9	1.74	61	38.64	1.58*	19.93
<b>Female breast</b>	3	0.85	8	0.80	12	1.88	4	1.10	27	23.52	1.15	6.27
<b>Female genital system</b>	0	0.00	7	1.53	1	0.36	0	0.00	8	10.48	0.76	-4.47
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.97	0.00	-1.75
Corpus uteri	0	0.00	3	1.25	1	0.72	0	0.00	4	5.37	0.75	-2.47
Ovary	0	0.00	4	3.01	0	0.00	0	0.00	4	3.11	1.28	1.60
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.33
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-1.05
<b>Male genital system</b>	10	1.41	13	0.60	12	0.87	7	1.02	42	49.42	0.85	-13.08
Prostate	10	1.42	12	0.56*	12	0.88	7	1.03	41	49.04	0.84	-14.18
Testis	0	0.00	1	27.77	0	0.00	0	0.00	1	0.07	13.99	1.64
<b>Urinary system</b>	1	0.34	6	0.70	8	1.51	2	0.69	17	19.74	0.86	-2.45
Urinary bladder	1	0.48	4	0.66	7	1.87	2	0.95	14	13.97	1.00	0.03
Kidney parenchyma	0	0.00	1	0.51	0	0.00	0	0.00	1	4.48	0.22	-3.10
Renal pelvis, other urinary	0	0.00	1	1.77	1	2.90	0	0.00	2	1.30	1.54	0.63
Ureter	0	0.00	1	5.18	0	0.00	0	0.00	1	0.44	2.28	0.50
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.17
<b>Soft tissue including heart</b>	1	7.60	1	2.64	0	0.00	0	0.00	2	0.89	2.25	0.99
<b>Kaposi sarcoma</b>	0	0.00	1	13.87	0	0.00	0	0.00	1	0.17	5.89	0.74
<b>Melanoma of skin</b>	1	1.49	1	0.50	2	1.60	1	1.42	5	4.63	1.08	0.33
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.30
<b>Brain, central nervous system</b>	0	0.00	3	2.96	0	0.00	0	0.00	3	2.25	1.33	0.67
<b>Thyroid</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.94	0.00	-0.84
<b>Lymphatic, hematopoietic</b>	9	3.34*	21	2.69*	17	3.43*	5	1.74	52	18.34	2.84*	30.00
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.48	0.00	-0.43
Non-Hodgkin lymphoma	6	5.17*	9	2.63*	8	3.62*	2	1.56	25	8.08	3.09*	15.08
Myeloma	0	0.00	1	0.73	0	0.00	0	0.00	1	3.23	0.31	-1.99
Leukemia	3	3.06	11	3.93*	9	5.13*	3	2.95	26	6.55	3.97*	17.33
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.14
Chronic lymphocytic	0	0.00	1	0.88	2	2.83	0	0.00	3	2.65	1.13	0.32
Acute non-lymphocytic	1	3.07	9	9.57*	6	10.01*	2	5.65	18	2.22	8.11*	14.06
Chronic myeloid	1	7.76	0	0.00	1	4.28	1	7.08	3	0.87	3.44	1.90

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 5,549 PYR and for male cancers on 5,672 PYR.

**Table 16.1.10:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	25	1.13	140	1.65*	190	2.37*	419	3.45*	774	308.38	2.51*	50.06
All excluding same site	25	1.15	139	1.66*	190	2.41*	419	3.48*	773	304.71	2.54*	50.35
<b>Buccal cavity, pharynx</b>	1	1.51	6	2.39	15	6.59*	15	4.49*	37	8.79	4.21*	3.03
Lip	1	10.11	0	0.00	2	6.89	0	0.00	3	1.09	2.74	0.20
Tongue	0	0.00	1	1.93	4	8.08*	4	5.07*	9	1.93	4.65*	0.76
Salivary gland	0	0.00	2	7.97	4	17.00*	10	28.79*	16	0.90	17.82*	1.62
Mouth	0	0.00	2	3.13	2	3.54	0	0.00	4	2.16	1.85	0.20
Nasopharynx	0	0.00	0	0.00	1	8.74	0	0.00	1	0.44	2.28	0.06
Tonsil	0	0.00	0	0.00	0	0.00	1	2.28	1	1.01	0.99	0.00
Oropharynx	0	0.00	0	0.00	2	33.58*	0	0.00	2	0.23	8.62	0.19
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.08
<b>Digestive system</b>	1	0.23	14	0.90	18	1.33	58	3.02*	91	52.61	1.73*	4.13
Esophagus	0	0.00	1	1.25	1	1.38	4	3.56	6	2.86	2.09	0.34
Stomach	0	0.00	3	1.90	3	2.27	17	9.62*	23	5.12	4.50*	1.92
Small intestine	0	0.00	2	7.81	0	0.00	0	0.00	2	0.99	2.02	0.11
Colon	1	0.53	5	0.74	9	1.53	20	2.52*	35	22.44	1.56*	1.35
Rectum, rectosigmoid junction	0	0.00	3	1.05	2	0.80	2	0.56	7	9.75	0.72	-0.30
Anus, anal canal	0	0.00	0	0.00	0	0.00	3	8.32*	3	0.81	3.71	0.24
Liver	0	0.00	0	0.00	2	3.91	3	3.44	5	2.07	2.42	0.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.07
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	2.35	1	1.10	0.91	-0.01
Pancreas	0	0.00	0	0.00	1	0.63	6	2.66	7	6.17	1.13	0.09
<b>Respiratory system</b>	5	1.46	19	1.49	46	4.05*	73	4.49*	143	43.83	3.26*	10.66
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	5.26	1	0.50	2.01	0.05
Larynx	0	0.00	0	0.00	0	0.00	3	2.41	3	3.40	0.88	-0.04
Lung, bronchus	5	1.62	17	1.47	45	4.37*	69	4.67*	136	39.70	3.43*	10.35
<b>Female breast</b>	3	1.11	10	0.93	17	1.50	110	5.42*	140	45.13	3.10*	21.09
<b>Female genital system</b>	0	0.00	7	1.29	10	1.87	25	3.01*	42	20.49	2.05*	4.78
Cervix uteri	0	0.00	2	1.44	1	0.69	5	2.52	8	5.15	1.55	0.63
Corpus uteri	0	0.00	2	0.96	5	2.62	14	4.42*	21	7.72	2.72*	2.95
Ovary	0	0.00	3	1.87	3	1.86	5	1.92	11	6.23	1.77	1.06
Vagina	0	0.00	0	0.00	0	0.00	1	11.79	1	0.23	4.41	0.17
Vulva	0	0.00	0	0.00	1	5.30	0	0.00	1	0.73	1.37	0.06
<b>Male genital system</b>	5	1.55	15	1.20	5	0.43*	13	0.70	38	45.97	0.83	-1.66
Prostate	5	1.73	12	1.08	5	0.48	12	0.71	34	41.42	0.82	-1.54
Testis	0	0.00	3	2.38	0	0.00	1	0.71	4	4.20	0.95	-0.04
<b>Urinary system</b>	0	0.00	5	0.85	7	1.31	16	2.01*	28	20.73	1.35	0.78
Urinary bladder	0	0.00	3	0.78	4	1.18	7	1.45	14	13.12	1.07	0.09
Kidney parenchyma	0	0.00	1	0.59	2	1.21	6	2.18	9	6.52	1.38	0.27
Renal pelvis, other urinary	0	0.00	1	2.93	1	3.51	3	8.20*	5	1.09	4.59*	0.42
Ureter	0	0.00	1	9.38	0	0.00	3	27.79*	4	0.33	12.04*	0.39
<b>Bone, joints</b>	0	0.00	2	8.18	0	0.00	3	12.35*	5	0.76	6.61*	0.46
<b>Soft tissue including heart</b>	1	6.79	1	1.72	8	14.68*	13	16.93*	23	2.04	11.28*	2.25
<b>Kaposi sarcoma</b>	0	0.00	2	2.07	1	0.82	1	0.61	4	4.00	1.00	0.00
<b>Melanoma of skin</b>	0	0.00	7	1.80	8	1.92	11	1.67	26	15.55	1.67*	1.12
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.06
<b>Brain, central nervous system</b>	0	0.00	4	2.56	2	1.35	1	0.49	7	5.47	1.28	0.16
<b>Thyroid</b>	0	0.00	2	1.13	2	1.09	18	6.73*	22	6.68	3.29*	1.65
<b>Lymphatic, hematopoietic</b>	9	4.43*	39	4.97*	46	6.26*	47	4.50*	141	27.68	5.09*	12.18
Hodgkin lymphoma	0	0.00	1	0.82	0	0.00	0	0.00	1	3.67	0.27	-0.29
Non-Hodgkin lymphoma	7	8.23*	18	5.29*	17	4.98*	36	6.73*	78	13.02	5.99*	6.99
Myeloma	0	0.00	2	2.28	1	1.27	2	1.67	5	3.10	1.61	0.20
Leukemia	2	3.16	18	7.67*	28	13.46*	9	3.18*	57	7.89	7.22*	5.28
Acute lymphocytic	0	0.00	0	0.00	1	6.07	2	10.65*	3	0.61	4.94	0.26
Chronic lymphocytic	0	0.00	0	0.00	2	3.16	0	0.00	2	2.45	0.82	-0.05
Acute non-lymphocytic	1	4.46	15	17.85*	21	27.98*	7	6.92*	44	2.83	15.57*	4.43
Chronic myeloid	1	10.44	1	2.74	2	5.90	0	0.00	4	1.27	3.16	0.29

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 44,979 PYR and for male cancers on 48,029 PYR.

# Hodgkin Lymphoma

## Both Sexes, No Radiotherapy

**Table 16.1.11:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	51	1.58*	185	1.81*	148	1.84*	179	2.08*	563	300.56	1.87*	46.17
All excluding same site	51	1.60*	185	1.83*	148	1.86*	179	2.09*	563	298.30	1.89*	46.57
<b>Buccal cavity, pharynx</b>	0	0.00	9	2.95*	4	1.74	6	2.57	19	8.65	2.20*	1.82
Lip	0	0.00	3	7.12*	2	6.76	1	3.65	6	1.13	5.29*	0.86
Tongue	0	0.00	2	3.17	0	0.00	3	5.70*	5	1.85	2.71	0.55
Salivary gland	0	0.00	1	3.73	1	4.78	0	0.00	2	0.78	2.56	0.21
Mouth	0	0.00	1	1.28	1	1.73	1	1.78	3	2.18	1.38	0.15
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.07
Tonsil	0	0.00	1	3.10	0	0.00	0	0.00	1	0.96	1.04	0.01
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.04
Hypopharynx	0	0.00	1	3.34	0	0.00	1	4.61	2	0.83	2.40	0.21
<b>Digestive system</b>	9	1.34	20	0.98	22	1.42	34	2.13*	85	58.59	1.45*	4.65
Esophagus	0	0.00	0	0.00	2	2.26	1	1.04	3	3.31	0.91	-0.05
Stomach	2	2.87	3	1.46	1	0.65	5	3.24*	11	5.85	1.88	0.91
Small intestine	0	0.00	1	3.10	0	0.00	2	6.58	3	0.99	3.03	0.35
Colon	4	1.35	8	0.90	11	1.63	13	1.90*	36	25.45	1.41	1.86
Rectum, rectosigmoid junction	1	0.82	4	1.08	2	0.72	0	0.00	7	10.46	0.67	-0.61
Anus, anal canal	0	0.00	0	0.00	2	10.44*	2	9.19*	4	0.72	5.59*	0.58
Liver	0	0.00	1	1.36	0	0.00	4	5.86*	5	2.25	2.22	0.48
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.12
Bile ducts, other biliary	1	7.40	0	0.00	0	0.00	1	2.80	2	1.23	1.62	0.13
Pancreas	1	1.24	3	1.24	4	2.17	5	2.61	13	6.98	1.86	1.06
<b>Respiratory system</b>	5	0.92	43	2.52*	30	2.30*	30	2.24*	108	48.91	2.21*	10.40
Nose, nasal cavity, ear	0	0.00	1	6.07	0	0.00	0	0.00	1	0.48	2.10	0.09
Larynx	0	0.00	3	2.30	2	2.04	4	4.06*	9	3.68	2.44*	0.94
Lung, bronchus	5	1.01	39	2.52*	27	2.27*	26	2.12*	97	44.57	2.18*	9.22
<b>Female breast</b>	2	0.59	6	0.56	16	1.84*	26	2.70*	50	32.48	1.54*	7.63
<b>Female genital system</b>	0	0.00	8	1.56	4	1.03	9	2.30*	21	14.59	1.44	2.79
Cervix uteri	0	0.00	1	1.03	1	1.26	1	1.35	3	2.79	1.08	0.09
Corpus uteri	0	0.00	3	1.33	3	1.84	5	3.03	11	6.31	1.74	2.04
Ovary	0	0.00	3	1.99	0	0.00	3	2.46	6	4.39	1.37	0.70
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.26
<b>Male genital system</b>	5	0.91	10	0.56	15	1.01	12	0.68	42	56.10	0.75	-4.16
Prostate	5	0.96	9	0.53	14	1.00	11	0.65	39	53.05	0.74	-4.15
Testis	0	0.00	1	1.02	1	1.29	0	0.00	2	2.66	0.75	-0.20
<b>Urinary system</b>	3	1.22	9	1.17	9	1.50	6	0.94	27	22.51	1.20	0.79
Urinary bladder	1	0.61	5	0.98	8	2.04	5	1.21	19	14.79	1.28	0.74
Kidney parenchyma	2	3.07	3	1.41	1	0.58	1	0.51	7	6.46	1.08	0.09
Renal pelvis, other urinary	0	0.00	1	2.21	0	0.00	0	0.00	1	1.26	0.79	-0.05
Ureter	0	0.00	1	6.87	0	0.00	0	0.00	1	0.40	2.49	0.11
<b>Bone, joints</b>	0	0.00	1	5.08	0	0.00	2	16.44*	3	0.52	5.79*	0.44
<b>Soft tissue including heart</b>	1	5.84	2	3.53	1	2.26	4	8.85*	8	1.63	4.90*	1.12
<b>Kaposi sarcoma</b>	7	31.37*	4	4.57*	1	1.27	0	0.00	12	2.63	4.57*	1.65
<b>Melanoma of skin</b>	3	2.98	6	1.66	4	1.29	4	1.16	17	11.16	1.52	1.03
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.09
<b>Brain, central nervous system</b>	0	0.00	2	1.31	2	1.70	0	0.00	4	4.34	0.92	-0.06
<b>Thyroid</b>	1	2.79	2	1.53	2	1.83	5	4.48*	10	3.87	2.58*	1.08
<b>Lymphatic, hematopoietic</b>	15	5.55*	58	6.68*	36	5.29*	32	4.53*	141	25.25	5.58*	20.36
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	2.26	0.00	-0.40
Non-Hodgkin lymphoma	12	10.11*	23	5.87*	12	3.75*	19	5.46*	66	11.79	5.60*	9.54
Myeloma	1	2.63	1	0.85	0	0.00	1	1.00	3	3.49	0.86	-0.09
Leukemia	2	2.29	34	12.57*	24	11.69*	12	5.75*	72	7.72	9.33*	11.31
Acute lymphocytic	0	0.00	2	12.52*	1	8.96	1	10.20	4	0.42	9.54*	0.63
Chronic lymphocytic	0	0.00	1	1.05	1	1.38	1	1.35	3	2.74	1.10	0.05
Acute non-lymphocytic	1	3.36	28	30.06*	22	31.03*	7	9.69*	58	2.66	21.80*	9.74
Chronic myeloid	0	0.00	0	0.00	0	0.00	3	9.44*	3	1.16	2.60	0.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 22,953 PYR and for male cancers on 33,884 PYR.

## Hodgkin Lymphoma Both Sexes, Long-term Follow-up, Radiotherapy

**Table 16.12:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	355	1.90*	177	2.96*	155	3.95*	87	3.88*	774	308.38	2.51*	50.06
All excluding same site	354	1.92*	177	2.99*	155	3.98*	87	3.91*	773	304.71	2.54*	50.35
<b>Buccal cavity, pharynx</b>	22	4.04*	4	2.43	8	7.41*	3	4.88	37	8.79	4.21*	3.03
Lip	3	4.06	0	0.00	0	0.00	0	0.00	3	1.09	2.74	0.20
Tongue	5	4.37*	2	5.31	2	7.75	0	0.00	9	1.93	4.65*	0.76
Salivary gland	6	10.90*	2	11.45*	6	53.80*	2	32.66*	16	0.90	17.82*	1.62
Mouth	4	2.91	0	0.00	0	0.00	0	0.00	4	2.16	1.85	0.20
Nasopharynx	1	3.67	0	0.00	0	0.00	0	0.00	1	0.44	2.28	0.06
Tonsil	0	0.00	0	0.00	0	0.00	1	11.04	1	1.01	0.99	0.00
Oropharynx	2	14.10*	0	0.00	0	0.00	0	0.00	2	0.23	8.62	0.19
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.08
<b>Digestive system</b>	33	0.99	23	2.40*	25	4.08*	10	2.85*	91	52.61	1.73*	4.13
Esophagus	2	1.15	2	3.69	1	2.72	1	4.66	6	2.86	2.09	0.34
Stomach	6	1.79	4	4.44*	8	14.33*	5	16.26*	23	5.12	4.50*	1.92
Small intestine	2	3.50	0	0.00	0	0.00	0	0.00	2	0.99	2.02	0.11
Colon	15	1.03	11	2.72*	7	2.80*	2	1.44	35	22.44	1.56*	1.35
Rectum, rectosigmoid junction	5	0.81	1	0.56	1	0.88	0	0.00	7	9.75	0.72	-0.30
Anus, anal canal	0	0.00	1	6.02	2	16.63*	0	0.00	3	0.81	3.71	0.24
Liver	2	1.68	0	0.00	3	10.43*	0	0.00	5	2.07	2.42	0.32
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.62	0.00	-0.07
Bile ducts, other biliary	0	0.00	0	0.00	1	7.26	0	0.00	1	1.10	0.91	-0.01
Pancreas	1	0.26	3	2.69	2	2.78	1	2.39	7	6.17	1.13	0.09
<b>Respiratory system</b>	70	2.54*	32	3.96*	27	5.20*	14	4.66*	143	43.83	3.26*	10.66
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	1	30.12	1	0.50	2.01	0.05
Larynx	0	0.00	3	4.82	0	0.00	0	0.00	3	3.40	0.88	-0.04
Lung, bronchus	67	2.69*	29	3.96*	27	5.73*	13	4.76*	136	39.70	3.43*	10.35
<b>Female breast</b>	30	1.21	41	4.36*	46	6.87*	23	5.46*	140	45.13	3.10*	21.09
<b>Female genital system</b>	17	1.40	11	2.72*	7	2.61*	7	4.42*	42	20.49	2.05*	4.78
Cervix uteri	3	0.95	2	1.87	1	1.60	2	6.79	8	5.15	1.55	0.63
Corpus uteri	7	1.54	7	4.83*	4	3.88*	3	4.36	21	7.72	2.72*	2.95
Ovary	6	1.65	2	1.59	2	2.37	1	2.00	11	6.23	1.77	1.06
Vagina	0	0.00	0	0.00	0	0.00	1	64.71	1	0.23	4.41	0.17
Vulva	1	2.33	0	0.00	0	0.00	0	0.00	1	0.73	1.37	0.06
<b>Male genital system</b>	25	0.91	5	0.56	5	0.82	3	0.86	38	45.97	0.83	-1.66
Prostate	22	0.90	4	0.50	5	0.89	3	0.91	34	41.42	0.82	-1.54
Testis	3	1.07	1	1.21	0	0.00	0	0.00	4	4.20	0.95	-0.04
<b>Urinary system</b>	12	0.94	6	1.53	4	1.56	6	4.11*	28	20.73	1.35	0.78
Urinary bladder	7	0.84	2	0.82	2	1.30	3	3.52	14	13.12	1.07	0.09
Kidney parenchyma	3	0.80	3	2.31	1	1.10	2	3.66	9	6.52	1.38	0.27
Renal pelvis, other urinary	2	2.77	1	5.28	1	8.73	1	16.10	5	1.09	4.59*	0.42
Ureter	1	4.46	1	17.63	1	29.86	1	56.30	4	0.33	12.04*	0.39
<b>Bone, joints</b>	2	3.89	1	7.62	1	13.33	1	27.30	5	0.76	6.61*	0.46
<b>Soft tissue including heart</b>	10	7.86*	5	12.78*	4	16.25*	4	30.71*	23	2.04	11.28*	2.25
<b>Kaposi sarcoma</b>	3	1.26	1	0.99	0	0.00	0	0.00	4	4.00	1.00	0.00
<b>Melanoma of skin</b>	15	1.67	4	1.22	5	2.34	2	1.72	26	15.55	1.67*	1.12
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.06
<b>Brain, central nervous system</b>	6	1.74	1	0.95	0	0.00	0	0.00	7	5.47	1.28	0.16
<b>Thyroid</b>	4	1.00	8	5.83*	7	8.20*	3	6.69*	22	6.68	3.29*	1.65
<b>Lymphatic, hematopoietic</b>	94	5.46*	28	5.25*	11	3.29*	8	4.51*	141	27.68	5.09*	12.18
Hodgkin lymphoma	1	0.39	0	0.00	0	0.00	0	0.00	1	3.67	0.27	-0.29
Non-Hodgkin lymphoma	42	5.47*	21	7.89*	8	4.58*	7	7.47*	78	13.02	5.99*	6.99
Myeloma	3	1.58	0	0.00	2	5.15	0	0.00	5	3.10	1.61	0.20
Leukemia	48	9.48*	7	4.81*	1	1.11	1	2.09	57	7.89	7.22*	5.28
Acute lymphocytic	1	2.39	1	9.62	0	0.00	1	36.71	3	0.61	4.94	0.26
Chronic lymphocytic	2	1.29	0	0.00	0	0.00	0	0.00	2	2.45	0.82	-0.05
Acute non-lymphocytic	37	20.39*	6	11.50*	1	3.15	0	0.00	44	2.83	15.57*	4.43
Chronic myeloid	4	5.00*	0	0.00	0	0.00	0	0.00	4	1.27	3.16	0.29

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 44,979 PYR and for male cancers on 48,029 PYR.



## Hodgkin Lymphoma

### Both Sexes, Long-term Follow-up, No Radiotherapy

**Table 16.1.13:** Risk of subsequent primary cancers after Hodgkin lymphoma, both sexes, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	8,315		2,269		1,115		459		8,315			
<b>Person-years in interval</b>	43,275		8,202		3,778		1,582		56,838			
<b>All subsequent cancers</b>	384	1.79*	102	2.12*	51	2.01*	26	2.05*	563	300.56	1.87*	46.17
All excluding same site	384	1.81*	102	2.14*	51	2.02*	26	2.06*	563	298.30	1.89*	46.57
<b>Buccal cavity, pharynx</b>	13	2.06*	2	1.52	4	5.96*	0	0.00	19	8.65	2.20*	1.82
Lip	5	5.82*	1	6.23	0	0.00	0	0.00	6	1.13	5.29*	0.86
Tongue	2	1.51	0	0.00	3	19.56*	0	0.00	5	1.85	2.71	0.55
Salivary gland	2	3.57	0	0.00	0	0.00	0	0.00	2	0.78	2.56	0.21
Mouth	2	1.24	0	0.00	1	6.19	0	0.00	3	2.18	1.38	0.15
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.07
Tonsil	1	1.48	0	0.00	0	0.00	0	0.00	1	0.96	1.04	0.01
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.04
Hypopharynx	1	1.62	1	8.02	0	0.00	0	0.00	2	0.83	2.40	0.21
<b>Digestive system</b>	51	1.20	15	1.66	14	3.04*	5	2.12	85	58.59	1.45*	4.65
Esophagus	2	0.85	0	0.00	1	3.59	0	0.00	3	3.31	0.91	-0.05
Stomach	6	1.39	4	4.58*	1	2.24	0	0.00	11	5.85	1.88	0.91
Small intestine	1	1.46	0	0.00	1	11.04	1	20.95	3	0.99	3.03	0.35
Colon	23	1.24	7	1.79	4	2.04	2	2.02	36	25.45	1.41	1.86
Rectum, rectosigmoid junction	7	0.91	0	0.00	0	0.00	0	0.00	7	10.46	0.67	-0.61
Anus, anal canal	2	4.02	0	0.00	1	15.35	1	29.50	4	0.72	5.59*	0.58
Liver	1	0.64	3	8.13*	0	0.00	1	8.80	5	2.25	2.22	0.48
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.70	0.00	-0.12
Bile ducts, other biliary	1	1.14	0	0.00	1	9.50	0	0.00	2	1.23	1.62	0.13
Pancreas	8	1.58	1	0.93	4	7.17*	0	0.00	13	6.98	1.86	1.06
<b>Respiratory system</b>	78	2.20*	16	2.12*	7	1.80	7	3.57*	108	48.91	2.21*	10.40
Nose, nasal cavity, ear	1	2.90	0	0.00	0	0.00	0	0.00	1	0.48	2.10	0.09
Larynx	5	1.85	3	5.34*	0	0.00	1	7.06	9	3.68	2.44*	0.94
Lung, bronchus	71	2.20*	13	1.88*	7	1.97	6	3.34*	97	44.57	2.18*	9.22
<b>Female breast</b>	24	1.05	18	3.34*	4	1.37	4	3.03	50	32.48	1.54*	7.63
<b>Female genital system</b>	12	1.12	6	2.67	2	1.72	1	1.98	21	14.59	1.44	2.79
Cervix uteri	2	0.98	1	2.24	0	0.00	0	0.00	3	2.79	1.08	0.09
Corpus uteri	6	1.29	3	3.23	1	2.01	1	4.48	11	6.31	1.74	2.04
Ovary	3	0.95	2	2.87	1	2.73	0	0.00	6	4.39	1.37	0.70
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.26
<b>Male genital system</b>	30	0.78	8	0.84	2	0.37	2	0.70	42	56.10	0.75	-4.16
Prostate	28	0.78	7	0.78	2	0.38	2	0.72	39	53.05	0.74	-4.15
Testis	2	0.99	0	0.00	0	0.00	0	0.00	2	2.66	0.75	-0.20
<b>Urinary system</b>	21	1.30	2	0.57	3	1.62	1	0.99	27	22.51	1.20	0.79
Urinary bladder	14	1.31	2	0.87	2	1.69	1	1.54	19	14.79	1.28	0.74
Kidney parenchyma	6	1.33	0	0.00	1	1.73	0	0.00	7	6.46	1.08	0.09
Renal pelvis, other urinary	1	1.07	0	0.00	0	0.00	0	0.00	1	1.26	0.79	-0.05
Ureter	1	3.32	0	0.00	0	0.00	0	0.00	1	0.40	2.49	0.11
<b>Bone, joints</b>	1	2.52	1	13.90	0	0.00	1	65.61	3	0.52	5.79*	0.44
<b>Soft tissue including heart</b>	4	3.39	3	11.73*	1	7.63	0	0.00	8	1.63	4.90*	1.12
<b>Kaposi sarcoma</b>	12	6.37*	0	0.00	0	0.00	0	0.00	12	2.63	4.57*	1.65
<b>Melanoma of skin</b>	13	1.69	3	1.57	0	0.00	1	1.90	17	11.16	1.52	1.03
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.09
<b>Brain, central nervous system</b>	4	1.26	0	0.00	0	0.00	0	0.00	4	4.34	0.92	-0.06
<b>Thyroid</b>	5	1.82	2	3.12	2	6.18	1	6.66	10	3.87	2.58*	1.08
<b>Lymphatic, hematopoietic</b>	109	5.99*	22	5.52*	7	3.41*	3	2.94	141	25.25	5.58*	20.36
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	2.26	0.00	-0.40
Non-Hodgkin lymphoma	47	5.66*	12	6.18*	4	3.91*	3	5.84*	66	11.79	5.60*	9.54
Myeloma	2	0.80	1	1.80	0	0.00	0	0.00	3	3.49	0.86	-0.09
Leukemia	60	10.65*	9	7.60*	3	5.01*	0	0.00	72	7.72	9.33*	11.31
Acute lymphocytic	3	9.34*	1	16.98	0	0.00	0	0.00	4	0.42	9.54*	0.63
Chronic lymphocytic	2	1.00	1	2.38	0	0.00	0	0.00	3	2.74	1.10	0.05
Acute non-lymphocytic	51	26.31*	5	12.24*	2	9.60*	0	0.00	58	2.66	21.80*	9.74
Chronic myeloid	0	0.00	2	11.01*	1	10.88	0	0.00	3	1.16	2.60	0.32

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 22,953 PYR and for male cancers on 33,884 PYR.

**Table 16.2.1:** Characteristics of patients with an initial non-Hodgkin lymphoma, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	39,861	100.0	34,097	100.0	73,958	100.0
<b>Initial treatment</b>						
Any radiation	11,287	28.3	9,737	28.6	21,024	28.4
With surgery	2,933	7.4	2,830	8.3	5,763	7.8
Without surgery	8,354	21.0	6,907	20.3	15,261	20.6
No radiation	28,574	71.7	24,360	71.4	52,934	71.6
With surgery	6,473	16.2	6,013	17.6	12,486	16.9
Without surgery	22,101	55.4	18,347	53.8	40,448	54.7
<b>Race</b>						
White	34,949	87.7	30,384	89.1	65,333	88.3
Black	2,573	6.5	1,854	5.4	4,427	6.0
Other	2,149	5.4	1,691	5.0	3,840	5.2
Unknown	190	0.5	168	0.5	358	0.5
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	2,823	7.1	1,440	4.2	4,263	5.8
30–49	9,113	22.9	4,959	14.5	14,072	19.0
50–69	16,442	41.2	13,348	39.1	29,790	40.3
70–79	8,089	20.3	9,048	26.5	17,137	23.2
≥ 80	3,394	8.5	5,302	15.5	8,696	11.8
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	36,828	92.4	31,944	93.7	68,772	93.0
1st and 2nd cancers	2,761	6.9	1,982	5.8	4,743	6.4
1st, 2nd, and 3rd cancers	244	0.6	155	0.5	399	0.5
1st, 2nd, 3rd, and additional cancers	28	0.1	16	0.0	44	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	61.0	—	67.0	—	63.8	—
Median year of 1st cancer diagnosis	1990.6	—	1990.0	—	1990.4	—
Median person-years at risk	2.5	—	3.0	—	2.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	95.2	—	95.4	—	95.3
1st, 2nd, and additional cancers	—	94.8	—	94.9	—	94.8
1st cancer only	—	3.8	—	3.9	—	3.8

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

# Non-Hodgkin Lymphoma Both Sexes

**Table 16.2.2:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	743	1.08*	2,191	1.07*	1,548	1.19*	1,195	1.26*	5,677	4,996.09	1.14*	19.31
All excluding same site	719	1.08*	2,124	1.07*	1,496	1.19*	1,151	1.26*	5,490	4,818.52	1.14*	19.04
<b>Buccal cavity, pharynx</b>	24	1.35	56	1.09	51	1.64*	39	1.85*	170	121.53	1.40*	1.37
Lip	5	1.87	9	1.19	11	2.48*	6	2.05	31	17.60	1.76*	0.38
Tongue	1	0.28	14	1.34	11	1.71	9	2.04	35	24.85	1.41	0.29
Salivary gland	3	1.92	6	1.29	7	2.38	6	2.76*	22	11.32	1.94*	0.30
Mouth	9	1.90	14	1.02	13	1.56	9	1.62	45	32.42	1.39*	0.36
Nasopharynx	0	0.00	4	1.96	2	1.65	2	2.51	8	4.77	1.68	0.09
Tonsil	2	1.21	2	0.41	2	0.69	5	2.62	11	11.28	0.98	-0.01
Oropharynx	1	2.05	0	0.00	0	0.00	0	0.00	1	3.35	0.30	-0.07
Hypopharynx	2	1.15	5	0.99	4	1.34	1	0.52	12	11.66	1.03	0.01
<b>Digestive system</b>	139	0.90	455	1.00	296	1.04	238	1.17*	1,128	1,097.36	1.03	0.87
Esophagus	8	1.11	11	0.52*	13	0.97	13	1.34	45	51.65	0.87	-0.19
Stomach	16	1.04	46	1.04	37	1.37	21	1.12	120	105.37	1.14	0.41
Small intestine	3	1.41	6	0.94	7	1.68	4	1.27	20	15.83	1.26	0.12
Colon	66	0.93	222	1.06	141	1.06	123	1.29*	552	507.05	1.09	1.27
Rectum, rectosigmoid junction	22	0.82	84	1.08	47	0.98	27	0.82	180	185.07	0.97	-0.14
Anus, anal canal	0	0.00	9	2.03	2	0.70	2	0.96	13	10.85	1.20	0.06
Liver	7	1.38	11	0.74	11	1.15	6	0.84	35	36.71	0.95	-0.05
Gallbladder	1	0.44	3	0.46	2	0.49	2	0.71	8	15.70	0.51	-0.22
Bile ducts, other biliary	2	0.60	11	1.10	6	0.92	9	1.79	28	24.88	1.13	0.09
Pancreas	11	0.59	50	0.91	28	0.81	30	1.20	119	132.99	0.89	-0.40
<b>Respiratory system</b>	135	1.16	425	1.23*	312	1.44*	222	1.43*	1,094	833.08	1.31*	7.40
Nose, nasal cavity, ear	1	0.98	3	1.00	5	2.66	2	1.50	11	7.24	1.52	0.11
Larynx	11	1.45	24	1.09	19	1.44	6	0.69	60	51.46	1.17	0.24
Lung, bronchus	123	1.15	398	1.25*	288	1.43*	214	1.48*	1,023	772.27	1.32*	7.11
<b>Female breast</b>	45	0.57*	193	0.80*	145	0.92	122	1.06	505	591.64	0.85*	-5.04
<b>Female genital system</b>	30	0.84	92	0.87	64	0.96	58	1.24	244	255.07	0.96	-0.64
Cervix uteri	3	0.76	6	0.53	3	0.45	6	1.38	18	26.45	0.68	-0.49
Corpus uteri	11	0.60	49	0.90	33	0.98	32	1.36	125	129.62	0.96	-0.27
Ovary	12	1.15	29	0.92	15	0.74	14	0.96	70	76.71	0.91	-0.39
Vagina	2	3.69	2	1.24	3	2.92	2	2.71	9	3.92	2.30*	0.30
Vulva	2	1.20	5	0.99	10	2.99*	3	1.18	20	12.60	1.59	0.43
<b>Male genital system</b>	89	0.71*	345	0.93	226	0.94	168	0.93	828	919.07	0.90*	-5.04
Prostate	88	0.72*	338	0.92	222	0.93	168	0.94	816	906.97	0.90*	-5.03
Testis	0	0.00	3	1.11	2	1.28	0	0.00	5	6.32	0.79	-0.07
<b>Urinary system</b>	91	1.69*	159	1.00	147	1.45*	136	1.83*	533	388.38	1.37*	4.10
Urinary bladder	34	0.92	111	1.02	104	1.50*	105	2.06*	354	266.58	1.33*	2.48
Kidney parenchyma	56	4.20*	39	0.98	39	1.52*	23	1.22	157	97.81	1.61*	1.68
Renal pelvis, other urinary	1	0.29	9	0.90	4	0.65	8	1.82	22	24.00	0.92	-0.06
Ureter	0	0.00	1	0.30	2	0.98	2	1.40	5	7.91	0.63	-0.08
<b>Bone, joints</b>	2	3.08	5	2.63	5	4.28*	4	4.90*	16	4.53	3.53*	0.33
<b>Soft tissue including heart</b>	0	0.00	12	1.47	11	2.11*	4	1.03	27	20.02	1.35	0.20
<b>Kaposi sarcoma</b>	64	48.45*	36	9.75*	10	4.42*	3	2.00	113	8.78	12.87*	2.96
<b>Melanoma of skin</b>	22	1.39	84	1.74*	53	1.68*	30	1.23	189	120.07	1.57*	1.95
<b>Eye, orbit</b>	2	1.93	2	0.66	2	1.07	0	0.00	6	7.25	0.83	-0.04
<b>Brain, central nervous system</b>	9	1.23	22	1.02	8	0.59	16	1.68	55	51.90	1.06	0.09
<b>Thyroid</b>	12	2.93*	14	1.15	8	1.05	4	0.73	38	29.41	1.29	0.24
<b>Lymphatic, hematopoietic</b>	52	0.99	200	1.28*	153	1.53*	95	1.29*	500	382.79	1.31*	3.32
Hodgkin lymphoma	3	1.58	29	5.34*	12	3.69*	17	7.70*	61	12.79	4.77*	1.37
Non-Hodgkin lymphoma	24	1.01	67	0.93	52	1.11	44	1.25	187	177.56	1.05	0.27
Myeloma	4	0.46	13	0.50*	11	0.67	7	0.58	35	63.05	0.56*	-0.80
Leukemia	21	1.16	91	1.71*	78	2.32*	27	1.11	217	129.39	1.68*	2.48
Acute lymphocytic	1	1.82	0	0.00	2	1.99	0	0.00	3	3.86	0.78	-0.02
Chronic lymphocytic	2	0.28	11	0.52*	7	0.53	5	0.53	25	51.13	0.49*	-0.74
Acute non-lymphocytic	11	1.80	59	3.27*	54	4.70*	18	2.13*	142	44.14	3.22*	2.77
Chronic myeloid	4	1.62	11	1.52	8	1.75	2	0.60	25	17.63	1.42	0.21

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 171,844 PYR and for male cancers on 180,851 PYR.

**Table 16.2.3:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4,482	1.11*	763	1.25*	307	1.22*	125	1.46*	5,677	4,996.09	1.14*	19.31
All excluding same site	4,339	1.11*	732	1.24*	298	1.23*	121	1.47*	5,490	4,818.52	1.14*	19.04
<b>Buccal cavity, pharynx</b>	131	1.30*	28	2.03*	11	2.03*	0	0.00	170	121.53	1.40*	1.37
Lip	25	1.70*	6	3.11*	0	0.00	0	0.00	31	17.60	1.76*	0.38
Tongue	26	1.27	6	2.08	3	2.61	0	0.00	35	24.85	1.41	0.29
Salivary gland	16	1.75	2	1.44	4	6.89*	0	0.00	22	11.32	1.94*	0.30
Mouth	36	1.34	8	2.18	1	0.70	0	0.00	45	32.42	1.39*	0.36
Nasopharynx	6	1.51	1	1.90	1	4.95	0	0.00	8	4.77	1.68	0.09
Tonsil	6	0.64	3	2.38	2	4.08	0	0.00	11	11.28	0.98	-0.01
Oropharynx	1	0.36	0	0.00	0	0.00	0	0.00	1	3.35	0.30	-0.07
Hypopharynx	11	1.13	1	0.78	0	0.00	0	0.00	12	11.66	1.03	0.01
<b>Digestive system</b>	890	1.00	137	1.04	72	1.34*	29	1.56*	1,128	1,097.36	1.03	0.87
Esophagus	32	0.76	10	1.61	3	1.17	0	0.00	45	51.65	0.87	-0.19
Stomach	99	1.14	13	1.07	7	1.44	1	0.61	120	105.37	1.14	0.41
Small intestine	16	1.26	2	1.00	2	2.35	0	0.00	20	15.83	1.26	0.12
Colon	429	1.04	71	1.16	37	1.47*	15	1.73	552	507.05	1.09	1.27
Rectum, rectosigmoid junction	153	1.01	12	0.56*	7	0.82	8	2.76*	180	185.07	0.97	-0.14
Anus, anal canal	11	1.26	0	0.00	2	3.58	0	0.00	13	10.85	1.20	0.06
Liver	29	0.98	6	1.33	0	0.00	0	0.00	35	36.71	0.95	-0.05
Gallbladder	6	0.47	2	1.10	0	0.00	0	0.00	8	15.70	0.51	-0.22
Bile ducts, other biliary	19	0.96	5	1.58	3	2.19	1	2.02	28	24.88	1.13	0.09
Pancreas	89	0.82	16	0.99	10	1.50	4	1.73	119	132.99	0.89	-0.40
<b>Respiratory system</b>	872	1.29*	141	1.41*	58	1.42*	23	1.66*	1,094	833.08	1.31*	7.40
Nose, nasal cavity, ear	9	1.52	1	1.16	1	2.84	0	0.00	11	7.24	1.52	0.11
Larynx	54	1.26	2	0.35	3	1.36	1	1.41	60	51.46	1.17	0.24
Lung, bronchus	809	1.29*	138	1.48*	54	1.41*	22	1.70*	1,023	772.27	1.32*	7.11
<b>Female breast</b>	383	0.80*	74	1.00	38	1.24	10	0.94	505	591.64	0.85*	-5.04
<b>Female genital system</b>	186	0.89	42	1.39	11	0.89	5	1.19	244	255.07	0.96	-0.64
Cervix uteri	12	0.54*	4	1.39	2	1.79	0	0.00	18	26.45	0.68	-0.49
Corpus uteri	93	0.88	24	1.58*	5	0.81	3	1.42	125	129.62	0.96	-0.27
Ovary	56	0.90	9	0.96	3	0.78	2	1.51	70	76.71	0.91	-0.39
Vagina	7	2.20	1	2.10	1	5.11	0	0.00	9	3.92	2.30*	0.30
Vulva	17	1.69	3	1.87	0	0.00	0	0.00	20	12.60	1.59	0.43
<b>Male genital system</b>	660	0.89*	109	0.93	42	0.86	17	1.09	828	919.07	0.90*	-5.04
Prostate	648	0.89*	109	0.94	42	0.87	17	1.10	816	906.97	0.90*	-5.03
Testis	5	0.96	0	0.00	0	0.00	0	0.00	5	6.32	0.79	-0.07
<b>Urinary system</b>	397	1.26*	82	1.73*	34	1.72*	20	2.89*	533	388.38	1.37*	4.10
Urinary bladder	249	1.15*	62	1.90*	27	1.99*	16	3.36*	354	266.58	1.33*	2.48
Kidney parenchyma	134	1.70*	16	1.32	5	0.99	2	1.14	157	97.81	1.61*	1.68
Renal pelvis, other urinary	14	0.71	4	1.41	2	1.73	2	5.00	22	24.00	0.92	-0.06
Ureter	3	0.46	2	2.16	0	0.00	0	0.00	5	7.91	0.63	-0.08
<b>Bone, joints</b>	12	3.23*	2	3.80	1	4.65	1	13.47	16	4.53	3.53*	0.33
<b>Soft tissue including heart</b>	23	1.42	1	0.41	2	1.93	1	2.72	27	20.02	1.35	0.20
<b>Kaposi sarcoma</b>	110	15.12*	3	2.92	0	0.00	0	0.00	113	8.78	12.87*	2.96
<b>Melanoma of skin</b>	159	1.66*	22	1.43	4	0.61	4	1.64	189	120.07	1.57*	1.95
<b>Eye, orbit</b>	6	1.01	0	0.00	0	0.00	0	0.00	6	7.25	0.83	-0.04
<b>Brain, central nervous system</b>	39	0.92	9	1.46	5	2.01	2	2.36	55	51.90	1.06	0.09
<b>Thyroid</b>	34	1.42	4	1.14	0	0.00	0	0.00	38	29.41	1.29	0.24
<b>Lymphatic, hematopoietic</b>	405	1.31*	69	1.46*	16	0.81	10	1.45	500	382.79	1.31*	3.32
Hodgkin lymphoma	44	4.16*	11	7.60*	3	5.24*	3	16.01*	61	12.79	4.77*	1.37
Non-Hodgkin lymphoma	143	1.00	31	1.38	9	0.95	4	1.19	187	177.56	1.05	0.27
Myeloma	28	0.55*	5	0.65	1	0.31	1	0.90	35	63.05	0.56*	-0.80
Leukemia	190	1.81*	22	1.41	3	0.46	2	0.89	217	129.39	1.68*	2.48
Acute lymphocytic	3	0.95	0	0.00	0	0.00	0	0.00	3	3.86	0.78	-0.02
Chronic lymphocytic	20	0.48*	3	0.49	1	0.40	1	1.18	25	51.13	0.49*	-0.74
Acute non-lymphocytic	124	3.48*	15	2.78*	2	0.88	1	1.24	142	44.14	3.22*	2.77
Chronic myeloid	23	1.61*	2	0.93	0	0.00	0	0.00	25	17.63	1.42	0.21

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 171,844 PYR and for male cancers on 180,851 PYR.

# Non-Hodgkin Lymphoma Females

**Table 16.2.4:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	258	0.92	852	1.00	676	1.22*	556	1.36*	2,342	2,090.46	1.12*	14.64
All excluding same site	249	0.92	828	1.01	651	1.22*	533	1.36*	2,261	2,010.36	1.12*	14.59
<b>Buccal cavity, pharynx</b>	2	0.40	14	0.93	20	2.09*	8	1.17	44	36.42	1.21	0.44
Lip	0	0.00	0	0.00	2	2.89	2	3.81	4	2.61	1.53	0.08
Tongue	0	0.00	4	1.21	6	2.82*	2	1.32	12	8.06	1.49	0.23
Salivary gland	0	0.00	3	1.79	5	4.63*	0	0.00	8	4.12	1.94	0.23
Mouth	2	1.15	3	0.58	4	1.20	3	1.26	12	12.65	0.95	-0.04
Nasopharynx	0	0.00	2	3.36	1	2.67	0	0.00	3	1.43	2.09	0.09
Tonsil	0	0.00	0	0.00	1	1.28	1	1.94	2	3.00	0.67	-0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	0.00	-0.05
Hypopharynx	0	0.00	2	1.99	1	1.60	0	0.00	3	2.38	1.26	0.04
<b>Digestive system</b>	61	0.92	188	0.95	145	1.13	123	1.30*	517	486.76	1.06	1.76
Esophagus	2	1.14	2	0.38	4	1.15	6	2.31	14	13.15	1.06	0.05
Stomach	6	1.16	19	1.26	15	1.56	15	2.18*	55	36.79	1.50*	1.06
Small intestine	0	0.00	2	0.72	3	1.60	0	0.00	5	7.01	0.71	-0.12
Colon	32	0.96	99	1.00	76	1.17	69	1.44*	276	245.43	1.12	1.78
Rectum, rectosigmoid junction	10	0.96	31	1.00	25	1.28	10	0.72	76	74.70	1.02	0.08
Rectum	7	1.03	25	1.24	16	1.24	6	0.65	54	49.17	1.10	0.28
Anus, anal canal	0	0.00	3	1.15	0	0.00	1	0.79	4	6.45	0.62	-0.14
Liver	3	2.15	1	0.24	4	1.42	1	0.46	9	10.65	0.85	-0.10
Gallbladder	1	0.65	2	0.45	2	0.72	1	0.52	6	10.70	0.56	-0.27
Bile ducts, other biliary	1	0.69	4	0.91	4	1.35	4	1.71	13	11.16	1.16	0.11
Pancreas	5	0.58	25	0.97	11	0.65	15	1.18	56	64.15	0.87	-0.47
<b>Respiratory system</b>	43	1.19	144	1.27*	129	1.70*	97	1.66*	413	283.63	1.46*	7.53
Nose, nasal cavity, ear	0	0.00	1	0.87	1	1.32	0	0.00	2	2.85	0.70	-0.05
Larynx	0	0.00	6	1.72	4	1.80	2	1.28	12	8.42	1.43	0.21
Lung, bronchus	43	1.24	137	1.27*	124	1.70*	95	1.70*	399	271.65	1.47*	7.41
<b>Female breast</b>	45	0.57*	193	0.80*	145	0.92	122	1.06	505	591.64	0.85*	-5.04
<b>Female genital system</b>	30	0.84	92	0.87	64	0.96	58	1.24	244	255.07	0.96	-0.64
Cervix uteri	3	0.76	6	0.53	3	0.45	6	1.38	18	26.45	0.68	-0.49
Corpus uteri	11	0.60	49	0.90	33	0.98	32	1.36	125	129.62	0.96	-0.27
Ovary	12	1.15	29	0.92	15	0.74	14	0.96	70	76.71	0.91	-0.39
Vagina	2	3.69	2	1.24	3	2.92	2	2.71	9	3.92	2.30*	0.30
Vulva	2	1.20	5	0.99	10	2.99*	3	1.18	20	12.60	1.59	0.43
<b>Urinary system</b>	28	2.07*	35	0.85	38	1.40	51	2.49*	152	102.32	1.49*	2.89
Urinary bladder	8	0.99	25	1.02	27	1.68*	41	3.38*	101	60.65	1.67*	2.35
Kidney parenchyma	19	4.41*	6	0.45*	11	1.24	6	0.89	42	33.25	1.26	0.51
Renal pelvis, other urinary	1	0.87	4	1.17	0	0.00	4	2.46	9	8.42	1.07	0.03
Ureter	0	0.00	1	0.94	0	0.00	2	4.01	3	2.61	1.15	0.02
<b>Bone, joints</b>	2	7.50	0	0.00	4	7.93*	2	5.49	8	1.93	4.14*	0.35
<b>Soft tissue including heart</b>	0	0.00	4	1.19	3	1.36	2	1.20	9	8.34	1.08	0.04
<b>Kaposi sarcoma</b>	0	0.00	1	3.05	4	18.04*	0	0.00	5	0.82	6.06*	0.24
<b>Melanoma of skin</b>	11	2.00	30	1.75*	22	1.94*	9	1.03	72	42.69	1.69*	1.71
<b>Eye, orbit</b>	1	2.36	1	0.80	0	0.00	0	0.00	2	3.02	0.66	-0.06
<b>Brain, central nervous system</b>	1	0.34	8	0.90	3	0.53	7	1.72	19	21.53	0.88	-0.15
<b>Thyroid</b>	6	2.37	10	1.30	5	1.03	3	0.85	24	18.59	1.29	0.31
<b>Lymphatic, hematopoietic</b>	20	0.92	86	1.31*	76	1.75*	44	1.34	226	163.88	1.38*	3.61
Hodgkin lymphoma	1	1.42	11	5.28*	6	4.61*	6	6.64*	24	4.99	4.81*	1.11
Non-Hodgkin lymphoma	9	0.87	24	0.75	25	1.17	23	1.40	81	80.11	1.01	0.05
Myeloma	3	0.82	9	0.81	5	0.68	3	0.55	20	27.54	0.73	-0.44
Leukemia	7	1.01	42	2.03*	40	2.96*	12	1.19	101	51.24	1.97*	2.90
Acute lymphocytic	1	4.81	0	0.00	1	2.46	0	0.00	2	1.54	1.30	0.03
Chronic lymphocytic	1	0.37	5	0.62	3	0.57	3	0.78	12	19.77	0.61	-0.45
Acute non-lymphocytic	3	1.23	31	4.22*	28	5.82*	8	2.19	70	18.24	3.84*	3.01
Chronic myeloid	1	1.06	4	1.41	4	2.16	0	0.00	9	7.02	1.28	0.12

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 16.2.5:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	485	1.18*	1,339	1.11*	872	1.16*	639	1.18*	3,335	2,905.62	1.15*	23.74
All excluding same site	470	1.18*	1,296	1.12*	845	1.16*	618	1.18*	3,229	2,808.17	1.15*	23.27
<b>Buccal cavity, pharynx</b>	22	1.73*	42	1.15	31	1.44	31	2.18*	126	85.11	1.48*	2.26
Lip	5	2.15	9	1.38	9	2.40*	4	1.66	27	14.98	1.80*	0.66
Tongue	1	0.41	10	1.40	5	1.17	7	2.41	23	16.79	1.37	0.34
Salivary gland	3	2.98	3	1.01	2	1.07	6	4.39*	14	7.20	1.94*	0.38
Mouth	7	2.33	11	1.28	9	1.80	6	1.88	33	19.77	1.67*	0.73
Nasopharynx	0	0.00	2	1.38	1	1.19	2	3.76	5	3.34	1.50	0.09
Tonsil	2	1.63	2	0.56	1	0.48	4	2.87	9	8.27	1.09	0.04
Oropharynx	1	2.74	0	0.00	0	0.00	0	0.00	1	2.46	0.41	-0.08
Hypopharynx	2	1.43	3	0.75	3	1.27	1	0.67	9	9.28	0.97	-0.02
<b>Digestive system</b>	78	0.88	267	1.04	151	0.96	115	1.05	611	610.60	1.00	0.02
Esophagus	6	1.09	9	0.56	9	0.91	7	0.99	31	38.50	0.81	-0.41
Stomach	10	0.98	27	0.93	22	1.26	6	0.51	65	68.58	0.95	-0.20
Small intestine	3	2.46	4	1.11	4	1.74	4	2.37	15	8.82	1.70	0.34
Colon	34	0.90	123	1.13	65	0.96	54	1.14	276	261.62	1.05	0.80
Rectum, rectosigmoid junction	12	0.74	53	1.13	22	0.78	17	0.89	104	110.37	0.94	-0.35
Anus, anal canal	0	0.00	6	3.29*	2	1.76	1	1.22	9	4.40	2.05	0.25
Liver	4	1.09	10	0.93	7	1.04	5	1.01	26	26.06	1.00	0.00
Gallbladder	0	0.00	1	0.47	0	0.00	1	1.15	2	4.99	0.40	-0.17
Bile ducts, other biliary	1	0.53	7	1.26	2	0.56	5	1.86	15	13.72	1.09	0.07
Pancreas	6	0.60	25	0.87	17	0.97	15	1.22	63	68.83	0.92	-0.32
<b>Respiratory system</b>	92	1.15	281	1.21*	183	1.30*	125	1.29*	681	549.45	1.24*	7.27
Nose, nasal cavity, ear	1	1.55	2	1.08	4	3.55	2	2.58	9	4.40	2.05	0.25
Larynx	11	1.71	18	0.97	15	1.37	4	0.56	48	43.04	1.12	0.27
Lung, bronchus	80	1.10	261	1.24*	164	1.27*	119	1.34*	624	500.63	1.25*	6.82
<b>Male breast</b>	0	0.00	3	1.32	2	1.41	2	1.94	7	5.49	1.27	0.08
<b>Male genital system</b>	89	0.71*	345	0.93	226	0.94	168	0.93	828	919.07	0.90*	-5.04
Prostate	88	0.72*	338	0.92	222	0.93	168	0.94	816	906.97	0.90*	-5.03
Testis	0	0.00	3	1.11	2	1.28	0	0.00	5	6.32	0.79	-0.07
<b>Urinary system</b>	63	1.56*	124	1.05	109	1.47*	85	1.58*	381	286.06	1.33*	5.25
Urinary bladder	26	0.90	86	1.01	77	1.45*	64	1.65*	253	205.93	1.23*	2.60
Kidney parenchyma	37	4.10*	33	1.24	28	1.67*	17	1.40	115	64.56	1.78*	2.79
Renal pelvis, other urinary	0	0.00	5	0.76	4	1.01	4	1.45	13	15.58	0.83	-0.14
Ureter	0	0.00	0	0.00	2	1.48	0	0.00	2	5.30	0.38	-0.18
<b>Bone, joints</b>	0	0.00	5	4.54*	1	1.50	2	4.43	8	2.60	3.08*	0.30
<b>Soft tissue including heart</b>	0	0.00	8	1.66	8	2.67*	2	0.91	18	11.68	1.54	0.35
<b>Kaposi sarcoma</b>	64	52.78*	35	10.41*	6	2.94*	3	2.25	108	7.95	13.58*	5.53
<b>Melanoma of skin</b>	11	1.07	54	1.74*	31	1.53*	21	1.34	117	77.38	1.51*	2.19
<b>Eye, orbit</b>	1	1.63	1	0.56	2	1.85	0	0.00	4	4.23	0.95	-0.01
<b>Brain, central nervous system</b>	8	1.83	14	1.10	5	0.64	9	1.66	36	30.38	1.19	0.31
<b>Thyroid</b>	6	3.84*	4	0.88	3	1.09	1	0.51	14	10.82	1.29	0.18
<b>Lymphatic, hematopoietic</b>	32	1.03	114	1.26*	77	1.36*	51	1.24	274	218.91	1.25*	3.05
Hodgkin lymphoma	2	1.67	18	5.38*	6	3.08*	11	8.44*	37	7.79	4.75*	1.61
Non-Hodgkin lymphoma	15	1.11	43	1.08	27	1.07	21	1.11	106	97.46	1.09	0.47
Myeloma	1	0.20	4	0.27*	6	0.65	4	0.60	15	35.52	0.42*	-1.13
Leukemia	14	1.25	49	1.51*	38	1.89*	15	1.05	116	78.15	1.48*	2.09
Acute lymphocytic	0	0.00	0	0.00	1	1.67	0	0.00	1	2.32	0.43	-0.07
Chronic lymphocytic	1	0.22	6	0.46*	4	0.49	2	0.35	13	31.35	0.41*	-1.01
Acute non-lymphocytic	8	2.17	28	2.61*	26	3.90*	10	2.08	72	25.90	2.78*	2.55
Chronic myeloid	3	1.96	7	1.59	4	1.47	2	1.01	16	10.62	1.51	0.30

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Non-Hodgkin Lymphoma

## Both Sexes, <30 Years of Age

**Table 16.2.6:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, <30 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	4,263	3,058	7	6.57*	25	5.95*	16	3.18*	19	1.67*	67	21.69	3.09*	13.38
All excluding same site			6	6.08*	23	5.92*	13	2.79*	17	1.60	59	20.17	2.93*	13.18
<b>Buccal cavity, pharynx</b>			0	0.00	0	0.00	1	9.46	1	3.18	2	0.52	3.82	0.50
Lip			0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.02
Tongue			0	0.00	0	0.00	0	0.00	1	12.60	1	0.12	8.26	0.30
Salivary gland			0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.03
Mouth			0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.03
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.02
Tonsil			0	0.00	0	0.00	1	160.32*	0	0.00	1	0.06	17.94	0.32
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
<b>Digestive system</b>			0	0.00	1	4.86	0	0.00	3	2.62	4	1.71	2.34	0.78
Esophagus			0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.02
Stomach			0	0.00	0	0.00	0	0.00	1	8.53	1	0.19	5.37	0.28
Small intestine			0	0.00	0	0.00	0	0.00	1	25.78	1	0.06	16.43	0.32
Colon			0	0.00	1	12.93	0	0.00	0	0.00	1	0.62	1.62	0.13
Rectum, rectosigmoid junction			0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.11
Anus, anal canal			0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.02
Liver			0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.04
Gallbladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Bile ducts, other biliary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
Pancreas			0	0.00	0	0.00	0	0.00	1	8.85	1	0.15	6.58	0.29
<b>Respiratory system</b>			0	0.00	1	12.61	1	7.10	1	1.40	3	0.96	3.14	0.69
Nose, nasal cavity, ear			0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
Larynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.03
Lung, bronchus			0	0.00	1	20.66	1	9.61	1	1.64	3	0.77	3.89	0.76
<b>Female breast</b>			0	0.00	0	0.00	2	3.14	6	2.47	8	3.43	2.33*	4.12
<b>Female genital system</b>			0	0.00	1	2.59	0	0.00	0	0.00	1	2.01	0.50	-0.91
Cervix uteri			0	0.00	1	4.83	0	0.00	0	0.00	1	0.89	1.13	0.10
Corpus uteri			0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.34
Ovary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.57
Vagina			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Vulva			0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
<b>Male genital system</b>			0	0.00	0	0.00	1	2.14	0	0.00	1	1.88	0.53	-0.48
Prostate			0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.14
Testis			0	0.00	0	0.00	1	2.18	0	0.00	1	1.60	0.62	-0.33
<b>Urinary system</b>			0	0.00	0	0.00	0	0.00	1	2.01	1	0.76	1.32	0.08
Urinary bladder			0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.13
Kidney parenchyma			0	0.00	0	0.00	0	0.00	1	4.18	1	0.36	2.78	0.22
Renal pelvis, other urinary			0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Bone, joints</b>			0	0.00	1	11.64	1	14.21	0	0.00	2	0.25	7.96	0.59
<b>Soft tissue including heart</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.13
<b>Kaposi sarcoma</b>			5	98.15*	4	16.22*	1	2.76	0	0.00	10	1.15	8.71*	3.00
<b>Melanoma of skin</b>			0	0.00	3	6.36*	2	3.44	1	0.92	6	2.25	2.66	1.27
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.02
<b>Brain, central nervous system</b>			1	12.16	0	0.00	0	0.00	1	2.86	2	0.96	2.08	0.35
<b>Thyroid</b>			0	0.00	2	5.90	2	5.52	1	1.79	5	1.35	3.71*	1.24
<b>Lymphatic, hematopoietic</b>			1	3.60	10	10.50*	5	5.36*	4	2.71	20	3.64	5.50*	5.55
Hodgkin lymphoma			0	0.00	4	10.65*	1	3.12	1	3.00	6	1.14	5.25*	1.65
Non-Hodgkin lymphoma			1	12.59	2	6.40	3	7.89*	2	2.67	8	1.52	5.26*	2.20
Myeloma			0	0.00	0	0.00	1	74.16	0	0.00	1	0.09	11.24	0.31
Leukemia			0	0.00	4	15.55*	0	0.00	1	3.07	5	0.89	5.65*	1.40
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.09
Chronic lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.02
Acute non-lymphocytic			0	0.00	4	41.37*	0	0.00	1	7.66	5	0.35	14.48*	1.58
Chronic myeloid			0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.06

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 11,090 PYR and for male cancers on 18,373 PYR.

## Non-Hodgkin Lymphoma Both Sexes, 30-49 Years of Age

**Table 16.2.7:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, 30-49 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	93	4.21*	151	1.68*	161	1.71*	260	1.66*	665	362.91	1.83*	37.29
All excluding same site	88	4.22*	139	1.63*	154	1.71*	250	1.66*	631	346.90	1.82*	35.07
<b>Buccal cavity, pharynx</b>	1	1.18	5	1.44	8	2.24	9	1.88	23	12.70	1.81*	1.27
Lip	0	0.00	0	0.00	1	3.11	1	2.26	2	1.20	1.67	0.10
Tongue	0	0.00	1	1.26	3	3.59	2	1.77	6	2.95	2.03	0.38
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	1.08	0.00	-0.13
Mouth	0	0.00	2	2.38	2	2.24	2	1.66	6	3.14	1.91	0.35
Nasopharynx	0	0.00	1	4.28	0	0.00	1	4.29	2	0.74	2.71	0.16
Tonsil	1	8.16	1	1.97	0	0.00	3	4.77	5	1.78	2.81	0.40
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	2	6.39	0	0.00	2	1.09	1.83	0.11
<b>Digestive system</b>	1	0.34	17	1.34	17	1.17	42	1.60*	77	56.31	1.37*	2.55
Esophagus	0	0.00	1	1.25	0	0.00	5	2.90	6	3.66	1.64	0.29
Stomach	1	3.06	1	0.76	1	0.72	5	2.22	8	5.30	1.51	0.33
Small intestine	0	0.00	1	2.90	1	2.78	0	0.00	2	1.35	1.48	0.08
Colon	0	0.00	6	1.30	4	0.74	16	1.53	26	21.59	1.20	0.54
Rectum, rectosigmoid junction	0	0.00	3	1.16	5	1.65	5	0.96	13	11.38	1.14	0.20
Anus, anal canal	0	0.00	4	12.36*	1	3.17	1	2.29	6	1.16	5.18*	0.60
Liver	0	0.00	1	1.47	0	0.00	1	0.82	2	2.81	0.71	-0.10
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.07
Bile ducts, other biliary	0	0.00	0	0.00	2	7.10	3	5.45*	5	1.14	4.40*	0.48
Pancreas	0	0.00	0	0.00	3	1.77	6	1.91	9	6.59	1.37	0.30
<b>Respiratory system</b>	5	2.05	19	1.69*	35	2.53*	60	2.30*	119	53.56	2.22*	8.08
Nose, nasal cavity, ear	0	0.00	1	5.43	0	0.00	1	4.13	2	0.65	3.07	0.17
Larynx	0	0.00	1	0.87	3	2.25	2	0.97	6	4.80	1.25	0.15
Lung, bronchus	5	2.37	17	1.72*	32	2.61*	57	2.41*	111	47.90	2.32*	7.79
<b>Female breast</b>	6	1.24	5	0.25*	19	0.99	31	1.24	61	68.60	0.89	-2.22
<b>Female genital system</b>	4	2.13	7	0.92	15	2.04*	17	1.72*	43	26.74	1.61*	4.75
Cervix uteri	2	3.35	2	0.99	1	0.69	3	2.42	8	5.31	1.51	0.78
Corpus uteri	2	3.34	2	0.71	8	2.49*	8	1.58	20	11.68	1.71*	2.43
Ovary	0	0.00	3	1.27	1	0.44	4	1.34	8	8.21	0.97	-0.06
Vagina	0	0.00	0	0.00	1	14.79	1	9.76	2	0.25	7.86	0.51
Vulva	0	0.00	0	0.00	4	19.27*	1	3.37	5	0.78	6.40*	1.23
<b>Male genital system</b>	0	0.00	8	1.41	11	1.24	21	0.78	40	42.75	0.94	-0.59
Prostate	0	0.00	4	0.95	9	1.12	21	0.79	34	39.35	0.86	-1.14
Testis	0	0.00	2	1.45	1	1.41	0	0.00	3	2.97	1.01	0.01
<b>Urinary system</b>	8	6.29*	6	1.10	13	2.09*	32	2.89*	59	24.07	2.45*	4.31
Urinary bladder	1	1.52	3	1.04	9	2.62*	22	3.32*	35	13.61	2.57*	2.64
Kidney parenchyma	7	12.39*	1	0.42	4	1.57	8	2.02	20	9.45	2.12*	1.30
Renal pelvis, other urinary	0	0.00	2	9.24*	0	0.00	2	4.09	4	1.00	3.98*	0.37
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.03
<b>Bone, joints</b>	1	15.43	3	14.01*	1	6.03	2	10.91*	7	0.63	11.14*	0.79
<b>Soft tissue including heart</b>	0	0.00	2	2.77	2	3.31	0	0.00	4	2.26	1.77	0.21
<b>Kaposi sarcoma</b>	49	70.76*	28	15.14*	6	5.93*	2	4.07	85	4.05	21.01*	9.99
<b>Melanoma of skin</b>	4	2.37	13	2.14*	10	1.93	7	1.16	34	18.99	1.79*	1.85
<b>Eye, orbit</b>	0	0.00	0	0.00	1	4.95	0	0.00	1	0.74	1.36	0.03
<b>Brain, central nervous system</b>	1	1.84	3	1.53	0	0.00	3	1.44	7	6.31	1.11	0.09
<b>Thyroid</b>	2	2.82	5	2.05	1	0.54	0	0.00	8	6.78	1.18	0.15
<b>Lymphatic, hematopoietic</b>	8	3.47*	26	3.06*	20	2.54*	26	2.29*	80	30.04	2.66*	6.17
Hodgkin lymphoma	1	3.21	4	4.28*	2	3.25	7	13.26*	14	2.39	5.86*	1.43
Non-Hodgkin lymphoma	5	3.97*	12	2.61*	7	1.65	10	1.69	34	16.01	2.12*	2.22
Myeloma	0	0.00	1	1.26	0	0.00	1	0.60	2	3.57	0.56	-0.19
Leukemia	2	3.59	9	4.17*	11	5.22*	8	2.46*	30	8.07	3.72*	2.71
Acute lymphocytic	0	0.00	0	0.00	1	7.49	0	0.00	1	0.49	2.03	0.06
Chronic lymphocytic	0	0.00	1	1.77	2	2.85	1	0.79	4	2.66	1.51	0.17
Acute non-lymphocytic	2	9.57*	7	9.11*	8	11.38*	7	6.52*	24	2.75	8.71*	2.62
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.34	0.00	-0.17

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 34,275 PYR and for male cancers on 46,741 PYR.

# Non-Hodgkin Lymphoma

## Both Sexes, 50-69 Years of Age

**Table 16.2.8:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, 50-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	317	1.20*	1,067	1.13*	893	1.17*	772	1.19*	3,049	2,621.79	1.16*	26.44
All excluding same site	307	1.20*	1,039	1.13*	865	1.17*	745	1.20*	2,956	2,533.45	1.17*	26.16
<b>Buccal cavity, pharynx</b>	12	1.39	24	0.85	29	1.50*	26	1.92*	91	69.67	1.31*	1.32
Lip	2	1.92	4	1.15	7	2.77*	3	1.51	16	9.05	1.77*	0.43
Tongue	0	0.00	7	1.19	7	1.73	6	2.16	20	14.54	1.38	0.34
Salivary gland	1	1.71	3	1.47	4	2.55	5	3.67*	13	5.55	2.34*	0.46
Mouth	6	2.62	4	0.54	7	1.37	7	1.95	24	18.45	1.30	0.34
Nasopharynx	0	0.00	2	1.67	0	0.00	1	2.13	3	2.81	1.07	0.01
Tonsil	1	1.05	1	0.33	1	0.53	2	1.77	5	6.97	0.72	-0.12
Oropharynx	1	3.67	0	0.00	0	0.00	0	0.00	1	2.13	0.47	-0.07
Hypopharynx	0	0.00	2	0.63	2	0.95	1	0.76	5	7.54	0.66	-0.16
<b>Digestive system</b>	56	1.09	190	1.02	160	1.04	151	1.10	557	528.47	1.05	1.77
Esophagus	4	1.26	5	0.46	8	0.96	6	0.90	23	29.13	0.79	-0.38
Stomach	6	1.20	16	0.90	16	1.12	11	0.88	49	49.45	0.99	-0.03
Small intestine	2	2.47	4	1.37	4	1.68	3	1.43	13	8.20	1.59	0.30
Colon	22	1.03	90	1.13	81	1.19	83	1.29*	276	232.99	1.18*	2.66
Rectum, rectosigmoid junction	12	1.18	38	1.07	29	1.05	16	0.72	95	95.68	0.99	-0.04
Anus, anal canal	0	0.00	4	1.86	1	0.61	1	0.77	6	5.71	1.05	0.02
Liver	2	1.01	6	0.86	7	1.24	4	0.82	19	19.54	0.97	-0.03
Gallbladder	0	0.00	1	0.44	0	0.00	2	1.07	3	6.74	0.45	-0.23
Bile ducts, other biliary	1	1.02	3	0.82	2	0.63	4	1.20	10	11.15	0.90	-0.07
Pancreas	6	0.96	22	0.97	11	0.59	20	1.18	59	64.51	0.91	-0.34
<b>Respiratory system</b>	74	1.45*	262	1.45*	199	1.42*	145	1.30*	680	483.01	1.41*	12.19
Nose, nasal cavity, ear	0	0.00	2	1.43	5	4.79*	1	1.16	8	3.73	2.14	0.26
Larynx	5	1.22	18	1.34	12	1.31	4	0.67	39	32.61	1.20	0.40
Lung, bronchus	69	1.49*	242	1.47*	182	1.40*	140	1.34*	633	445.56	1.42*	11.60
<b>Female breast</b>	22	0.68	100	0.88	66	0.75*	64	0.89	252	305.38	0.83*	-6.76
<b>Female genital system</b>	8	0.51*	48	0.90	32	0.83	30	1.02	118	137.29	0.86	-2.44
Cervix uteri	0	0.00	2	0.37	1	0.29	1	0.45	4	12.81	0.31*	-1.12
Corpus uteri	2	0.23*	27	0.91	18	0.85	18	1.16	65	75.01	0.87	-1.27
Ovary	5	1.14	15	0.99	8	0.70	10	1.10	38	39.96	0.95	-0.25
Vagina	1	5.74	2	3.24	2	3.92	1	2.13	6	1.77	3.39*	0.54
Vulva	0	0.00	1	0.61	3	2.06	0	0.00	4	5.07	0.79	-0.14
<b>Male genital system</b>	36	0.79	161	0.91	139	0.89	131	0.97	467	513.21	0.91*	-5.59
Prostate	35	0.78	160	0.91	138	0.89	131	0.98	464	508.89	0.91*	-5.43
Testis	0	0.00	1	1.50	0	0.00	0	0.00	1	1.40	0.71	-0.05
<b>Urinary system</b>	43	2.18*	84	1.18	97	1.66*	92	1.79*	316	200.68	1.57*	7.14
Urinary bladder	14	1.10	58	1.24	68	1.74*	72	2.02*	212	134.26	1.58*	4.81
Kidney parenchyma	29	4.97*	24	1.18	27	1.72*	14	1.11	94	54.42	1.73*	2.45
Renal pelvis, other urinary	0	0.00	2	0.47	2	0.57	6	1.92	10	12.00	0.83	-0.12
Ureter	0	0.00	0	0.00	0	0.00	2	1.93	2	3.97	0.50	-0.12
<b>Bone, joints</b>	0	0.00	1	1.16	3	4.81	2	4.28	6	2.21	2.72	0.23
<b>Soft tissue including heart</b>	0	0.00	7	2.00	6	2.23	3	1.26	16	9.59	1.67	0.40
<b>Kaposi sarcoma</b>	9	33.81*	4	5.15*	2	4.27	1	2.73	16	1.88	8.52*	0.87
<b>Melanoma of skin</b>	8	1.18	39	1.68*	31	1.78*	21	1.45	99	61.83	1.60*	2.30
<b>Eye, orbit</b>	1	2.28	1	0.67	0	0.00	0	0.00	2	3.87	0.52	-0.12
<b>Brain, central nervous system</b>	7	2.15	11	1.00	5	0.62	11	1.80	34	28.41	1.20	0.35
<b>Thyroid</b>	5	2.67	4	0.67	4	1.01	3	1.10	16	14.54	1.10	0.09
<b>Lymphatic, hematopoietic</b>	22	1.21	87	1.33*	84	1.56*	54	1.10	247	186.37	1.33*	3.75
Hodgkin lymphoma	1	1.37	14	6.04*	6	3.82*	8	7.01*	29	5.76	5.04*	1.44
Non-Hodgkin lymphoma	10	1.16	28	0.90	28	1.10	27	1.16	93	88.34	1.05	0.29
Myeloma	1	0.33	3	0.27*	6	0.65	5	0.60	15	31.62	0.47*	-1.03
Leukemia	10	1.72	42	1.98*	44	2.51*	14	0.87	110	60.65	1.81*	3.05
Acute lymphocytic	1	5.32	0	0.00	1	2.05	0	0.00	2	1.71	1.17	0.02
Chronic lymphocytic	1	0.41	7	0.79	3	0.41	2	0.31	13	25.07	0.52*	-0.75
Acute non-lymphocytic	4	2.12	30	4.29*	33	5.53*	9	1.58	76	20.57	3.70*	3.43
Chronic myeloid	2	2.57	3	1.09	4	1.77	2	0.93	11	7.94	1.39	0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 78,918 PYR and for male cancers on 82,637 PYR.

**Table 16.2.9:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	326	0.81*	948	0.94	478	1.08	144	1.06	1,896	1,989.70	0.95*	-11.62
All excluding same site	318	0.82*	923	0.95	464	1.09	139	1.07	1,844	1,918.01	0.96	-9.17
<b>Buccal cavity, pharynx</b>	11	1.33	27	1.36	13	1.59	3	1.24	54	38.64	1.40*	1.90
Lip	3	1.94	5	1.35	3	1.91	2	4.24	13	7.29	1.78	0.71
Tongue	1	0.64	6	1.61	1	0.66	0	0.00	8	7.23	1.11	0.09
Salivary gland	2	2.26	3	1.33	3	2.82	1	2.65	9	4.58	1.96	0.55
Mouth	3	1.34	8	1.47	4	1.73	0	0.00	15	10.75	1.40	0.53
Nasopharynx	0	0.00	1	1.68	2	8.54	0	0.00	3	1.15	2.60	0.23
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	2.47	0.00	-0.31
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.86	0.00	-0.11
Hypopharynx	2	2.82	3	1.86	0	0.00	0	0.00	5	3.00	1.66	0.25
<b>Digestive system</b>	82	0.82	247	0.97	119	1.01	42	1.08	490	510.86	0.96	-2.59
Esophagus	4	1.03	5	0.52	5	1.23	2	1.60	16	18.79	0.85	-0.35
Stomach	9	0.89	29	1.15	20	1.76*	4	1.06	62	50.44	1.23	1.43
Small intestine	1	0.82	1	0.32	2	1.41	0	0.00	4	6.21	0.64	-0.27
Colon	44	0.91	125	1.00	56	0.95	24	1.20	249	251.86	0.99	-0.35
Rectum, rectosigmoid junction	10	0.63	43	1.09	13	0.76	6	1.15	72	77.67	0.93	-0.70
Anus, anal canal	0	0.00	1	0.51	0	0.00	0	0.00	1	3.91	0.26	-0.36
Liver	5	1.72	4	0.55	4	1.27	1	1.07	14	14.25	0.98	-0.03
Gallbladder	1	0.61	2	0.48	2	1.04	0	0.00	5	8.39	0.60	-0.42
Bile ducts, other biliary	1	0.43	8	1.32	2	0.66	2	1.79	13	12.56	1.04	0.06
Pancreas	5	0.41*	28	0.91	14	0.99	3	0.62	50	61.74	0.81	-1.46
<b>Respiratory system</b>	56	0.89	143	0.93	77	1.23	16	0.96	292	295.56	0.99	-0.44
Nose, nasal cavity, ear	1	1.80	0	0.00	0	0.00	0	0.00	1	2.82	0.35	-0.23
Larynx	6	1.87	5	0.67	4	1.49	0	0.00	15	13.96	1.07	0.13
Lung, bronchus	49	0.83	138	0.96	73	1.23	16	1.01	276	278.04	0.99	-0.25
<b>Female breast</b>	17	0.41*	88	0.82	58	1.17	21	1.29	184	214.23	0.86*	-6.36
<b>Female genital system</b>	18	1.01	36	0.80	17	0.86	11	1.71	82	89.03	0.92	-1.48
Cervix uteri	1	0.64	1	0.26	1	0.63	2	3.94	5	7.43	0.67	-0.51
Corpus uteri	7	0.80	20	0.91	7	0.76	6	2.22	40	42.56	0.94	-0.54
Ovary	7	1.29	11	0.79	6	0.94	0	0.00	24	27.91	0.86	-0.82
Vagina	1	2.85	0	0.00	0	0.00	0	0.00	1	1.88	0.53	-0.18
Vulva	2	1.70	4	1.26	3	1.81	2	2.96	11	6.69	1.65	0.91
<b>Male genital system</b>	53	0.68*	176	0.93	75	0.99	16	0.85	320	361.22	0.89*	-12.45
Prostate	53	0.68*	174	0.93	75	1.00	16	0.85	318	358.47	0.89*	-12.23
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.10
<b>Urinary system</b>	40	1.22	69	0.84	37	1.01	11	0.98	157	162.88	0.96	-0.73
Urinary bladder	19	0.80	50	0.84	27	1.01	11	1.33	107	118.33	0.90	-1.40
Kidney parenchyma	20	2.89*	14	0.81	8	1.09	0	0.00	42	33.58	1.25	1.04
Renal pelvis, other urinary	1	0.45	5	0.90	2	0.82	0	0.00	8	10.97	0.73	-0.37
Ureter	0	0.00	1	0.54	2	2.48	0	0.00	3	3.67	0.82	-0.08
<b>Bone, joints</b>	1	3.31	0	0.00	0	0.00	0	0.00	1	1.45	0.69	-0.06
<b>Soft tissue including heart</b>	0	0.00	3	0.78	3	1.66	1	1.64	7	7.79	0.90	-0.10
<b>Kaposi sarcoma</b>	1	3.21	0	0.00	1	2.39	0	0.00	2	1.71	1.17	0.04
<b>Melanoma of skin</b>	10	1.39	29	1.57*	10	1.18	1	0.35	50	37.01	1.35*	1.61
<b>Eye, orbit</b>	1	1.86	1	0.76	1	1.79	0	0.00	3	2.58	1.16	0.05
<b>Brain, central nervous system</b>	0	0.00	8	0.95	3	0.86	1	1.04	12	16.22	0.74	-0.52
<b>Thyroid</b>	5	3.51*	3	0.87	1	0.70	0	0.00	9	6.74	1.34	0.28
<b>Lymphatic, hematopoietic</b>	21	0.66	77	0.95	44	1.17	11	0.90	153	162.75	0.94	-1.21
Hodgkin lymphoma	1	1.34	7	3.88*	3	4.04	1	4.87	12	3.50	3.43*	1.05
Non-Hodgkin lymphoma	8	0.57	25	0.70	14	0.84	5	0.94	52	71.69	0.73*	-2.44
Myeloma	3	0.55	9	0.64	4	0.63	1	0.50	17	27.78	0.61*	-1.34
Leukemia	9	0.77	36	1.21	23	1.67*	4	0.86	72	59.78	1.20	1.52
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.39	0.00	-0.17
Chronic lymphocytic	1	0.22	3	0.26*	2	0.38	2	1.13	8	23.35	0.34*	-1.90
Acute non-lymphocytic	5	1.25	18	1.76*	13	2.76*	1	0.64	37	20.47	1.81*	2.05
Chronic myeloid	2	1.28	8	1.98	4	2.08	0	0.00	14	8.19	1.71	0.72

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 47,561 PYR and for male cancers on 33,100 PYR.

## Non-Hodgkin Lymphoma Both Sexes, Radiotherapy

**Table 16.2.10:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	202	1.13	583	1.07	452	1.19*	439	1.30*	1,676	1,441.52	1.16*	21.49
All excluding same site	192	1.11	563	1.07	434	1.19*	417	1.28*	1,606	1,390.23	1.16*	19.78
<b>Buccal cavity, pharynx</b>	6	1.28	13	0.92	14	1.50	14	1.82	47	35.77	1.31	1.03
Lip	1	1.40	3	1.45	2	1.51	3	2.78	9	5.18	1.74	0.35
Tongue	0	0.00	0	0.00	4	2.09	2	1.24	6	7.31	0.82	-0.12
Salivary gland	0	0.00	0	0.00	2	2.35	3	3.87	5	3.27	1.53	0.16
Mouth	3	2.38	5	1.32	2	0.80	3	1.49	13	9.55	1.36	0.32
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.48	0.00	-0.14
Tonsil	1	2.28	1	0.76	1	1.16	2	2.83	5	3.32	1.50	0.15
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.09
Hypopharynx	0	0.00	3	2.20	2	2.23	0	0.00	5	3.43	1.46	0.14
<b>Digestive system</b>	32	0.79	124	1.02	80	0.96	87	1.21	323	317.92	1.02	0.47
Esophagus	0	0.00	1	0.18*	3	0.78	6	1.73	10	14.76	0.68	-0.44
Stomach	4	0.97	16	1.33	11	1.38	8	1.19	39	30.91	1.26	0.74
Small intestine	2	3.69	2	1.19	2	1.67	3	2.71	9	4.52	1.99	0.41
Colon	13	0.70	54	0.97	36	0.93	42	1.26	145	146.30	0.99	-0.12
Rectum, rectosigmoid junction	3	0.42	25	1.19	15	1.06	9	0.76	52	54.09	0.96	-0.19
Anus, anal canal	0	0.00	2	1.67	0	0.00	2	2.74	4	3.15	1.27	0.08
Liver	5	3.78*	3	0.75	2	0.72	0	0.00	10	10.72	0.93	-0.07
Gallbladder	0	0.00	2	1.10	0	0.00	1	1.03	3	4.62	0.65	-0.15
Bile ducts, other biliary	1	1.14	3	1.13	2	1.06	3	1.70	9	7.18	1.25	0.17
Pancreas	4	0.82	15	1.02	8	0.79	13	1.48	40	38.43	1.04	0.14
<b>Respiratory system</b>	32	1.07	108	1.18	94	1.48*	76	1.37*	310	240.31	1.29*	6.39
Nose, nasal cavity, ear	1	3.68	0	0.00	0	0.00	1	2.10	2	2.12	0.94	-0.01
Larynx	5	2.54	7	1.18	6	1.53	1	0.31	19	15.04	1.26	0.36
Lung, bronchus	26	0.95	101	1.19	88	1.50*	74	1.44*	289	222.52	1.30*	6.09
<b>Female breast</b>	13	0.61	70	1.06	45	0.96	49	1.25	177	173.73	1.02	0.62
<b>Female genital system</b>	10	1.01	24	0.81	22	1.09	22	1.37	78	75.88	1.03	0.40
Cervix uteri	0	0.00	2	0.60	0	0.00	2	1.27	4	8.13	0.49	-0.78
Corpus uteri	5	0.99	14	0.92	14	1.37	12	1.50	45	38.53	1.17	1.22
Ovary	3	1.05	6	0.69	5	0.82	7	1.41	21	22.69	0.93	-0.32
Vagina	1	6.75	0	0.00	1	3.27	1	4.02	3	1.15	2.61	0.35
Vulva	1	2.20	1	0.72	2	2.01	0	0.00	4	3.68	1.09	0.06
<b>Male genital system</b>	28	0.93	82	0.87	75	1.12	55	0.83	240	257.09	0.93	-3.04
Prostate	28	0.95	81	0.88	74	1.13	55	0.84	238	253.29	0.94	-2.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.13	0.00	-0.38
<b>Urinary system</b>	21	1.53	33	0.79	35	1.20	52	1.96*	141	111.35	1.27*	2.72
Urinary bladder	8	0.85	22	0.77	21	1.06	41	2.25*	92	76.25	1.21	1.44
Kidney parenchyma	13	3.82*	10	0.95	12	1.62	8	1.18	43	28.14	1.53*	1.36
Renal pelvis, other urinary	0	0.00	1	0.37	2	1.10	3	1.92	6	6.96	0.86	-0.09
Ureter	0	0.00	0	0.00	1	1.66	2	3.91	3	2.30	1.30	0.06
<b>Bone, joints</b>	0	0.00	3	5.68*	3	8.43*	4	13.36*	10	1.36	7.35*	0.79
<b>Soft tissue including heart</b>	0	0.00	1	0.45	6	3.94*	2	1.45	9	5.84	1.54	0.29
<b>Kaposi sarcoma</b>	22	60.44*	6	5.85*	1	1.38	1	1.64	30	2.72	11.01*	2.50
<b>Melanoma of skin</b>	8	1.97	26	2.03*	10	1.09	15	1.71	59	34.89	1.69*	2.21
<b>Eye, orbit</b>	0	0.00	1	1.21	1	1.80	0	0.00	2	2.13	0.94	-0.01
<b>Brain, central nervous system</b>	4	2.08	5	0.85	2	0.49	6	1.74	17	15.31	1.11	0.16
<b>Thyroid</b>	6	5.27*	7	2.02	3	1.28	1	0.49	17	8.97	1.89*	0.74
<b>Lymphatic, hematopoietic</b>	14	1.02	55	1.32	40	1.37	36	1.38	145	110.60	1.31*	3.15
Hodgkin lymphoma	0	0.00	7	4.52*	4	3.92*	5	5.95*	16	3.95	4.06*	1.11
Non-Hodgkin lymphoma	10	1.62	20	1.05	18	1.32	22	1.77*	70	51.29	1.36*	1.72
Myeloma	1	0.45	3	0.44	2	0.42	2	0.47	8	18.00	0.44*	-0.92
Leukemia	3	0.63	25	1.76*	16	1.64	7	0.81	51	37.37	1.36*	1.25
Acute lymphocytic	0	0.00	0	0.00	1	3.28	0	0.00	1	1.15	0.87	-0.01
Chronic lymphocytic	0	0.00	2	0.36	2	0.52	0	0.00	4	14.70	0.27*	-0.98
Acute non-lymphocytic	2	1.25	16	3.31*	10	2.99*	6	2.01	34	12.76	2.67*	1.95
Chronic myeloid	0	0.00	3	1.55	3	2.26	0	0.00	6	5.10	1.18	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 52,891 PYR and for male cancers on 56,202 PYR.

**Table 16.2.11:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	541	1.06	1,608	1.07*	1,096	1.18*	756	1.23*	4,001	3,554.57	1.13*	18.33
All excluding same site	527	1.07	1,561	1.08*	1,062	1.19*	734	1.25*	3,884	3,428.29	1.13*	18.71
<b>Buccal cavity, pharynx</b>	18	1.38	43	1.15	37	1.69*	25	1.87*	123	85.76	1.43*	1.53
Lip	4	2.03	6	1.09	9	2.89*	3	1.62	22	12.42	1.77*	0.39
Tongue	1	0.38	14	1.84*	7	1.55	7	2.49	29	17.54	1.65*	0.47
Salivary gland	3	2.60	6	1.77	5	2.39	3	2.14	17	8.04	2.11*	0.37
Mouth	6	1.73	9	0.90	11	1.89	6	1.69	32	22.86	1.40	0.38
Nasopharynx	0	0.00	4	2.75	2	2.41	2	4.04	8	3.29	2.43*	0.19
Tonsil	1	0.82	1	0.28	1	0.50	3	2.49	6	7.96	0.75	-0.08
Oropharynx	1	2.78	0	0.00	0	0.00	0	0.00	1	2.37	0.42	-0.06
Hypopharynx	2	1.57	2	0.55	2	0.96	1	0.83	7	8.23	0.85	-0.05
<b>Digestive system</b>	107	0.94	331	1.00	216	1.07	151	1.14	805	779.44	1.03	1.05
Esophagus	8	1.48	10	0.64	10	1.05	7	1.13	35	36.89	0.95	-0.08
Stomach	12	1.06	30	0.93	26	1.37	13	1.09	81	74.46	1.09	0.27
Small intestine	1	0.63	4	0.85	5	1.68	1	0.49	11	11.31	0.97	-0.01
Colon	53	1.01	168	1.10	105	1.12	81	1.31*	407	360.75	1.13*	1.90
Rectum, rectosigmoid junction	19	0.97	59	1.04	32	0.95	18	0.85	128	130.98	0.98	-0.12
Anus, anal canal	0	0.00	7	2.16	2	1.00	0	0.00	9	7.70	1.17	0.05
Liver	2	0.53	8	0.73	9	1.33	6	1.32	25	25.99	0.96	-0.04
Gallbladder	1	0.60	1	0.21	2	0.70	1	0.55	5	11.07	0.45	-0.25
Bile ducts, other biliary	1	0.40	8	1.09	4	0.86	6	1.83	19	17.70	1.07	0.05
Pancreas	7	0.51	35	0.87	20	0.82	17	1.04	79	94.55	0.84	-0.64
<b>Respiratory system</b>	103	1.19	317	1.25*	218	1.42*	146	1.47*	784	592.77	1.32*	7.85
Nose, nasal cavity, ear	0	0.00	3	1.37	5	3.77*	1	1.17	9	5.12	1.76	0.16
Larynx	6	1.07	17	1.06	13	1.40	5	0.91	41	36.42	1.13	0.19
Lung, bronchus	97	1.22	297	1.27*	200	1.40*	140	1.51*	734	549.75	1.34*	7.56
<b>Female breast</b>	32	0.56*	123	0.71*	100	0.91	73	0.96	328	417.91	0.78*	-7.56
<b>Female genital system</b>	20	0.78	68	0.89	42	0.91	36	1.17	166	179.19	0.93	-1.11
Cervix uteri	3	1.07	4	0.49	3	0.65	4	1.44	14	18.32	0.76	-0.36
Corpus uteri	6	0.46*	35	0.90	19	0.81	20	1.29	80	91.09	0.88	-0.93
Ovary	9	1.19	23	1.01	10	0.71	7	0.73	49	54.02	0.91	-0.42
Vagina	1	2.54	2	1.71	2	2.77	1	2.04	6	2.77	2.16	0.27
Vulva	1	0.82	4	1.10	8	3.41*	3	1.76	16	8.92	1.79*	0.60
<b>Male genital system</b>	61	0.64*	263	0.95	151	0.87	113	0.98	588	661.97	0.89*	-5.93
Prostate	60	0.64*	257	0.94	148	0.86	113	1.00	578	653.68	0.88*	-6.07
Testis	0	0.00	3	1.60	2	1.96	0	0.00	5	4.18	1.19	0.07
<b>Urinary system</b>	70	1.74*	126	1.07	112	1.55*	84	1.76*	392	277.04	1.41*	4.72
Urinary bladder	26	0.94	89	1.11	83	1.68*	64	1.96*	262	190.33	1.38*	2.94
Kidney parenchyma	43	4.33*	29	0.99	27	1.48	15	1.23	114	69.67	1.64*	1.82
Renal pelvis, other urinary	1	0.39	8	1.10	2	0.46	5	1.77	16	17.04	0.94	-0.04
Ureter	0	0.00	1	0.41	1	0.70	0	0.00	2	5.61	0.36	-0.15
<b>Bone, joints</b>	2	4.23	2	1.46	2	2.46	0	0.00	6	3.17	1.89	0.12
<b>Soft tissue including heart</b>	0	0.00	11	1.84	5	1.36	2	0.80	18	14.18	1.27	0.16
<b>Kaposi sarcoma</b>	42	43.88*	30	11.25*	9	5.86*	2	2.24	83	6.05	13.71*	3.16
<b>Melanoma of skin</b>	14	1.19	58	1.64*	43	1.92*	15	0.96	130	85.18	1.53*	1.84
<b>Eye, orbit</b>	2	2.63	1	0.45	1	0.76	0	0.00	4	5.12	0.78	-0.05
<b>Brain, central nervous system</b>	5	0.93	17	1.08	6	0.64	10	1.65	38	36.60	1.04	0.06
<b>Thyroid</b>	6	2.03	7	0.80	5	0.95	3	0.87	21	20.44	1.03	0.02
<b>Lymphatic, hematopoietic</b>	38	0.98	145	1.27*	113	1.59*	59	1.23	355	272.19	1.30*	3.40
Hodgkin lymphoma	3	2.20	22	5.67*	8	3.59*	12	8.78*	45	8.84	5.09*	1.48
Non-Hodgkin lymphoma	14	0.79	47	0.89	34	1.03	22	0.96	117	126.28	0.93	-0.38
Myeloma	3	0.46	10	0.53*	9	0.77	5	0.64	27	45.05	0.60*	-0.74
Leukemia	18	1.34	66	1.69*	62	2.60*	20	1.27	166	92.02	1.80*	3.04
Acute lymphocytic	1	2.49	0	0.00	1	1.43	0	0.00	2	2.71	0.74	-0.03
Chronic lymphocytic	2	0.38	9	0.58	5	0.53	5	0.81	21	36.43	0.58*	-0.63
Acute non-lymphocytic	9	1.99	43	3.25*	44	5.41*	12	2.19*	108	31.38	3.44*	3.15
Chronic myeloid	4	2.19	8	1.51	5	1.54	2	0.92	19	12.53	1.52	0.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 118,953 PYR and for male cancers on 124,649 PYR.



## Non-Hodgkin Lymphoma

### Both Sexes, Long-term Follow-up, Radiotherapy

**Table 16.2.12:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, long-term follow-up, with initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	21,024		4,008		1,901		794		21,024			
<b>Person-years in interval</b>	85,959		14,293		6,366		2,474		109,093			
<b>All subsequent cancers</b>	1,237	1.12*	260	1.28*	122	1.28*	57	1.46*	1,676	1,441.52	1.16*	21.49
All excluding same site	1,189	1.12*	244	1.25*	117	1.28*	56	1.49*	1,606	1,390.23	1.16*	19.78
<b>Buccal cavity, pharynx</b>	33	1.17	10	2.11*	4	1.90	0	0.00	47	35.77	1.31	1.03
Lip	6	1.46	3	4.51	0	0.00	0	0.00	9	5.18	1.74	0.35
Tongue	4	0.70	2	2.03	0	0.00	0	0.00	6	7.31	0.82	-0.12
Salivary gland	2	0.80	1	2.15	2	9.19*	0	0.00	5	3.27	1.53	0.16
Mouth	10	1.33	3	2.40	0	0.00	0	0.00	13	9.55	1.36	0.32
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.48	0.00	-0.14
Tonsil	3	1.15	0	0.00	2	10.22*	0	0.00	5	3.32	1.50	0.15
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.09
Hypopharynx	5	1.84	0	0.00	0	0.00	0	0.00	5	3.43	1.46	0.14
<b>Digestive system</b>	236	0.96	41	0.93	30	1.51*	16	1.95*	323	317.92	1.02	0.47
Esophagus	4	0.35*	4	1.93	2	2.05	0	0.00	10	14.76	0.68	-0.44
Stomach	31	1.28	4	0.97	4	2.17	0	0.00	39	30.91	1.26	0.74
Small intestine	6	1.76	1	1.52	2	6.36	0	0.00	9	4.52	1.99	0.41
Colon	103	0.91	20	0.98	12	1.30	10	2.65*	145	146.30	0.99	-0.12
Rectum, rectosigmoid junction	43	1.02	4	0.55	2	0.62	3	2.29	52	54.09	0.96	-0.19
Anus, anal canal	2	0.83	0	0.00	2	9.77*	0	0.00	4	3.15	1.27	0.08
Liver	10	1.23	0	0.00	0	0.00	0	0.00	10	10.72	0.93	-0.07
Gallbladder	2	0.55	1	1.66	0	0.00	0	0.00	3	4.62	0.65	-0.15
Bile ducts, other biliary	6	1.11	2	1.92	1	1.99	0	0.00	9	7.18	1.25	0.17
Pancreas	27	0.91	5	0.94	5	2.05	3	2.98	40	38.43	1.04	0.14
<b>Respiratory system</b>	234	1.27*	38	1.13	30	1.94*	8	1.26	310	240.31	1.29*	6.39
Nose, nasal cavity, ear	1	0.61	0	0.00	1	7.58	0	0.00	2	2.12	0.94	-0.01
Larynx	18	1.53	0	0.00	1	1.13	0	0.00	19	15.04	1.26	0.36
Lung, bronchus	215	1.26*	38	1.22	28	1.94*	8	1.35	289	222.52	1.30*	6.09
<b>Female breast</b>	128	0.95	32	1.33	11	1.02	6	1.39	177	173.73	1.02	0.62
<b>Female genital system</b>	56	0.94	17	1.71	4	0.92	1	0.59	78	75.88	1.03	0.40
Cervix uteri	2	0.31	2	2.01	0	0.00	0	0.00	4	8.13	0.49	-0.78
Corpus uteri	33	1.08	10	2.01	1	0.46	1	1.17	45	38.53	1.17	1.22
Ovary	14	0.79	5	1.63	2	1.47	0	0.00	21	22.69	0.93	-0.32
Vagina	2	2.23	0	0.00	1	14.78	0	0.00	3	1.15	2.61	0.35
Vulva	4	1.41	0	0.00	0	0.00	0	0.00	4	3.68	1.09	0.06
<b>Male genital system</b>	185	0.97	33	0.85	13	0.66	9	1.13	240	257.09	0.93	-3.04
Prostate	183	0.97	33	0.86	13	0.67	9	1.15	238	253.29	0.94	-2.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	2.13	0.00	-0.38
<b>Urinary system</b>	89	1.05	33	2.09*	10	1.33	9	2.79*	141	111.35	1.27*	2.72
Urinary bladder	51	0.88	26	2.40*	8	1.55	7	3.14*	92	76.25	1.21	1.44
Kidney parenchyma	35	1.64*	5	1.24	2	1.04	1	1.23	43	28.14	1.53*	1.36
Renal pelvis, other urinary	3	0.56	2	2.12	0	0.00	1	5.52	6	6.96	0.86	-0.09
Ureter	1	0.56	2	6.40	0	0.00	0	0.00	3	2.30	1.30	0.06
<b>Bone, joints</b>	6	5.65*	2	10.97*	1	12.05	1	29.37	10	1.36	7.35*	0.79
<b>Soft tissue including heart</b>	7	1.57	0	0.00	2	5.12	0	0.00	9	5.84	1.54	0.29
<b>Kaposi sarcoma</b>	29	13.72*	1	2.50	0	0.00	0	0.00	30	2.72	11.01*	2.50
<b>Melanoma of skin</b>	44	1.69*	11	2.15*	2	0.79	2	1.74	59	34.89	1.69*	2.21
<b>Eye, orbit</b>	2	1.20	0	0.00	0	0.00	0	0.00	2	2.13	0.94	-0.01
<b>Brain, central nervous system</b>	11	0.93	3	1.43	2	2.10	1	2.56	17	15.31	1.11	0.16
<b>Thyroid</b>	16	2.30*	1	0.82	0	0.00	0	0.00	17	8.97	1.89*	0.74
<b>Lymphatic, hematopoietic</b>	109	1.29*	26	1.66*	7	0.95	3	0.97	145	110.60	1.31*	3.15
Hodgkin lymphoma	11	3.54*	3	5.77*	1	4.31	1	11.29	16	3.95	4.06*	1.11
Non-Hodgkin lymphoma	48	1.24	16	2.16*	5	1.42	1	0.66	70	51.29	1.36*	1.72
Myeloma	6	0.44*	2	0.78	0	0.00	0	0.00	8	18.00	0.44*	-0.92
Leukemia	44	1.53*	5	0.96	1	0.41	1	1.00	51	37.37	1.36*	1.25
Acute lymphocytic	1	1.12	0	0.00	0	0.00	0	0.00	1	1.15	0.87	-0.01
Chronic lymphocytic	4	0.35*	0	0.00	0	0.00	0	0.00	4	14.70	0.27*	-0.98
Acute non-lymphocytic	28	2.87*	4	2.24	1	1.19	1	2.78	34	12.76	2.67*	1.95
Chronic myeloid	6	1.53	0	0.00	0	0.00	0	0.00	6	5.10	1.18	0.08

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 52,891 PYR and for male cancers on 56,202 PYR.

## Non-Hodgkin Lymphoma Both Sexes, Long-term Follow-up, No Radiotherapy

**Table 16.2.13:** Risk of subsequent primary cancers after non-Hodgkin lymphoma, both sexes, long-term follow-up, without initial radiotherapy, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	3,245	1.10*	503	1.23*	185	1.18*	68	1.45*	4,001	3,554.57	1.13*	18.33
All excluding same site	3,150	1.11*	488	1.24*	181	1.20*	65	1.44*	3,884	3,428.29	1.13*	18.71
<b>Buccal cavity, pharynx</b>	98	1.35*	18	1.98*	7	2.11	0	0.00	123	85.76	1.43*	1.53
Lip	19	1.80*	3	2.37	0	0.00	0	0.00	22	12.42	1.77*	0.39
Tongue	22	1.49	4	2.11	3	4.27	0	0.00	29	17.54	1.65*	0.47
Salivary gland	14	2.11*	1	1.08	2	5.51	0	0.00	17	8.04	2.11*	0.37
Mouth	26	1.35	5	2.07	1	1.13	0	0.00	32	22.86	1.40	0.38
Nasopharynx	6	2.15	1	2.96	1	8.26	0	0.00	8	3.29	2.43*	0.19
Tonsil	3	0.44	3	3.63	0	0.00	0	0.00	6	7.96	0.75	-0.08
Oropharynx	1	0.50	0	0.00	0	0.00	0	0.00	1	2.37	0.42	-0.06
Hypopharynx	6	0.85	1	1.20	0	0.00	0	0.00	7	8.23	0.85	-0.05
<b>Digestive system</b>	654	1.01	96	1.09	42	1.24	13	1.25	805	779.44	1.03	1.05
Esophagus	28	0.91	6	1.44	1	0.63	0	0.00	35	36.89	0.95	-0.08
Stomach	68	1.09	9	1.12	3	0.99	1	1.11	81	74.46	1.09	0.27
Small intestine	10	1.08	1	0.74	0	0.00	0	0.00	11	11.31	0.97	-0.01
Colon	326	1.09	51	1.24	25	1.56*	5	1.02	407	360.75	1.13*	1.90
Rectum, rectosigmoid junction	110	1.00	8	0.56	5	0.94	5	3.14*	128	130.98	0.98	-0.12
Anus, anal canal	9	1.42	0	0.00	0	0.00	0	0.00	9	7.70	1.17	0.05
Liver	19	0.89	6	2.00	0	0.00	0	0.00	25	25.99	0.96	-0.04
Gallbladder	4	0.43	1	0.82	0	0.00	0	0.00	5	11.07	0.45	-0.25
Bile ducts, other biliary	13	0.90	3	1.41	2	2.30	1	3.60	19	17.70	1.07	0.05
Pancreas	62	0.79	11	1.02	5	1.19	1	0.77	79	94.55	0.84	-0.64
<b>Respiratory system</b>	638	1.29*	103	1.55*	28	1.10	15	2.00*	784	592.77	1.32*	7.85
Nose, nasal cavity, ear	8	1.88	1	1.76	0	0.00	0	0.00	9	5.12	1.76	0.16
Larynx	36	1.16	2	0.53	2	1.51	1	2.75	41	36.42	1.13	0.19
Lung, bronchus	594	1.30*	100	1.61*	26	1.09	14	1.99*	734	549.75	1.34*	7.56
<b>Female breast</b>	255	0.75*	42	0.84	27	1.35	4	0.63	328	417.91	0.78*	-7.56
<b>Female genital system</b>	130	0.88	25	1.23	7	0.87	4	1.59	166	179.19	0.93	-1.11
Cervix uteri	10	0.64	2	1.07	2	2.91	0	0.00	14	18.32	0.76	-0.36
Corpus uteri	60	0.79	14	1.37	4	0.99	2	1.58	80	91.09	0.88	-0.93
Ovary	42	0.95	4	0.63	1	0.40	2	2.53	49	54.02	0.91	-0.42
Vagina	5	2.19	1	3.12	0	0.00	0	0.00	6	2.77	2.16	0.27
Vulva	13	1.80	3	2.74	0	0.00	0	0.00	16	8.92	1.79*	0.60
<b>Male genital system</b>	475	0.87*	76	0.98	29	0.99	8	1.04	588	661.97	0.89*	-5.93
Prostate	465	0.86*	76	0.99	29	1.00	8	1.05	578	653.68	0.88*	-6.07
Testis	5	1.40	0	0.00	0	0.00	0	0.00	5	4.18	1.19	0.07
<b>Urinary system</b>	308	1.34*	49	1.55*	24	1.96*	11	2.98*	392	277.04	1.41*	4.72
Urinary bladder	198	1.26*	36	1.66*	19	2.26*	9	3.56*	262	190.33	1.38*	2.94
Kidney parenchyma	99	1.72*	11	1.36	3	0.96	1	1.06	114	69.67	1.64*	1.82
Renal pelvis, other urinary	11	0.77	2	1.06	2	2.76	1	4.57	16	17.04	0.94	-0.04
Ureter	2	0.43	0	0.00	0	0.00	0	0.00	2	5.61	0.36	-0.15
<b>Bone, joints</b>	6	2.26	0	0.00	0	0.00	0	0.00	6	3.17	1.89	0.12
<b>Soft tissue including heart</b>	16	1.37	1	0.61	0	0.00	1	4.97	18	14.18	1.27	0.16
<b>Kaposi sarcoma</b>	81	15.70*	2	3.19	0	0.00	0	0.00	83	6.05	13.71*	3.16
<b>Melanoma of skin</b>	115	1.65*	11	1.07	2	0.49	2	1.55	130	85.18	1.53*	1.84
<b>Eye, orbit</b>	4	0.94	0	0.00	0	0.00	0	0.00	4	5.12	0.78	-0.05
<b>Brain, central nervous system</b>	28	0.92	6	1.47	3	1.95	1	2.18	38	36.60	1.04	0.06
<b>Thyroid</b>	18	1.06	3	1.31	0	0.00	0	0.00	21	20.44	1.03	0.02
<b>Lymphatic, hematopoietic</b>	296	1.32*	43	1.36	9	0.73	7	1.84	355	272.19	1.30*	3.40
Hodgkin lymphoma	33	4.41*	8	8.63*	2	5.88	2	20.23*	45	8.84	5.09*	1.48
Non-Hodgkin lymphoma	95	0.92	15	1.00	4	0.67	3	1.61	117	126.28	0.93	-0.38
Myeloma	22	0.59*	3	0.58	1	0.49	1	1.63	27	45.05	0.60*	-0.74
Leukemia	146	1.91*	17	1.63	2	0.49	1	0.81	166	92.02	1.80*	3.04
Acute lymphocytic	2	0.88	0	0.00	0	0.00	0	0.00	2	2.71	0.74	-0.03
Chronic lymphocytic	16	0.53*	3	0.73	1	0.64	1	2.14	21	36.43	0.58*	-0.63
Acute non-lymphocytic	96	3.71*	11	3.05*	1	0.70	0	0.00	108	31.38	3.44*	3.15
Chronic myeloid	17	1.64	2	1.39	0	0.00	0	0.00	19	12.53	1.52	0.27

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 118,953 PYR and for male cancers on 124,649 PYR.

## Myeloma Both Sexes

**Table 16.3.1:** Characteristics of patients with an initial myeloma, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	12,419	100.0	11,419	100.0	23,838	100.0
<b>Initial treatment</b>						
Any radiation	3,852	31.0	3,193	28.0	7,045	29.6
With surgery	368	3.0	209	1.8	577	2.4
Without surgery	3,484	28.1	2,984	26.1	6,468	27.1
No radiation	8,567	69.0	8,226	72.0	16,793	70.4
With surgery	138	1.1	88	0.8	226	0.9
Without surgery	8,429	67.9	8,138	71.3	16,567	69.5
<b>Race</b>						
White	9,904	79.7	8,993	78.8	18,897	79.3
Black	1,875	15.1	1,912	16.7	3,787	15.9
Other	607	4.9	489	4.3	1,096	4.6
Unknown	33	0.3	25	0.2	58	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	30	0.2	20	0.2	50	0.2
30–49	1,112	9.0	782	6.8	1,894	7.9
50–69	6,108	49.2	4,773	41.8	10,881	45.6
70–79	3,587	28.9	3,639	31.9	7,226	30.3
≥ 80	1,582	12.7	2,205	19.3	3,787	15.9
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	11,710	94.3	10,977	96.1	22,687	95.2
1st and 2nd cancers	660	5.3	424	3.7	1,084	4.5
1st, 2nd, and 3rd cancers	48	0.4	18	0.2	66	0.3
1st, 2nd, 3rd, and additional cancers	1	0.0	0	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	67.6	—	70.3	—	68.9	—
Median year of 1st cancer diagnosis	1989.1	—	1988.7	—	1989.0	—
Median person-years at risk	2.0	—	2.0	—	2.0	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	86.7	—	87.3	—	87.0
1st, 2nd, and additional cancers	—	86.5	—	87.3	—	86.8
1st cancer only	—	7.2	—	5.2	—	6.4

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 16.3.2:** Risk of subsequent primary cancers after myeloma, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	250	0.88	626	0.93	252	1.17*	91	1.10	1,219	1,255.85	0.97	-5.19
All excluding same site	250	0.90	624	0.94	251	1.18*	91	1.12	1,216	1,238.01	0.98	-3.10
<b>Buccal cavity, pharynx</b>	4	0.56	9	0.54	5	0.98	1	0.57	19	30.84	0.62*	-1.67
Lip	1	0.95	0	0.00	0	0.00	0	0.00	1	4.30	0.23	-0.46
Tongue	0	0.00	3	0.90	1	0.97	0	0.00	4	6.13	0.65	-0.30
Salivary gland	0	0.00	1	0.69	1	2.19	0	0.00	2	2.68	0.75	-0.10
Mouth	2	1.04	2	0.44	1	0.73	1	2.12	6	8.28	0.72	-0.32
Nasopharynx	0	0.00	1	1.57	0	0.00	0	0.00	1	1.18	0.85	-0.03
Tonsil	0	0.00	1	0.63	2	4.09	0	0.00	3	2.92	1.03	0.01
Oropharynx	1	4.86	0	0.00	0	0.00	0	0.00	1	0.90	1.11	0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	3.25	0.00	-0.46
<b>Digestive system</b>	59	0.89	154	0.99	64	1.31*	18	0.97	295	288.87	1.02	0.86
Esophagus	1	0.30	5	0.63	0	0.00	1	1.03	7	14.87	0.47*	-1.11
Stomach	3	0.43	18	1.10	6	1.18	2	1.04	29	30.38	0.95	-0.19
Small intestine	1	1.13	5	2.31	2	2.80	0	0.00	8	4.06	1.97	0.55
Colon	33	1.10	60	0.85	38	1.69*	10	1.17	141	131.87	1.07	1.28
Rectum, rectosigmoid junction	5	0.46	28	1.10	8	1.02	5	1.81	46	47.05	0.98	-0.15
Anus, anal canal	0	0.00	2	1.46	0	0.00	0	0.00	2	2.54	0.79	-0.08
Liver	4	1.85	8	1.54	0	0.00	0	0.00	12	9.69	1.24	0.32
Gallbladder	0	0.00	0	0.00	1	1.49	0	0.00	1	4.07	0.25	-0.43
Bile ducts, other biliary	2	1.48	5	1.55	2	1.91	0	0.00	9	6.03	1.49	0.42
Pancreas	9	1.11	22	1.15	7	1.16	0	0.00	38	35.63	1.07	0.33
<b>Respiratory system</b>	31	0.64*	110	0.94	36	0.97	15	1.07	192	216.47	0.89	-3.44
Nose, nasal cavity, ear	0	0.00	0	0.00	1	3.29	0	0.00	1	1.80	0.56	-0.11
Larynx	0	0.00	7	0.92	4	1.69	2	2.43	13	14.08	0.92	-0.15
Lung, bronchus	31	0.69*	103	0.96	31	0.90	13	1.00	178	200.06	0.89	-3.10
<b>Female breast</b>	23	0.82	53	0.78	14	0.65	5	0.58	95	126.32	0.75*	-9.16
<b>Female genital system</b>	8	0.61	30	0.97	7	0.74	4	1.11	49	56.94	0.86	-2.32
Cervix uteri	0	0.00	4	1.09	1	0.93	0	0.00	5	6.74	0.74	-0.51
Corpus uteri	7	1.06	15	0.97	3	0.64	2	1.12	27	28.50	0.95	-0.44
Ovary	1	0.27	8	0.90	2	0.72	1	0.92	12	16.50	0.73	-1.32
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.30
Vulva	0	0.00	2	1.35	0	0.00	1	5.16	3	2.76	1.09	0.07
<b>Male genital system</b>	43	0.77	93	0.68*	32	0.71*	15	0.83	183	255.75	0.72*	-19.74
Prostate	42	0.76	92	0.68*	32	0.71	15	0.83	181	253.46	0.71*	-19.66
Testis	1	5.81	0	0.00	0	0.00	0	0.00	1	0.69	1.44	0.08
<b>Urinary system</b>	29	1.33	54	1.05	28	1.72*	10	1.66	121	95.65	1.27*	3.57
Urinary bladder	17	1.13	34	0.96	21	1.89*	8	1.97	80	65.68	1.22	2.02
Kidney parenchyma	11	2.07*	15	1.17	6	1.44	2	1.26	34	23.85	1.43	1.43
Renal pelvis, other urinary	1	0.71	5	1.51	1	0.98	0	0.00	7	6.11	1.14	0.12
Ureter	0	0.00	3	2.81	0	0.00	0	0.00	3	1.96	1.53	0.15
<b>Bone, joints</b>	0	0.00	1	1.86	1	6.14	0	0.00	2	0.99	2.03	0.14
<b>Soft tissue including heart</b>	1	0.93	2	0.78	0	0.00	0	0.00	3	4.74	0.63	-0.24
<b>Kaposi sarcoma</b>	2	6.39	1	1.36	1	4.25	1	13.01	5	1.36	3.67*	0.51
<b>Melanoma of skin</b>	9	1.75	15	1.20	6	1.47	3	2.00	33	23.23	1.42	1.38
<b>Eye, orbit</b>	1	2.68	0	0.00	1	3.83	0	0.00	2	1.59	1.26	0.06
<b>Brain, central nervous system</b>	5	1.91	6	0.96	1	0.52	1	1.48	13	11.46	1.13	0.22
<b>Thyroid</b>	3	2.26	5	1.59	0	0.00	1	2.81	9	5.81	1.55	0.45
<b>Lymphatic, hematopoietic</b>	22	1.05	78	1.57*	53	3.34*	16	2.64*	169	92.48	1.83*	10.77
Hodgkin lymphoma	2	3.19	0	0.00	0	0.00	1	7.19	3	2.62	1.14	0.05
Non-Hodgkin lymphoma	11	1.24	22	1.03	14	2.02*	4	1.50	51	39.88	1.28	1.56
Myeloma	0	0.00*	2	0.21*	1	0.32	0	0.00	3	17.84	0.17*	-2.09
Leukemia	9	1.22	54	3.12*	38	7.01*	11	5.45*	112	32.14	3.49*	11.24
Acute lymphocytic	0	0.00	2	4.42	0	0.00	1	19.79	3	0.84	3.58	0.30
Chronic lymphocytic	0	0.00	0	0.00*	1	0.46	0	0.00	1	12.89	0.08*	-1.67
Acute non-lymphocytic	6	2.44	42	7.21*	34	18.53*	8	11.52*	90	10.82	8.32*	11.15
Chronic myeloid	3	2.98	6	2.54	1	1.34	1	3.51	11	4.40	2.50*	0.93

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 34,191 PYR and for male cancers on 36,856 PYR.

**Table 16.3.3:** Risk of subsequent primary cancers after myeloma, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	93	0.89	244	0.97	87	1.09	36	1.12	460	468.83	0.98	-2.58
All excluding same site	93	0.90	244	0.98	87	1.11	36	1.14	460	461.50	1.00	-0.44
<b>Buccal cavity, pharynx</b>	0	0.00	2	0.45	1	0.73	1	1.89	4	8.16	0.49	-1.22
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.16
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	1.78	0.00	-0.52
Salivary gland	0	0.00	1	2.11	0	0.00	0	0.00	1	0.88	1.14	0.03
Mouth	0	0.00	1	0.65	0	0.00	1	5.37	2	2.86	0.70	-0.25
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.09
Tonsil	0	0.00	0	0.00	1	8.59	0	0.00	1	0.71	1.41	0.09
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.16
<b>Digestive system</b>	21	0.79	66	1.04	28	1.39	6	0.74	121	118.60	1.02	0.70
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	3.45	0.00	-1.01
Stomach	1	0.45	9	1.71	2	1.20	1	1.56	13	9.82	1.32	0.93
Small intestine	0	0.00	1	1.14	2	6.95	0	0.00	3	1.65	1.82	0.39
Colon	12	0.90	29	0.91	18	1.78*	4	0.99	63	59.37	1.06	1.06
Rectum, rectosigmoid junction	2	0.49	10	1.04	3	1.02	1	0.89	16	17.71	0.90	-0.50
Rectum	2	0.75	9	1.44	2	1.04	0	0.00	13	11.56	1.12	0.42
Anus, anal canal	0	0.00	2	2.59	0	0.00	0	0.00	2	1.44	1.39	0.16
Liver	1	1.75	2	1.44	0	0.00	0	0.00	3	2.62	1.14	0.11
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	2.63	0.00	-0.77
Bile ducts, other biliary	2	3.62	1	0.75	1	2.27	0	0.00	4	2.51	1.59	0.44
Pancreas	3	0.84	12	1.40	2	0.73	0	0.00	17	15.98	1.06	0.30
<b>Respiratory system</b>	11	0.82	27	0.81	9	0.83	5	1.08	52	62.23	0.84	-2.99
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.65	0.00	-0.19
Larynx	0	0.00	0	0.00	0	0.00	1	7.42	1	1.98	0.51	-0.29
Lung, bronchus	11	0.86	27	0.85	9	0.86	4	0.90	51	59.44	0.86	-2.47
<b>Female breast</b>	23	0.82	53	0.78	14	0.65	5	0.58	95	126.32	0.75*	-9.16
<b>Female genital system</b>	8	0.61	30	0.97	7	0.74	4	1.11	49	56.94	0.86	-2.32
Cervix uteri	0	0.00	4	1.09	1	0.93	0	0.00	5	6.74	0.74	-0.51
Corpus uteri	7	1.06	15	0.97	3	0.64	2	1.12	27	28.50	0.95	-0.44
Ovary	1	0.27	8	0.90	2	0.72	1	0.92	12	16.50	0.73	-1.32
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	1.03	0.00	-0.30
Vulva	0	0.00	2	1.35	0	0.00	1	5.16	3	2.76	1.09	0.07
<b>Urinary system</b>	6	1.17	11	0.89	7	1.77	1	0.61	25	23.12	1.08	0.55
Urinary bladder	5	1.63	4	0.54	4	1.71	1	1.05	14	13.73	1.02	0.08
Kidney parenchyma	1	0.62	4	1.01	2	1.55	0	0.00	7	7.43	0.94	-0.13
Renal pelvis, other urinary	0	0.00	3	2.83	1	3.01	0	0.00	4	1.97	2.03	0.59
Ureter	0	0.00	2	6.27	0	0.00	0	0.00	2	0.59	3.38	0.41
<b>Bone, joints</b>	0	0.00	0	0.00	1	15.06	0	0.00	1	0.40	2.49	0.17
<b>Soft tissue including heart</b>	1	2.40	2	1.99	0	0.00	0	0.00	3	1.87	1.60	0.33
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	27.95	0	0.00	1	0.20	4.91	0.23
<b>Melanoma of skin</b>	3	1.82	4	1.00	1	0.77	1	1.90	9	7.48	1.20	0.45
<b>Eye, orbit</b>	1	6.97	0	0.00	0	0.00	0	0.00	1	0.61	1.63	0.11
<b>Brain, central nervous system</b>	2	1.99	1	0.41	1	1.32	1	3.41	5	4.47	1.12	0.15
<b>Thyroid</b>	0	0.00	4	2.13	0	0.00	1	4.41	5	3.48	1.44	0.44
<b>Lymphatic, hematopoietic</b>	12	1.46	37	1.87*	16	2.52*	10	3.85*	75	36.97	2.03*	11.12
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	1	16.89	1	0.98	1.02	0.01
Non-Hodgkin lymphoma	8	2.15	9	0.99	3	1.02	1	0.82	21	16.94	1.24	1.19
Myeloma	0	0.00	0	0.00*	0	0.00	0	0.00	0	7.33	0.00*	-2.14
Leukemia	4	1.51	28	4.45*	13	6.55*	8	10.03*	53	11.72	4.52*	12.07
Acute lymphocytic	0	0.00	2	11.72*	0	0.00	0	0.00	2	0.32	6.28	0.49
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	4.58	0.00*	-1.34
Acute non-lymphocytic	2	2.18	22	10.00*	13	18.65*	7	24.46*	44	4.10	10.73*	11.67
Chronic myeloid	2	5.47	3	3.45	0	0.00	1	9.00	6	1.62	3.70*	1.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 16.3.4:** Risk of subsequent primary cancers after myeloma, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	157	0.88	382	0.90*	165	1.22*	55	1.09	759	787.02	0.96	-7.60
All excluding same site	157	0.89	380	0.91	164	1.23*	55	1.11	756	776.51	0.97	-5.56
<b>Buccal cavity, pharynx</b>	4	0.75	7	0.57	4	1.07	0	0.00	15	22.68	0.66	-2.09
Lip	1	1.07	0	0.00	0	0.00	0	0.00	1	3.75	0.27	-0.75
Tongue	0	0.00	3	1.27	1	1.36	0	0.00	4	4.35	0.92	-0.10
Salivary gland	0	0.00	0	0.00	1	3.24	0	0.00	1	1.80	0.56	-0.22
Mouth	2	1.56	1	0.34	1	1.12	0	0.00	4	5.42	0.74	-0.39
Nasopharynx	0	0.00	1	2.15	0	0.00	0	0.00	1	0.86	1.16	0.04
Tonsil	0	0.00	1	0.83	1	2.68	0	0.00	2	2.22	0.90	-0.06
Oropharynx	1	6.27	0	0.00	0	0.00	0	0.00	1	0.70	1.43	0.08
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.69	0.00	-0.73
<b>Digestive system</b>	38	0.97	88	0.96	36	1.25	12	1.15	174	170.27	1.02	1.01
Esophagus	1	0.39	5	0.81	0	0.00	1	1.37	7	11.42	0.61	-1.20
Stomach	2	0.42	9	0.81	4	1.16	1	0.78	16	20.56	0.78	-1.24
Small intestine	1	1.89	4	3.12	0	0.00	0	0.00	5	2.41	2.07	0.70
Colon	21	1.26	31	0.79	20	1.62	6	1.33	78	72.50	1.08	1.49
Rectum, rectosigmoid junction	3	0.44	18	1.13	5	1.03	4	2.43	30	29.33	1.02	0.18
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.10	0.00	-0.30
Liver	3	1.89	6	1.58	0	0.00	0	0.00	9	7.07	1.27	0.52
Gallbladder	0	0.00	0	0.00	1	4.26	0	0.00	1	1.43	0.70	-0.12
Bile ducts, other biliary	0	0.00	4	2.12	1	1.65	0	0.00	5	3.52	1.42	0.40
Pancreas	6	1.32	10	0.95	5	1.51	0	0.00	21	19.64	1.07	0.37
<b>Respiratory system</b>	20	0.57*	83	1.00	27	1.03	10	1.07	140	154.24	0.91	-3.86
Nose, nasal cavity, ear	0	0.00	0	0.00	1	5.19	0	0.00	1	1.15	0.87	-0.04
Larynx	0	0.00	7	1.06	4	1.97	1	1.45	12	12.10	0.99	-0.03
Lung, bronchus	20	0.62*	76	1.00	22	0.92	9	1.05	127	140.62	0.90	-3.69
<b>Male breast</b>	1	2.94	0	0.00	0	0.00	0	0.00	1	1.50	0.67	-0.14
<b>Male genital system</b>	43	0.77	93	0.68*	32	0.71*	15	0.83	183	255.75	0.72*	-19.74
Prostate	42	0.76	92	0.68*	32	0.71	15	0.83	181	253.46	0.71*	-19.66
Testis	1	5.81	0	0.00	0	0.00	0	0.00	1	0.69	1.44	0.08
<b>Urinary system</b>	23	1.39	43	1.10	21	1.70*	9	2.05	96	72.52	1.32*	6.37
Urinary bladder	12	1.00	30	1.07	17	1.93*	7	2.25	66	51.95	1.27	3.81
Kidney parenchyma	10	2.72*	11	1.24	4	1.40	2	1.91	27	16.43	1.64*	2.87
Renal pelvis, other urinary	1	1.03	2	0.89	0	0.00	0	0.00	3	4.15	0.72	-0.31
Ureter	0	0.00	1	1.34	0	0.00	0	0.00	1	1.37	0.73	-0.10
<b>Bone, joints</b>	0	0.00	1	3.13	0	0.00	0	0.00	1	0.58	1.71	0.11
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.87	0.00	-0.78
<b>Kaposi sarcoma</b>	2	7.45	1	1.59	0	0.00	1	16.06	4	1.16	3.45	0.77
<b>Melanoma of skin</b>	6	1.72	11	1.29	5	1.80	2	2.06	24	15.75	1.52	2.24
<b>Eye, orbit</b>	0	0.00	0	0.00	1	6.19	0	0.00	1	0.98	1.02	0.01
<b>Brain, central nervous system</b>	3	1.86	5	1.31	0	0.00	0	0.00	8	6.99	1.14	0.27
<b>Thyroid</b>	3	5.56*	1	0.79	0	0.00	0	0.00	4	2.33	1.71	0.45
<b>Lymphatic, hematopoietic</b>	10	0.79	41	1.37	37	3.89*	6	1.74	94	55.51	1.69*	10.44
Hodgkin lymphoma	2	5.01	0	0.00	0	0.00	0	0.00	2	1.64	1.22	0.10
Non-Hodgkin lymphoma	3	0.58	13	1.05	11	2.75*	3	2.08	30	22.95	1.31	1.91
Myeloma	0	0.00	2	0.36	1	0.55	0	0.00	3	10.51	0.29*	-2.04
Leukemia	5	1.06	26	2.36*	25	7.28*	3	2.46	59	20.41	2.89*	10.47
Acute lymphocytic	0	0.00	0	0.00	0	0.00	1	34.76	1	0.52	1.93	0.13
Chronic lymphocytic	0	0.00	0	0.00*	1	0.72	0	0.00	1	8.31	0.12*	-1.98
Acute non-lymphocytic	4	2.59	20	5.52*	21	18.46*	1	2.45	46	6.71	6.85*	10.66
Chronic myeloid	1	1.56	3	2.01	1	2.13	0	0.00	5	2.78	1.80	0.60

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Myeloma

## Both Sexes, <70 Years of Age

**Table 16.3.5:** Risk of subsequent primary cancers after myeloma, both sexes, <70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	12,825		10,131		3,267		842		12,825			
<b>Person-years in interval</b>	9,391		24,221		8,714		3,514		45,840			
<b>All subsequent cancers</b>	93	0.87	327	1.04	174	1.27*	80	1.18	674	624.11	1.08	10.88
All excluding same site	93	0.88	325	1.05	173	1.28*	80	1.20	671	615.76	1.09*	12.05
<b>Buccal cavity, pharynx</b>	2	0.56	7	0.72	2	0.54	1	0.66	12	18.52	0.65	-1.42
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	2.02	0.00	-0.44
Tongue	0	0.00	2	0.99	1	1.29	0	0.00	3	3.84	0.78	-0.18
Salivary gland	0	0.00	1	1.51	0	0.00	0	0.00	1	1.30	0.77	-0.07
Mouth	1	1.04	1	0.39	0	0.00	1	2.50	3	4.92	0.61	-0.42
Nasopharynx	0	0.00	1	2.37	0	0.00	0	0.00	1	0.80	1.25	0.04
Tonsil	0	0.00	1	0.91	1	2.49	0	0.00	2	2.07	0.96	-0.02
Oropharynx	1	8.35	0	0.00	0	0.00	0	0.00	1	0.61	1.63	0.08
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.19	0.00	-0.48
<b>Digestive system</b>	18	0.84	63	1.00	34	1.22	16	1.12	131	126.90	1.03	0.90
Esophagus	0	0.00	2	0.46	0	0.00	1	1.20	3	8.56	0.35	-1.21
Stomach	2	0.90	5	0.77	2	0.71	2	1.39	11	12.93	0.85	-0.42
Small intestine	0	0.00	4	3.89*	1	2.19	0	0.00	5	2.07	2.41	0.64
Colon	8	0.91	23	0.87	20	1.67*	8	1.25	59	53.58	1.10	1.18
Rectum, rectosigmoid junction	3	0.75	14	1.22	6	1.25	5	2.25	28	22.47	1.25	1.21
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	1.37	0.00	-0.30
Liver	1	1.16	4	1.58	0	0.00	0	0.00	5	5.08	0.98	-0.02
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	1.48	0.00	-0.32
Bile ducts, other biliary	0	0.00	1	0.87	1	1.88	0	0.00	2	2.36	0.85	-0.08
Pancreas	3	1.13	10	1.27	4	1.16	0	0.00	17	15.80	1.08	0.26
<b>Respiratory system</b>	13	0.61	67	1.09	32	1.24	14	1.16	126	120.30	1.05	1.24
Nose, nasal cavity, ear	0	0.00	0	0.00	1	5.28	0	0.00	1	0.92	1.09	0.02
Larynx	0	0.00	7	1.47	4	2.17	2	2.69	13	9.12	1.43	0.85
Lung, bronchus	13	0.68	60	1.07	27	1.14	12	1.07	112	109.98	1.02	0.44
<b>Female breast</b>	10	0.83	31	0.92	10	0.72	4	0.56	55	67.02	0.82	-5.88
<b>Female genital system</b>	3	0.50	17	1.06	4	0.65	4	1.33	28	31.19	0.90	-1.56
Cervix uteri	0	0.00	2	0.95	0	0.00	0	0.00	2	3.99	0.50	-0.97
Corpus uteri	2	0.63	9	1.06	2	0.62	2	1.30	15	16.39	0.92	-0.68
Ovary	1	0.62	5	1.13	1	0.56	1	1.11	8	8.72	0.92	-0.35
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.21
Vulva	0	0.00	1	2.05	0	0.00	1	7.45	2	1.00	1.99	0.49
<b>Male genital system</b>	10	0.52*	45	0.73*	23	0.77	15	0.98	93	126.29	0.74*	-13.11
Prostate	10	0.53*	45	0.74*	23	0.77	15	0.99	93	124.97	0.74*	-12.59
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.23
<b>Urinary system</b>	14	1.84*	30	1.33	18	1.81*	8	1.66	70	44.95	1.56*	5.46
Urinary bladder	10	2.07	18	1.24	12	1.85	7	2.20	47	29.01	1.62*	3.92
Kidney parenchyma	4	1.72	10	1.49	5	1.75	1	0.73	20	13.25	1.51	1.47
Renal pelvis, other urinary	0	0.00	2	1.48	1	1.69	0	0.00	3	2.68	1.12	0.07
Ureter	0	0.00	1	2.37	0	0.00	0	0.00	1	0.84	1.20	0.04
<b>Bone, joints</b>	0	0.00	1	3.52	1	8.98	0	0.00	2	0.55	3.67	0.32
<b>Soft tissue including heart</b>	1	2.38	2	1.67	0	0.00	0	0.00	3	2.36	1.27	0.14
<b>Kaposi sarcoma</b>	2	11.75*	1	2.31	0	0.00	1	17.53	4	0.82	4.89*	0.69
<b>Melanoma of skin</b>	4	1.68	11	1.63	5	1.80	2	1.62	22	13.14	1.67*	1.93
<b>Eye, orbit</b>	0	0.00	0	0.00	1	5.82	0	0.00	1	0.84	1.19	0.03
<b>Brain, central nervous system</b>	2	1.61	2	0.58	1	0.73	1	1.72	6	6.63	0.90	-0.14
<b>Thyroid</b>	2	2.69	2	1.01	0	0.00	1	3.19	5	3.77	1.33	0.27
<b>Lymphatic, hematopoietic</b>	7	0.96	41	1.91*	42	4.46*	12	2.51*	102	42.91	2.38*	12.89
Hodgkin lymphoma	1	3.22	0	0.00	0	0.00	1	8.35	2	1.54	1.30	0.10
Non-Hodgkin lymphoma	4	1.22	8	0.83	10	2.35*	2	0.93	24	19.31	1.24	1.02
Myeloma	0	0.00	2	0.48	1	0.54	0	0.00	3	8.35	0.36	-1.17
Leukemia	2	0.87	31	4.52*	31	10.25*	9	5.92*	73	13.71	5.32*	12.93
Acute lymphocytic	0	0.00	1	4.78	0	0.00	1	25.20	2	0.41	4.87	0.35
Chronic lymphocytic	0	0.00	0	0.00	1	0.81	0	0.00	1	5.64	0.18*	-1.01
Acute non-lymphocytic	2	2.68	25	11.10*	28	27.57*	6	11.34*	61	4.54	13.43*	12.32
Chronic myeloid	0	0.00	3	3.18	0	0.00	1	4.69	4	1.89	2.11	0.46

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 20,449 PYR and for male cancers on 25,391 PYR.

**Table 16.3.6:** Risk of subsequent primary cancers after myeloma, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	157	0.89	299	0.83*	78	0.99	11	0.73	545	631.73	0.86*	-34.41
All excluding same site	157	0.90	299	0.84*	78	1.00	11	0.75	545	622.25	0.88*	-30.65
<b>Buccal cavity, pharynx</b>	2	0.56	2	0.28	3	2.11	0	0.00	7	12.33	0.57	-2.11
Lip	1	1.50	0	0.00	0	0.00	0	0.00	1	2.28	0.44	-0.51
Tongue	0	0.00	1	0.76	0	0.00	0	0.00	1	2.29	0.44	-0.51
Salivary gland	0	0.00	0	0.00	1	5.51	0	0.00	1	1.38	0.73	-0.15
Mouth	1	1.04	1	0.52	1	2.51	0	0.00	3	3.36	0.89	-0.14
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.15
Tonsil	0	0.00	0	0.00	1	11.32	0	0.00	1	0.85	1.17	0.06
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.06	0.00	-0.42
<b>Digestive system</b>	41	0.92	91	0.99	30	1.42	2	0.47	164	161.98	1.01	0.80
Esophagus	1	0.55	3	0.83	0	0.00	0	0.00	4	6.31	0.63	-0.92
Stomach	1	0.21	13	1.32	4	1.76	0	0.00	18	17.45	1.03	0.22
Small intestine	1	1.84	1	0.88	1	3.86	0	0.00	3	1.99	1.51	0.40
Colon	25	1.18	37	0.83	18	1.72*	2	0.94	82	78.29	1.05	1.47
Rectum, rectosigmoid junction	2	0.29	14	1.00	2	0.66	0	0.00	18	24.58	0.73	-2.61
Anus, anal canal	0	0.00	2	3.01	0	0.00	0	0.00	2	1.16	1.72	0.33
Liver	3	2.32	4	1.51	0	0.00	0	0.00	7	4.61	1.52	0.95
Gallbladder	0	0.00	0	0.00	1	2.94	0	0.00	1	2.59	0.39	-0.63
Bile ducts, other biliary	2	2.06	4	1.93	1	1.95	0	0.00	7	3.67	1.91	1.32
Pancreas	6	1.10	12	1.06	3	1.16	0	0.00	21	19.82	1.06	0.47
<b>Respiratory system</b>	18	0.65	43	0.78	4	0.35*	1	0.53	66	96.17	0.69*	-11.97
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.88	0.00	-0.35
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	4.96	0.00*	-1.97
Lung, bronchus	18	0.70	43	0.83	4	0.38*	1	0.56	66	90.08	0.73*	-9.55
<b>Female breast</b>	13	0.81	22	0.65*	4	0.52	1	0.69	40	59.30	0.67*	-14.05
<b>Female genital system</b>	5	0.70	13	0.88	3	0.93	0	0.00	21	25.75	0.82	-3.45
Cervix uteri	0	0.00	2	1.28	1	2.91	0	0.00	3	2.75	1.09	0.18
Corpus uteri	5	1.46	6	0.86	1	0.70	0	0.00	12	12.11	0.99	-0.08
Ovary	0	0.00	3	0.67	1	1.00	0	0.00	4	7.78	0.51	-2.75
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.43
Vulva	0	0.00	1	1.01	0	0.00	0	0.00	1	1.76	0.57	-0.55
<b>Male genital system</b>	33	0.90	48	0.64*	9	0.59	0	0.00	90	129.46	0.70*	-34.42
Prostate	32	0.88	47	0.64*	9	0.59	0	0.00	88	128.50	0.68*	-35.32
Testis	1	27.30	0	0.00	0	0.00	0	0.00	1	0.12	8.30	0.77
<b>Urinary system</b>	15	1.06	24	0.83	10	1.57	2	1.68	51	50.70	1.01	0.12
Urinary bladder	7	0.69	16	0.76	9	1.93	1	1.13	33	36.67	0.90	-1.45
Kidney parenchyma	7	2.35	5	0.82	1	0.77	1	4.36	14	10.60	1.32	1.35
Renal pelvis, other urinary	1	1.04	3	1.53	0	0.00	0	0.00	4	3.43	1.17	0.23
Ureter	0	0.00	2	3.10	0	0.00	0	0.00	2	1.13	1.77	0.35
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.17
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.38	0.00	-0.94
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	1	12.95	0	0.00	1	0.54	1.84	0.18
<b>Melanoma of skin</b>	5	1.82	4	0.69	1	0.77	1	3.79	11	10.09	1.09	0.36
<b>Eye, orbit</b>	1	4.64	0	0.00	0	0.00	0	0.00	1	0.75	1.33	0.10
<b>Brain, central nervous system</b>	3	2.18	4	1.43	0	0.00	0	0.00	7	4.83	1.45	0.86
<b>Thyroid</b>	1	1.71	3	2.55	0	0.00	0	0.00	4	2.05	1.95	0.77
<b>Lymphatic, hematopoietic</b>	15	1.10	37	1.31	11	1.71	4	3.12	67	49.57	1.35*	6.91
Hodgkin lymphoma	1	3.15	0	0.00	0	0.00	0	0.00	1	1.09	0.92	-0.03
Non-Hodgkin lymphoma	7	1.25	14	1.19	4	1.49	2	3.86	27	20.57	1.31	2.55
Myeloma	0	0.00	0	0.00*	0	0.00	0	0.00	0	9.49	0.00*	-3.76
Leukemia	7	1.38	23	2.20*	7	2.92*	2	4.03	39	18.42	2.12*	8.16
Acute lymphocytic	0	0.00	1	4.11	0	0.00	0	0.00	1	0.43	2.34	0.23
Chronic lymphocytic	0	0.00	0	0.00*	0	0.00	0	0.00	0	7.25	0.00*	-2.88
Acute non-lymphocytic	4	2.33	17	4.76*	6	7.33*	2	12.10*	29	6.27	4.62*	9.02
Chronic myeloid	3	4.41	3	2.11	1	3.00	0	0.00	7	2.51	2.79*	1.78

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 13,742 PYR and for male cancers on 11,465 PYR.



# Chapter 17

## New Malignancies Following Leukemia

Naoko Ishibe, Rochelle E. Curtis

### Synopsis

The risk of subsequent primary cancer was assessed in more than 46,000 individuals diagnosed with any of the 4 major leukemias between 1973 and 2000. The overall risk of subsequent cancers was significantly increased among survivors of chronic lymphocytic leukemia (CLL) (O/E=1.19,<sup>1</sup> O=2,718, EAR=38 per 10,000 person-years), chronic myeloid leukemia (CML) (O/E=1.16,<sup>1</sup> O=334, EAR=19), and acute lymphocytic leukemia (ALL) (O/E=1.55,<sup>1</sup> O=66, EAR=5), but not acute myeloid leukemia (O/E=0.94,<sup>1</sup> O=157). The risk of a new malignancy was notably high among children diagnosed with ALL (O/E=5.01,<sup>1</sup> O=36, EAR=7), with statistically significant increased risks seen for cancers of the salivary gland, brain and other central nervous system, thyroid, and bone, based on small numbers. Much of the excess was likely related to treatment with radiotherapy at a young age, although familial cancer syndromes could have played a small role. Immune dysfunction, which is an intrinsic part of CLL, may have contributed to the significantly increased incidence for subsequent cancers of the lip, larynx, and lung, as well as subsequent cutaneous melanoma, Hodgkin lymphoma, and Kaposi sarcoma seen in these patients. Excess new malignancies of the oral cavity, lung, and colon (females only) and non-Hodgkin lymphoma were seen following CML for reasons that are unclear.

### Leukemia

The leukemias are a heterogeneous group of malignancies constituting 2.5% of incident cancer cases and 4.0% of cancer deaths (Jemal et al, 2005). Leukemias are classified by lineage into 2 main groups, myeloid and lymphoid, and further subdivided into acute and chronic forms. All 4 major subtypes of leukemia originate from a common stem cell that normally divides and differentiates into subtypes of cells that play an important role in immune function. The hematologic malignancies of each lineage arise from genetic changes that occur at some point along the

differentiation pathway of this stem cell, and each has its own unique pattern of disease presentation.

The etiology is largely unknown for all 4 major subtypes of leukemia. Ionizing radiation has been shown to cause excesses of each leukemia subtype except chronic lymphocytic leukemia (CLL) (Preston et al, 1994), whereas chemotherapeutic agents (alkylating agents, topoisomerase II inhibitors) and the organic solvent benzene have been associated with acute myeloid leukemia (AML) (Hayes et al, 1997). Most studies of environmental and occupational exposures and leukemia have shown inconsistent results in both children and adults. Epidemiologic evidence suggests a weak association between smoking and leukemia, particularly AML (Kane et al, 1999). Some investigators have linked childhood acute lymphocytic leukemia (ALL) to various risk factors, such as parental exposures (Shu et al, 1999; Schüz et al, 2000), infectious agents (Kinlen and Balkwill, 2001), and high birth weight (Hjalgrim et al, 2004).

Genetic factors contribute also to the etiology of leukemia, especially in familial aggregation of CLL (Ishibe et al, 2001). Approximately 5% of acute leukemia has been related to genetic syndromes, such as Down syndrome, ataxia telangiectasia, neurofibromatosis type 1, Li-Fraumeni syndrome, Fanconi anemia, and other bone marrow failure disorders (Lindor and Greene, 1998).

Overall risks presented below for each leukemia subtype exclude observed and expected numbers of subsequent leukemia of the same lineage (i.e., myeloid or lymphoid) as the first primary leukemia, because according to SEER abstracting rules, new leukemia diagnoses of the same lineage are not considered new, separate primaries.

### Acute Leukemias

ALL is the most common childhood leukemia; more than 60% of all ALL cases occur in children and adolescents younger than 17 years of age. In contrast, AML is typically diagnosed in adulthood, and pediatric patients constitute less than 10% of the total. Survival among children with ALL has improved greatly since the 1970s due to advances in treatment, with current relative survival rates reaching 84.9% at 5 years and 78.1% at 10 years. In contrast, adults with ALL have a poor prognosis: 29.6% relative survival at 5 years. Substantially lower 5-year relative survival rates are seen for AML: 50.9% for children and 17.4% for adults. Patients with acute leukemia

<sup>1</sup>Observed-to-expected ratios for acute and chronic lymphocytic leukemia exclude subsequent lymphocytic leukemias; those for acute and chronic myeloid leukemia exclude subsequent myeloid leukemias. Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000).

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are usually treated for curative intent with chemotherapy relying heavily on antimetabolites and anthracyclines (Hoelzer et al, 2002). With ALL, and to a lesser extent AML, cranial or craniospinal irradiation has been used to prevent or treat central nervous system (CNS) involvement. (Treatment with cranial radiotherapy has been reportable to the SEER Program since its inception, but cranial irradiation given for prophylaxis was not recorded in registry databases until 1988.) Current efforts to reduce the late sequelae of cranial irradiation have led to wider use of intrathecal chemotherapy alone for lower-risk patients. Younger ALL/AML patients with a poor prognosis or those who fail conventional treatment may be considered for bone marrow transplantation.

## Results and Discussion

### Acute Lymphocytic Leukemia

The overall risk of subsequent primary cancer was significantly increased among the 7,246 ALL patients who survived 2 months or more (O/E=1.55, O=66, 95% CI=1.20-1.98, EAR=5 per 10,000 person-years). The cumulative incidence of developing a second cancer following ALL, adjusted for the competing risk of death due to other causes, was 2.3% (95% CI=1.4%-3.6%) at 25 years. The increase in risk of developing a new malignancy was confined to pediatric patients (ages <17 years, O/E=5.01, 95% CI=3.51-6.93, EAR=7); no elevation in risk was observed among older patients (ages ≥17 years, O/E=0.85, 95% CI=0.57-1.21). Among children with ALL, significantly increased relative risks were observed for new cancers of the salivary gland, small intestine, brain and other CNS, thyroid, and bone, based on small numbers. The risk of a new malignancy among pediatric ALL patients was increased 3-fold compared to expected values among those surviving 1 to 5 years and then rose to 5-fold among those surviving 5 years or more. Females and males appeared to have similar risks. These results are consistent with previous studies of childhood ALL, which have reported increased risks of subsequent cancers ranging from 4- to 14-fold, with significant elevations noted for cancers of the brain, thyroid, buccal cavity (especially salivary gland), and bone, as well as for AML (Neglia et al, 1991, 2001; Kimball Dalton et al, 1998; Bhatia et al, 2002; Pui et al, 2003).

We observed an overall 10-fold increase in risk of developing a subsequent malignancy of the brain/CNS among children with ALL, rising to 17-fold among long-term survivors (≥5 years). Gliomas (O=7) and primitive neuroectodermal tumors (O=2) were the most frequent cell types. Most of the patients developing subsequent brain/CNS tumors (7 out of 11) were known to have received initial radiation treatment for ALL, and 9 of the brain cancers occurred among ALL patients diagnosed at 5 years of age or younger. These findings resemble those of previous studies of childhood ALL showing a marked increase in risk of subsequent brain/CNS tumors following cranial irradiation at doses of 18 to 24 Gy (Walter et al, 1998). The especially high risks seen among very

young children in our series and other studies (Neglia et al, 1991; Walter et al, 1998) indicate that the developing brain is particularly susceptible to the carcinogenic effects of radiation.

Treatment of ALL with cranial irradiation during childhood may also account for the excess cancers of the thyroid, salivary gland, and bone, since the patterns over time for these subsequent cancers are consistent with a radiation effect. Thyroid tissue is highly radiosensitive (Thompson et al, 1994; Ron et al, 1995), and an excess of thyroid cancer has been reported after head and neck radiotherapy during childhood (de Vathaire et al, 1999). Similarly, radiation exposure is associated with excess tumors of the salivary gland (Land et al, 1996), and bone cancer is well documented as a second cancer following radiotherapy for childhood cancer (Hawkins et al, 1996; Le Vu et al, 1998). Three of the 4 bone tumors in the current study were located in the skull or shoulder/upper limb, sites that may have received direct or scatter radiation. In addition, genetic susceptibility may have played a role, since brain tumors, bone sarcomas, and acute leukemia are part of the constellation of tumors seen in Li-Fraumeni syndrome (Hisada et al, 1998; Lindor and Greene, 1998).

Data from clinical trials have shown an increased risk of subsequent AML following treatment for ALL with topoisomerase II inhibitors (etoposide, teniposide) since their introduction in the mid-1980s (Pui et al, 1991). Although only 1 case of subsequent AML was observed among pediatric ALL patients, we found a 15-fold significantly increased risk among older ALL patients, based on 4 cases.

### Acute Myeloid Leukemia

The number of new malignancies observed among the 11,169 individuals diagnosed with AML did not differ from that expected based on general population rates (O/E=0.94, O=157, 95% CI=0.79-1.09). Approximately 3% of patients developed a second cancer within 20 years of initial diagnosis (cumulative incidence=2.2%, CI=1.8%-2.7%). Subsequent cancer risks appeared similar among males and females and did not differ significantly by race or follow-up period. Although significantly increased risks were detected for subsequent kidney and thyroid cancers, the elevations in risk were limited to the first year after AML diagnosis, suggesting an effect of increased medical surveillance during this period.

Pediatric AML patients in our series appeared at increased risk of subsequent cancers, although the risk was not statistically significant (O/E=3.51, O=3). A previous study of childhood AML found a 10-fold elevation in the risk of second cancers following conventional treatment, based on 5 cases (Leung et al, 2001). The risks were substantially higher (48-fold) in a survey of 1,100 children undergoing allogeneic bone marrow transplantation for AML, with excesses of lymphoma and melanoma of the skin, and cancers of the tongue, salivary gland, brain/CNS, bone, soft tissue, and thyroid (Socié et al, 2000).



## Chronic Leukemias

CLL is typically a disease of older adults; its median age at onset is 70 years. In contrast, incidence rates for chronic myeloid leukemia (CML) begin increasing in adolescence, rise rapidly in young adulthood, and reach a peak at older ages. In general, age-adjusted incidence rates of leukemia tend to be higher for males than females; however, the sex difference is most pronounced for CLL and CML (Jemal et al, 2005). CLL is generally indolent, with 5- and 10-year relative survival rates of 72.7% and 52.9%, respectively. Prognosis for CML varies by age at diagnosis, with more favorable 5-year survival rates under age 55 years (56.1%) compared to older ages (24.2%). Patients with CLL and CML typically receive palliative treatment, but low-risk CLL patients may remain untreated until the disease progresses. Chemotherapy for CLL usually includes alkylating agents (chlorambucil, cyclophosphamide) and more recently nucleoside analogues (e.g., fludarabine) (Kipps, 2000). Frontline chemotherapy for CML includes busulfan, hydroxyurea, and interferon  $\alpha$ , although the recent introduction of Gleevec™ (imatinib mesylate) has revolutionized the treatment of CML (Garcia-Manero et al, 2003). Bone marrow transplantation is frequently considered as a treatment option for younger CML patients.

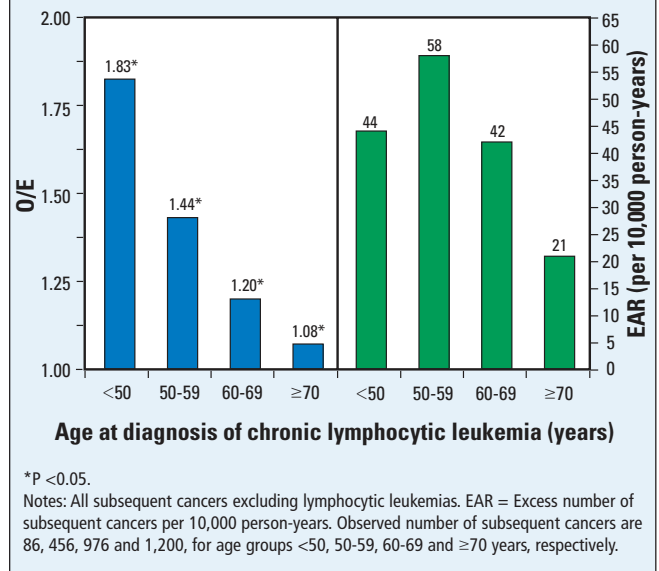
## Results and Discussion

### Chronic Lymphocytic Leukemia

A 19% elevation in risk of subsequent primary cancers was observed among 19,631 patients who survived 2 months or more following a diagnosis of CLL (O/E=1.19, O=2,718, 95% CI=1.15-1.24, EAR=38). An estimated 17% of patients developed a second cancer within 25 years of follow-up (cumulative incidence=16.7%, CI=16.1%-17.4%). An 80% increase in risk was seen among CLL patients diagnosed at less than 50 years of age, and then risk declined at older ages (Figure 17.1). Both relative and absolute risks of new cancers were higher among blacks (O/E=1.41, EAR=82) than whites (O/E=1.19, EAR=37). The risk was greatest during the first 5 years of follow-up and then diminished. Significantly heightened risks were observed for subsequent cancers of the lip, salivary gland, nose and nasal cavity, larynx, lung, colon, rectum (females), and kidney, as well as cutaneous melanoma, Hodgkin lymphoma, and Kaposi sarcoma. Significantly decreased risks were seen for new malignancies of the bile ducts and of the corpus uteri. Our findings are consistent with previous surveys of CLL patients (Mellempgaard et al, 1994; Wiernik 2004), including 2 earlier SEER analyses (Travis et al, 1992; Hisada et al, 2001) that reported increased risks for subsequent cancers of the lung, as well as Hodgkin lymphoma, Kaposi sarcoma, and melanoma of the skin. CLL transformation to large B-cell non-Hodgkin lymphoma, known as Richter's syndrome, is not reportable to SEER (Robak, 2004).

Cancers of the respiratory tract are the most common new cancers seen after a diagnosis of CLL (Mellempgaard

**Figure 17.1:** Observed-to-expected ratio (O/E) and excess absolute risk (EAR) of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, SEER 1973-2000.



et al, 1994; Hisada et al, 2001). In our survey, 50-60% increased risks of subsequent cancers of the lung were observed in all follow-up periods. Excess cancers of the larynx were confined to long-term survivors. Reasons for these excesses are not entirely clear but may be related to the combined effects of cigarette smoking (Parekh et al, 1999), immunologic impairment (Bartik et al, 1998; Sgambati et al, 2001), and treatment with alkylating agents (Travis et al, 2002) or nucleoside analogues (Robak et al, 2004).

Immune alterations probably contributed to the excess risks reported for lip cancer, as well as for melanoma of the skin, Hodgkin lymphoma, and Kaposi sarcoma, as these malignancies occur excessively in other immunocompromised groups, such as transplant recipients (Curtis et al, 1997; Euvrard et al, 2003) and Hodgkin lymphoma patients (Dores et al, 2002). Infections with Epstein-Barr virus and human herpesvirus 8 may account for Hodgkin lymphoma and Kaposi sarcoma, respectively, in the setting of immunosuppression. However, some cases of Hodgkin lymphoma after CLL may represent a Hodgkin variant of Richter's syndrome (Ohno et al, 1998).

The risk of subsequent primary cancer has been reported to be higher in patients with familial CLL as compared with nonfamilial CLL, particularly at younger ages (Ishibe et al, 2001). Thus the nearly 2-fold increased risk of subsequent cancers seen among CLL patients diagnosed under age 50 years, with excesses of cancers of the lip and lung, as well as melanoma of the skin and AML, may be related in part to an underlying genetic susceptibility.

The excess of kidney cancers was confined to the first year of follow-up, likely due to increased medical surveillance during the initial diagnostic work-up. The elevated risks of new cancers of the colon, rectum, and



salivary gland that were observed in the current CLL cohort, but not in earlier surveys of the SEER Program, may provide etiologic clues for future studies.

### Chronic Myeloid Leukemia

There was a 16% increased risk for all subsequent primary cancers combined among the 8,005 patients who survived 2 months or more after a diagnosis of CML (O/E=1.16, O=334, 95% CI=1.04-1.29, EAR=19). The cumulative incidence of developing a new malignancy at 15 years was 4.8% (CI=4.3%-5.4%). Females had a 30% elevation in the risk of subsequent cancers, whereas no excess was observed among males. No discernible pattern in risk was evident over time since initial diagnosis. Significantly increased risks were observed for new primary cancers of the oral cavity and lung and for non-Hodgkin lymphoma in both sexes combined, as well as for cancers of the colon among females but not males. Because little is known of the etiology of CML, the reasons for these associations are unclear. Secondary ALL appeared more frequently than expected in this cohort, based on 7 cases, but this may represent a transformation of the original CML to a lymphoblastic phase (Garcia-Manero et al, 2003).

Among younger CML patients who were potential candidates for bone marrow transplantation, there was a 5-fold significantly increased risk of subsequent malignancies involving a variety of sites, including 2 lymphomas. Although the effects of bone marrow transplantation could not be evaluated in our study, previous transplant studies of CML have reported increased risks for lymphomas and solid tumors (Socié et al, 2001).

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## Acute Lymphocytic Leukemia Both Sexes

**Table 17.1.1:** Characteristics of patients with an initial acute lymphocytic leukemia, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	4,205	100.0	3,041	100.0	7,246	100.0
<b>Initial treatment</b>						
Any radiation	1,221	29.0	819	26.9	2,040	28.2
With surgery	5	0.1	1	0.0	6	0.1
Without surgery	1,216	28.9	818	26.9	2,034	28.1
No radiation	2,984	71.0	2,222	73.1	5,206	71.8
With surgery	9	0.2	1	0.0	10	0.1
Without surgery	2,975	70.7	2,221	73.0	5,196	71.7
<b>Race</b>						
White	3,523	83.8	2,511	82.6	6,034	83.3
Black	275	6.5	235	7.7	510	7.0
Other	389	9.3	278	9.1	667	9.2
Unknown	18	0.4	17	0.6	35	0.5
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	3,274	77.9	2,359	77.6	5,633	77.7
30–49	415	9.9	275	9.0	690	9.5
50–69	335	8.0	256	8.4	591	8.2
70–79	133	3.2	89	2.9	222	3.1
≥ 80	48	1.1	62	2.0	110	1.5
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	4,171	99.2	3,013	99.1	7,184	99.1
1st and 2nd cancers	31	0.7	27	0.9	58	0.8
1st, 2nd, and 3rd cancers	3	0.1	1	0.0	4	0.1
1st, 2nd, 3rd, and additional cancers	0	0.0	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	9.9	—	7.8	—	8.8	—
Median year of 1st cancer diagnosis	1988.9	—	1989.0	—	1989.0	—
Median person-years at risk	3.3	—	4.0	—	3.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	100.0	—	96.4	—	98.4
1st, 2nd, and additional cancers	—	100.0	—	96.4	—	98.4
1st cancer only	—	0.0	—	3.6	—	1.6

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 17.1.2:** Risk of subsequent primary cancers after acute lymphocytic leukemia, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	7	0.80	19	1.24	19	2.10*	21	1.98*	66	43.79	1.51*	4.77
All excluding same site	7	0.82	19	1.28	19	2.17*	21	2.02*	66	42.46	1.55*	5.06
<b>Buccal cavity, pharynx</b>	0	0.00	1	2.55	1	4.61	3	12.44*	5	1.09	4.61*	0.84
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.03
Tongue	0	0.00	0	0.00	0	0.00	1	20.09	1	0.22	4.63	0.17
Salivary gland	0	0.00	1	22.87	1	30.31	1	21.91	3	0.14	20.78*	0.61
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.05
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.02
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.02
Oropharynx	0	0.00	0	0.00	0	0.00	1	253.03*	1	0.03	39.48	0.21
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.02
<b>Digestive system</b>	3	1.76	1	0.37	0	0.00	2	1.42	6	7.31	0.82	-0.28
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.08
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.75	0.00	-0.16
Small intestine	1	39.84	1	23.74	0	0.00	0	0.00	2	0.12	16.72*	0.40
Colon	1	1.35	0	0.00	0	0.00	0	0.00	1	3.18	0.31	-0.47
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	4.08	1	1.29	0.78	-0.06
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.02
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.07
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.02
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.03
Pancreas	1	5.00	0	0.00	0	0.00	0	0.00	1	0.84	1.19	0.03
<b>Respiratory system</b>	1	0.75	2	0.94	3	2.72	0	0.00	6	5.55	1.08	0.10
Nose, nasal cavity, ear	0	0.00	0	0.00	1	63.21	0	0.00	1	0.08	13.00	0.20
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.08
Lung, bronchus	1	0.82	2	1.04	2	2.00	0	0.00	5	5.02	1.00	0.00
<b>Female breast</b>	0	0.00	0	0.00	1	1.23	1	1.01	2	4.15	0.48	-1.03
<b>Female genital system</b>	0	0.00	0	0.00	1	2.37	0	0.00	1	2.21	0.45	-0.58
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.24
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.78	0.00	-0.37
Ovary	0	0.00	0	0.00	1	6.49	0	0.00	1	0.76	1.32	0.12
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.04
<b>Male genital system</b>	1	0.66	4	1.53	0	0.00	1	0.58	6	7.43	0.81	-0.55
Prostate	1	0.70	4	1.66	0	0.00	1	0.83	6	6.41	0.94	-0.16
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.37
<b>Urinary system</b>	1	1.51	2	1.79	0	0.00	1	1.69	4	2.97	1.35	0.22
Urinary bladder	1	2.39	1	1.43	0	0.00	1	2.57	3	1.90	1.58	0.24
Kidney parenchyma	0	0.00	1	2.75	0	0.00	0	0.00	1	0.92	1.09	0.02
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.03
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.01
<b>Bone, joints</b>	1	27.66	0	0.00	1	7.39	2	14.33*	4	0.44	9.12*	0.76
<b>Soft tissue including heart</b>	0	0.00	2	11.24*	1	7.97	0	0.00	3	0.55	5.44*	0.53
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.09
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	2	2.66	2	1.90	1.05	0.02
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.03
<b>Brain, central nervous system</b>	0	0.00	1	1.66	7	17.96*	3	7.83*	11	1.61	6.85*	2.02
<b>Thyroid</b>	0	0.00	1	4.43	2	10.08*	5	10.17*	8	1.01	7.90*	1.50
<b>Lymphatic, hematopoietic</b>	0	0.00	5	2.58	1	0.79	0	0.00	6	5.74	1.05	0.06
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.09	0.00	-0.24
Non-Hodgkin lymphoma	0	0.00	1	1.56	0	0.00	0	0.00	1	1.98	0.51	-0.21
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.09
Leukemia	0	0.00	4	4.48*	1	2.04	0	0.00	5	2.25	2.22	0.59
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.94	0.00	-0.20
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.07
Acute non-lymphocytic	0	0.00	4	18.07*	1	6.96	0	0.00	5	0.65	7.70*	0.93
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.04

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 20,836 PYR and for male cancers on 25,728 PYR.

# Acute Lymphocytic Leukemia Females

**Table 17.1.3:** Risk of subsequent primary cancers after acute lymphocytic leukemia, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	1	0.32	7	1.27	11	3.39*	10	2.32*	29	16.25	1.78*	6.12
All excluding same site	1	0.32	7	1.32	11	3.50*	10	2.36*	29	15.78	1.84*	6.34
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	1	17.60	1	13.54	2	0.28	7.17	0.83
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.03
Salivary gland	0	0.00	0	0.00	1	76.41	0	0.00	1	0.06	17.26	0.45
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.04
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Oropharynx	0	0.00	0	0.00	0	0.00	1	†	1	0.01	175.46*	0.48
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Digestive system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	2.50	0.00	-1.20
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.03
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.10
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.02
Colon	0	0.00	0	0.00	0	0.00	0	0.00	0	1.18	0.00	-0.57
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.19
Rectum	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.13
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.02
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.04
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.02
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.03
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.15
<b>Respiratory system</b>	0	0.00	1	1.83	1	3.49	0	0.00	2	1.47	1.36	0.25
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.03
Lung, bronchus	0	0.00	1	1.96	1	3.73	0	0.00	2	1.37	1.46	0.30
<b>Female breast</b>	0	0.00	0	0.00	1	1.23	1	1.01	2	4.15	0.48	-1.03
<b>Female genital system</b>	0	0.00	0	0.00	1	2.37	0	0.00	1	2.21	0.45	-0.58
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.24
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.78	0.00	-0.37
Ovary	0	0.00	0	0.00	1	6.49	0	0.00	1	0.76	1.32	0.12
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.04
<b>Urinary system</b>	1	6.88	1	4.20	0	0.00	0	0.00	2	0.62	3.24	0.66
Urinary bladder	1	13.99	0	0.00	0	0.00	0	0.00	1	0.30	3.37	0.34
Kidney parenchyma	0	0.00	1	8.72	0	0.00	0	0.00	1	0.28	3.54	0.34
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.02
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	1	14.18	1	19.90	0	0.00	2	0.22	9.12*	0.85
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	2	5.46	2	0.79	2.55	0.58
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.03
<b>Brain, central nervous system</b>	0	0.00	1	4.44	4	26.20*	3	20.81*	8	0.61	13.20*	3.55
<b>Thyroid</b>	0	0.00	0	0.00	1	7.01	3	7.81*	4	0.74	5.39*	1.56
<b>Lymphatic, hematopoietic</b>	0	0.00	3	4.56	0	0.00	0	0.00	3	2.00	1.50	0.48
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.22
Non-Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.29
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.07
Leukemia	0	0.00	3	9.30*	0	0.00	0	0.00	3	0.80	3.74	1.06
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.18
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.04
Acute non-lymphocytic	0	0.00	3	36.58*	0	0.00	0	0.00	3	0.24	12.28*	1.32
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.03

\*P < 0.05. †O/E > 500. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 17.1.4:** Risk of subsequent primary cancers after acute lymphocytic leukemia, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Number starting interval</b>	4,205		3,368		1,723		1,018		4,205			
<b>Person-years in interval</b>	3,100		9,333		6,621		6,674		25,728			
<b>All subsequent cancers</b>	6	1.08	12	1.22	8	1.38	11	1.74	37	27.54	1.34	3.68
All excluding same site	6	1.11	12	1.26	8	1.42	11	1.78	37	26.68	1.39	4.01
<b>Buccal cavity, pharynx</b>	0	0.00	1	3.36	0	0.00	2	11.96*	3	0.81	3.72	0.85
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.05
Tongue	0	0.00	0	0.00	0	0.00	1	28.61	1	0.16	6.28	0.33
Salivary gland	0	0.00	1	36.37	0	0.00	1	40.95	2	0.09	23.13*	0.74
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.07
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.02
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.03
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.03
<b>Digestive system</b>	3	2.73	1	0.56	0	0.00	2	2.12	6	4.81	1.25	0.46
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.11
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.54	0.00	-0.21
Small intestine	1	61.54	1	36.32	0	0.00	0	0.00	2	0.08	25.74*	0.75
Colon	1	2.23	0	0.00	0	0.00	0	0.00	1	2.00	0.50	-0.39
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	6.00	1	0.89	1.13	0.04
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.02
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.09
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.04
Pancreas	1	8.13	0	0.00	0	0.00	0	0.00	1	0.53	1.90	0.18
<b>Respiratory system</b>	1	1.01	1	0.63	2	2.45	0	0.00	4	4.08	0.98	-0.03
Nose, nasal cavity, ear	0	0.00	0	0.00	1	100.67*	0	0.00	1	0.05	20.19	0.37
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.13
Lung, bronchus	1	1.13	1	0.71	1	1.37	0	0.00	3	3.64	0.82	-0.25
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.02
<b>Male genital system</b>	1	0.66	4	1.53	0	0.00	1	0.58	6	7.43	0.81	-0.55
Prostate	1	0.70	4	1.66	0	0.00	1	0.83	6	6.41	0.94	-0.16
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.96	0.00	-0.37
<b>Urinary system</b>	0	0.00	1	1.13	0	0.00	1	2.12	2	2.35	0.85	-0.14
Urinary bladder	0	0.00	1	1.70	0	0.00	1	3.03	2	1.60	1.25	0.15
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.25
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.05
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.02
<b>Bone, joints</b>	1	41.97	0	0.00	1	12.03	2	22.27*	4	0.28	14.44*	1.45
<b>Soft tissue including heart</b>	0	0.00	1	9.31	0	0.00	0	0.00	1	0.33	3.01	0.26
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.16
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.11	0.00	-0.43
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.03
<b>Brain, central nervous system</b>	0	0.00	0	0.00	3	12.66*	0	0.00	3	1.00	3.00	0.78
<b>Thyroid</b>	0	0.00	1	13.79	1	17.99	2	18.61*	4	0.27	14.80*	1.45
<b>Lymphatic, hematopoietic</b>	0	0.00	2	1.57	1	1.20	0	0.00	3	3.74	0.80	-0.29
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.64	0.00	-0.25
Non-Hodgkin lymphoma	0	0.00	1	2.23	0	0.00	0	0.00	1	1.38	0.72	-0.15
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.10
Leukemia	0	0.00	1	1.75	1	3.17	0	0.00	2	1.45	1.38	0.21
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.58	0.00	-0.22
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.10
Acute non-lymphocytic	0	0.00	1	7.18	1	10.96	0	0.00	2	0.41	4.94	0.62
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.05

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Acute Lymphocytic Leukemia

## Both Sexes, <17 Years of Age

**Table 17.1.5:** Risk of subsequent primary cancers after acute lymphocytic leukemia, both sexes, <17 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	4,811	3,821	6	3.19*	13	7.87*	16	4.06*	36	8.08	4.45*	7.10
All excluding same site	4,811	3,821	6	4.09*	13	8.95*	16	4.19*	36	7.19	5.01*	7.33
<b>Buccal cavity, pharynx</b>	0	0.00	1	41.12	1	31.65	2	25.86*	4	0.14	28.84*	0.98
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Tongue	0	0.00	0	0.00	0	0.00	1	69.87	1	0.02	50.83	0.25
Salivary gland	0	0.00	1	119.23*	1	77.72*	1	37.53	3	0.05	60.63*	0.75
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.01
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Digestive system</b>	0	0.00	1	19.21	0	0.00	1	6.36	2	0.27	7.44	0.44
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Small intestine	0	0.00	1	†	0	0.00	0	0.00	1	0.01	113.27*	0.25
Colon	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.02
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.01
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.01
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	0.00
<b>Respiratory system</b>	0	0.00	0	0.00	1	48.54	0	0.00	1	0.12	8.07	0.22
Nose, nasal cavity, ear	0	0.00	0	0.00	1	207.29*	0	0.00	1	0.02	47.24	0.25
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Lung, bronchus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.01
<b>Female breast</b>	0	0.00	0	0.00	0	0.00	1	5.37	1	0.19	5.13	0.45
<b>Female genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.25
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.08
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.01
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.13
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.01
<b>Male genital system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.28
Prostate	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.27
<b>Urinary system</b>	0	0.00	0	0.00	0	0.00	1	13.64	1	0.25	3.97	0.19
Urinary bladder	0	0.00	0	0.00	0	0.00	1	25.87	1	0.06	18.06	0.24
Kidney parenchyma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.05
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Bone, joints</b>	1	49.21	0	0.00	1	8.20	2	15.50*	4	0.37	10.79*	0.92
<b>Soft tissue including heart</b>	0	0.00	1	9.70	1	11.92	0	0.00	2	0.35	5.66	0.42
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.03
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.15
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.02
<b>Brain, central nervous system</b>	0	0.00	1	2.46	7	24.61*	3	10.36*	11	1.10	9.98*	2.52
<b>Thyroid</b>	0	0.00	1	23.62	1	11.06	5	12.78*	7	0.53	13.18*	1.64
<b>Lymphatic, hematopoietic</b>	0	0.00	1	1.26	1	1.59	0	0.00	2	2.70	0.74	-0.18
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.20
Non-Hodgkin lymphoma	0	0.00	1	7.27	0	0.00	0	0.00	1	0.60	1.66	0.10
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	0.00
Leukemia	0	0.00	0	0.00	1	3.43	0	0.00	1	1.29	0.77	-0.07
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	0.00	-0.23
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
Acute non-lymphocytic	0	0.00	0	0.00	1	13.52	0	0.00	1	0.31	3.18	0.17
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.02

\*P < 0.05. †O/E > 500. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 18,065 PYR and for male cancers on 21,264 PYR.

## Acute Lymphocytic Leukemia Both Sexes, ≥17 Years of Age

**Table 17.1.6:** Risk of subsequent primary cancers after acute lymphocytic leukemia, both sexes, ≥17 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	6	0.74	13	0.96	6	0.81	5	0.75	30	35.70	0.84	-7.88
All excluding same site	6	0.75	13	0.97	6	0.82	5	0.76	30	35.27	0.85	-7.28
<b>Buccal cavity, pharynx</b>	0	0.00	0	0.00	0	0.00	1	6.11	1	0.95	1.06	0.07
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.20
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.20	0.00	-0.27
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.13
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.32
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.13
Oropharynx	0	0.00	0	0.00	0	0.00	1	262.50*	1	0.02	40.42	1.35
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.11
<b>Digestive system</b>	3	1.79	0	0.00	0	0.00	1	0.80	4	7.04	0.57	-4.21
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.48
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-1.00
Small intestine	1	40.28	0	0.00	0	0.00	0	0.00	1	0.11	9.02	1.23
Colon	1	1.35	0	0.00	0	0.00	0	0.00	1	3.12	0.32	-2.92
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	1	4.66	1	1.25	0.80	-0.35
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.11
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.37
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.12
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.21
Pancreas	1	5.01	0	0.00	0	0.00	0	0.00	1	0.83	1.21	0.24
<b>Respiratory system</b>	1	0.75	2	0.95	2	1.85	0	0.00	5	5.43	0.92	-0.59
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.08
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.53
Lung, bronchus	1	0.82	2	1.04	2	2.02	0	0.00	5	4.97	1.01	0.04
<b>Female breast</b>	0	0.00	0	0.00	1	1.24	0	0.00	1	3.96	0.25	-10.67
<b>Female genital system</b>	0	0.00	0	0.00	1	2.83	0	0.00	1	1.76	0.57	-2.75
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-1.27
Corpus uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-2.73
Ovary	0	0.00	0	0.00	1	9.37	0	0.00	1	0.53	1.90	1.71
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.25
<b>Male genital system</b>	1	0.67	4	1.55	0	0.00	1	0.78	6	6.84	0.88	-1.88
Prostate	1	0.70	4	1.66	0	0.00	1	0.84	6	6.41	0.94	-0.91
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.87
<b>Urinary system</b>	1	1.62	2	1.96	0	0.00	0	0.00	3	2.72	1.10	0.39
Urinary bladder	1	2.40	1	1.45	0	0.00	0	0.00	2	1.84	1.08	0.21
Kidney parenchyma	0	0.00	1	3.68	0	0.00	0	0.00	1	0.72	1.38	0.38
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.21
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.07
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.09
<b>Soft tissue including heart</b>	0	0.00	1	13.36	0	0.00	0	0.00	1	0.20	5.06	1.11
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.40
<b>Melanoma of skin</b>	0	0.00	0	0.00	0	0.00	2	6.89	2	1.30	1.54	0.97
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.08
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.70
<b>Thyroid</b>	0	0.00	0	0.00	1	9.27	0	0.00	1	0.48	2.08	0.72
<b>Lymphatic, hematopoietic</b>	0	0.00	4	3.49	0	0.00	0	0.00	4	3.03	1.32	1.34
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.29	0.00	-0.40
Non-Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	1.38	0.00	-1.90
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.56
Leukemia	0	0.00	4	10.94*	0	0.00	0	0.00	4	0.96	4.16*	4.20
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.08
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.46
Acute non-lymphocytic	0	0.00	4	31.29*	0	0.00	0	0.00	4	0.33	11.95*	5.07
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.20

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,771 PYR and for male cancers on 4,465 PYR.

## Acute Myeloid Leukemia Both Sexes

**Table 17.2.1:** Characteristics of patients with an initial acute myeloid leukemia, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	6,080	100.0	5,089	100.0	11,169	100.0
<b>Initial treatment</b>						
Any radiation	296	4.9	254	5.0	550	4.9
With surgery	4	0.1	2	0.0	6	0.1
Without surgery	292	4.8	252	5.0	544	4.9
No radiation	5,784	95.1	4,835	95.0	10,619	95.1
With surgery	12	0.2	14	0.3	26	0.2
Without surgery	5,772	94.9	4,821	94.7	10,593	94.8
<b>Race</b>						
White	5,152	84.7	4,285	84.2	9,437	84.5
Black	429	7.1	420	8.3	849	7.6
Other	486	8.0	374	7.3	860	7.7
Unknown	13	0.2	10	0.2	23	0.2
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	924	15.2	872	17.1	1,796	16.1
30–49	1,106	18.2	1,008	19.8	2,114	18.9
50–69	2,201	36.2	1,534	30.1	3,735	33.4
70–79	1,318	21.7	1,020	20.0	2,338	20.9
≥ 80	531	8.7	655	12.9	1,186	10.6
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	5,987	98.5	5,028	98.8	11,015	98.6
1st and 2nd cancers	91	1.5	59	1.2	150	1.3
1st, 2nd, and 3rd cancers	2	0.0	2	0.0	4	0.0
1st, 2nd, 3rd, and additional cancers	0	0.0	0	0.0	0	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	61.5	—	59.8	—	60.9	—
Median year of 1st cancer diagnosis	1989.0	—	1989.0	—	1989.0	—
Median person-years at risk	0.6	—	0.7	—	0.7	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	87.1	—	90.2	—	88.3
1st, 2nd, and additional cancers	—	87.1	—	90.2	—	88.3
1st cancer only	—	12.9	—	9.8	—	11.7

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 17.2.2:** Risk of subsequent primary cancers after acute myeloid leukemia, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	61	1.05	54	0.85	20	0.82	23	0.96	158	169.81	0.93	-5.35
All excluding same site	61	1.06	53	0.84	20	0.83	23	0.97	157	167.91	0.94	-4.94
<b>Buccal cavity, pharynx</b>	0	0.00	2	1.17	2	3.18	1	1.73	5	4.48	1.12	0.24
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.27
Tongue	0	0.00	0	0.00	0	0.00	1	7.84	1	0.92	1.08	0.03
Salivary gland	0	0.00	1	6.59	1	16.89	0	0.00	2	0.40	4.98	0.72
Mouth	0	0.00	1	2.27	1	6.18	0	0.00	2	1.16	1.73	0.38
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.21
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.12	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.20
<b>Digestive system</b>	8	0.63	14	1.05	3	0.62	4	0.83	29	35.61	0.81	-3.00
Esophagus	0	0.00	2	3.01	0	0.00	1	4.02	3	1.79	1.68	0.55
Stomach	1	0.75	0	0.00	1	2.01	0	0.00	2	3.70	0.54	-0.77
Small intestine	1	5.72	1	5.07	0	0.00	0	0.00	2	0.53	3.74	0.66
Colon	4	0.71	8	1.37	1	0.47	1	0.48	14	15.72	0.89	-0.78
Rectum, rectosigmoid junction	2	0.89	1	0.42	0	0.00	0	0.00	3	6.24	0.48	-1.47
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.17
Liver	0	0.00	0	0.00	1	5.06	2	9.19*	3	1.35	2.22	0.75
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.22
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.77	0.00	-0.35
Pancreas	0	0.00	2	1.26	0	0.00	0	0.00	2	4.26	0.47	-1.02
<b>Respiratory system</b>	11	1.11	10	0.96	2	0.53	1	0.27	24	27.90	0.86	-1.77
Nose, nasal cavity, ear	1	11.46	0	0.00	0	0.00	0	0.00	1	0.26	3.91	0.34
Larynx	1	1.44	0	0.00	0	0.00	0	0.00	1	1.89	0.53	-0.40
Lung, bronchus	9	0.98	10	1.04	2	0.57	1	0.29	22	25.66	0.86	-1.66
<b>Female breast</b>	2	0.34	2	0.25*	4	1.08	4	1.22	12	20.94	0.57	-8.10
<b>Female genital system</b>	1	0.36	2	0.56	1	0.64	3	2.23	7	9.24	0.76	-2.03
Cervix uteri	0	0.00	0	0.00	0	0.00	2	9.75*	2	1.39	1.44	0.55
Corpus uteri	0	0.00	1	0.59	1	1.38	0	0.00	2	4.40	0.45	-2.17
Ovary	1	1.26	0	0.00	0	0.00	1	2.39	2	2.74	0.73	-0.67
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.12
Vulva	0	0.00	1	7.02	0	0.00	0	0.00	1	0.38	2.61	0.56
<b>Male genital system</b>	17	1.51	9	0.81	1	0.27	3	0.68	30	30.56	0.98	-0.50
Prostate	16	1.44	9	0.83	1	0.28	3	0.70	29	29.80	0.97	-0.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.50
<b>Urinary system</b>	8	1.75	7	1.49	3	1.81	2	1.20	20	12.59	1.59	3.36
Urinary bladder	0	0.00	4	1.27	3	2.81	1	0.93	8	8.43	0.95	-0.20
Kidney parenchyma	7	6.19*	3	2.36	0	0.00	1	2.00	11	3.40	3.24*	3.44
Renal pelvis, other urinary	1	3.48	0	0.00	0	0.00	0	0.00	1	0.76	1.32	0.11
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.25	0.00	-0.11
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.78	0.00	-0.35
<b>Kaposi sarcoma</b>	0	0.00	1	4.37	0	0.00	0	0.00	1	0.57	1.75	0.19
<b>Melanoma of skin</b>	1	0.73	2	1.14	0	0.00	0	0.00	3	4.67	0.64	-0.76
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.26	0.00	-0.12
<b>Brain, central nervous system</b>	1	1.55	1	1.28	0	0.00	0	0.00	2	2.03	0.99	-0.01
<b>Thyroid</b>	6	14.65*	0	0.00	1	3.29	0	0.00	7	1.60	4.37*	2.45
<b>Lymphatic, hematopoietic</b>	3	0.68	3	0.61	2	1.03	4	2.14	12	13.10	0.92	-0.50
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.33
Non-Hodgkin lymphoma	2	1.04	1	0.45	1	1.08	2	2.22	6	5.98	1.00	0.01
Myeloma	0	0.00	1	1.32	0	0.00	1	3.44	2	2.04	0.98	-0.02
Leukemia	1	0.65	1	0.61	1	1.68	1	1.76	4	4.35	0.92	-0.16
Acute lymphocytic	0	0.00	0	0.00	1	26.33	0	0.00	1	0.23	4.42	0.35
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	5.04	1	1.59	0.63	-0.27
Acute non-lymphocytic	0	0.00	1	1.79	0	0.00	0	0.00	1	1.50	0.67	-0.22
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.61	0.00	-0.28

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 11,036 PYR and for male cancers on 11,037 PYR.

# Acute Myeloid Leukemia

## Females

**Table 17.2.3:** Risk of subsequent primary cancers after acute myeloid leukemia, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	19	0.93	22	0.84	11	0.94	11	1.05	63	68.86	0.91	-5.31
All excluding same site	19	0.94	22	0.85	11	0.95	11	1.06	63	68.13	0.92	-4.65
<b>Buccal cavity, pharynx</b>	0	0.00	1	2.15	2	9.90*	0	0.00	3	1.21	2.49	1.63
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.07
Tongue	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.24
Salivary gland	0	0.00	0	0.00	1	38.30	0	0.00	1	0.15	6.68	0.77
Mouth	0	0.00	1	6.56	1	15.27	0	0.00	2	0.40	5.02	1.45
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.05
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.10
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.03	0.00	-0.03
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.07
<b>Digestive system</b>	4	0.88	9	1.67	1	0.44	1	0.48	15	14.29	1.05	0.65
Esophagus	0	0.00	2	13.64*	0	0.00	0	0.00	2	0.39	5.11	1.46
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-1.07
Small intestine	1	15.66	1	12.47	0	0.00	0	0.00	2	0.22	9.13*	1.61
Colon	3	1.33	4	1.53	0	0.00	1	0.99	8	6.96	1.15	0.95
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	2.30	0.00	-2.08
Rectum	0	0.00	0	0.00	0	0.00	0	0.00	0	1.51	0.00	-1.37
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.19
Liver	0	0.00	0	0.00	1	17.25	0	0.00	1	0.34	2.95	0.60
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.29
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.29
Pancreas	0	0.00	2	2.91	0	0.00	0	0.00	2	1.84	1.09	0.14
<b>Respiratory system</b>	4	1.58	2	0.62	1	0.68	1	0.75	8	8.54	0.94	-0.49
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.08
Larynx	1	11.63	0	0.00	0	0.00	0	0.00	1	0.29	3.47	0.64
Lung, bronchus	3	1.24	2	0.66	1	0.71	1	0.79	7	8.14	0.86	-1.03
<b>Female breast</b>	2	0.34	2	0.25*	4	1.08	4	1.22	12	20.94	0.57	-8.10
<b>Female genital system</b>	1	0.36	2	0.56	1	0.64	3	2.23	7	9.24	0.76	-2.03
Cervix uteri	0	0.00	0	0.00	0	0.00	2	9.75*	2	1.39	1.44	0.55
Corpus uteri	0	0.00	1	0.59	1	1.38	0	0.00	2	4.40	0.45	-2.17
Ovary	1	1.26	0	0.00	0	0.00	1	2.39	2	2.74	0.73	-0.67
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.12
Vulva	0	0.00	1	7.02	0	0.00	0	0.00	1	0.38	2.61	0.56
<b>Urinary system</b>	1	1.07	3	2.61	0	0.00	1	2.15	5	3.05	1.64	1.76
Urinary bladder	0	0.00	2	3.05	0	0.00	1	3.82	3	1.75	1.71	1.13
Kidney parenchyma	1	3.22	1	2.49	0	0.00	0	0.00	2	1.07	1.88	0.85
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.24	0.00	-0.22
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.07
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.09
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.29
<b>Kaposi sarcoma</b>	0	0.00	1	118.35*	0	0.00	0	0.00	1	0.02	42.67	0.88
<b>Melanoma of skin</b>	0	0.00	1	1.45	0	0.00	0	0.00	1	1.83	0.55	-0.75
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.10
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.80	0.00	-0.72
<b>Thyroid</b>	4	15.55*	0	0.00	0	0.00	0	0.00	4	1.09	3.66	2.63
<b>Lymphatic, hematopoietic</b>	1	0.64	1	0.51	1	1.14	1	1.25	4	5.17	0.77	-1.06
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.27
Non-Hodgkin lymphoma	1	1.39	1	1.10	0	0.00	0	0.00	2	2.44	0.82	-0.40
Myeloma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.82	0.00	-0.75
Leukemia	0	0.00	0	0.00	1	3.85	1	4.22	2	1.60	1.25	0.36
Acute lymphocytic	0	0.00	0	0.00	1	56.38	0	0.00	1	0.10	10.48	0.82
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	1	12.67	1	0.55	1.80	0.40
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.53
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.20

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 17.2.4:** Risk of subsequent primary cancers after acute myeloid leukemia, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	42	1.12	32	0.85	9	0.72	12	0.89	95	100.94	0.94	-5.39
All excluding same site	42	1.13	31	0.84	9	0.73	12	0.90	94	99.78	0.94	-5.24
<b>Buccal cavity, pharynx</b>	0	0.00	1	0.81	0	0.00	1	2.45	2	3.27	0.61	-1.15
Lip	0	0.00	0	0.00	0	0.00	0	0.00	0	0.53	0.00	-0.48
Tongue	0	0.00	0	0.00	0	0.00	1	11.30	1	0.65	1.53	0.31
Salivary gland	0	0.00	1	10.61	0	0.00	0	0.00	1	0.25	3.97	0.68
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.76	0.00	-0.69
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.15
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.31
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.09
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.36	0.00	-0.32
<b>Digestive system</b>	4	0.49	5	0.63	2	0.77	3	1.11	14	21.33	0.66	-6.64
Esophagus	0	0.00	0	0.00	0	0.00	1	5.21	1	1.40	0.72	-0.36
Stomach	1	1.04	0	0.00	1	3.25	0	0.00	2	2.52	0.79	-0.47
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.32	0.00	-0.29
Colon	1	0.29	4	1.23	1	0.97	0	0.00	6	8.76	0.68	-2.50
Rectum, rectosigmoid junction	2	1.32	1	0.68	0	0.00	0	0.00	3	3.94	0.76	-0.85
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.15
Liver	0	0.00	0	0.00	0	0.00	2	12.18*	2	1.01	1.98	0.90
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.16
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.41
Pancreas	0	0.00	0	0.00	0	0.00	0	0.00	0	2.42	0.00	-2.19
<b>Respiratory system</b>	7	0.94	8	1.10	1	0.43	0	0.00	16	19.36	0.83	-3.04
Nose, nasal cavity, ear	1	16.79	0	0.00	0	0.00	0	0.00	1	0.16	6.10	0.76
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-1.45
Lung, bronchus	6	0.89	8	1.22	1	0.48	0	0.00	15	17.53	0.86	-2.29
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.17
<b>Male genital system</b>	17	1.51	9	0.81	1	0.27	3	0.68	30	30.56	0.98	-0.50
Prostate	16	1.44	9	0.83	1	0.28	3	0.70	29	29.80	0.97	-0.72
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.56	0.00	-0.50
<b>Urinary system</b>	7	1.93	4	1.13	3	2.60	1	0.83	15	9.53	1.57	4.95
Urinary bladder	0	0.00	2	0.80	3	3.83	0	0.00	5	6.68	0.75	-1.52
Kidney parenchyma	6	7.32*	2	2.30	0	0.00	1	3.03	9	2.33	3.86*	6.04
Renal pelvis, other urinary	1	4.77	0	0.00	0	0.00	0	0.00	1	0.52	1.91	0.43
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.16
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.12
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.42
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.50
<b>Melanoma of skin</b>	1	1.10	1	0.94	0	0.00	0	0.00	2	2.85	0.70	-0.77
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.14
<b>Brain, central nervous system</b>	1	2.40	1	2.12	0	0.00	0	0.00	2	1.23	1.63	0.70
<b>Thyroid</b>	2	13.14*	0	0.00	1	11.90	0	0.00	3	0.51	5.91*	2.26
<b>Lymphatic, hematopoietic</b>	2	0.71	2	0.68	1	0.94	3	2.81	8	7.92	1.01	0.07
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.43	0.00	-0.39
Non-Hodgkin lymphoma	1	0.83	0	0.00	1	1.99	2	3.90	4	3.53	1.13	0.42
Myeloma	0	0.00	1	2.22	0	0.00	1	6.04	2	1.22	1.64	0.71
Leukemia	1	0.96	1	0.97	0	0.00	0	0.00	2	2.74	0.73	-0.67
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.12
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.04	0.00	-0.94
Acute non-lymphocytic	0	0.00	1	2.95	0	0.00	0	0.00	1	0.91	1.10	0.08
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.38	0.00	-0.35

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



## Chronic Lymphocytic Leukemia Both Sexes

**Table 17.3.1:** Characteristics of patients with an initial chronic lymphocytic leukemia, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	11,528	100.0	8,103	100.0	19,631	100.0
<b>Initial treatment</b>						
Any radiation	285	2.5	171	2.1	456	2.3
With surgery	8	0.1	4	0.0	12	0.1
Without surgery	277	2.4	167	2.1	444	2.3
No radiation	11,243	97.5	7,932	97.9	19,175	97.7
With surgery	130	1.1	71	0.9	201	1.0
Without surgery	11,113	96.4	7,861	97.0	18,974	96.7
<b>Race</b>						
White	10,560	91.6	7,460	92.1	18,020	91.8
Black	705	6.1	494	6.1	1,199	6.1
Other	162	1.4	97	1.2	259	1.3
Unknown	101	0.9	52	0.6	153	0.8
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	7	0.1	9	0.1	16	0.1
30–49	804	7.0	345	4.3	1,149	5.9
50–69	5,567	48.3	3,049	37.6	8,616	43.9
70–79	3,360	29.1	2,616	32.3	5,976	30.4
≥ 80	1,790	15.5	2,084	25.7	3,874	19.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	9,842	85.4	7,313	90.3	17,155	87.4
1st and 2nd cancers	1,527	13.2	726	9.0	2,253	11.5
1st, 2nd, and 3rd cancers	148	1.3	59	0.7	207	1.1
1st, 2nd, 3rd, and additional cancers	11	0.1	5	0.1	16	0.1
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	68.3	—	72.4	—	70.0	—
Median year of 1st cancer diagnosis	1987.9	—	1988.0	—	1987.9	—
Median person-years at risk	4.4	—	4.8	—	4.6	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	92.0	—	89.6	—	91.2
1st, 2nd, and additional cancers	—	91.6	—	89.2	—	90.8
1st cancer only	—	4.9	—	6.1	—	5.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

**Table 17.3.2:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	353	1.26*	1,228	1.22*	728	1.13*	409	1.05	2,718	2,314.31	1.17*	35.06
All excluding same site	353	1.28*	1,228	1.24*	728	1.15*	409	1.07	2,718	2,284.29	1.19*	37.67
<b>Buccal cavity, pharynx</b>	9	1.24	29	1.15	15	1.00	8	0.99	61	55.73	1.09	0.46
Lip	4	3.07	7	1.60	6	2.35	4	2.91	21	9.62	2.18*	0.99
Tongue	1	0.72	3	0.62	1	0.34	1	0.63	6	10.82	0.55	-0.42
Salivary gland	2	3.16	5	2.20	3	2.06	2	2.21	12	5.26	2.28*	0.59
Mouth	2	1.05	6	0.90	2	0.51	1	0.47	11	14.67	0.75	-0.32
Nasopharynx	0	0.00	2	2.50	1	2.16	0	0.00	3	1.73	1.73	0.11
Tonsil	0	0.00	1	0.45	1	0.79	0	0.00	2	4.73	0.42	-0.24
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.50	0.00	-0.13
Hypopharynx	0	0.00	4	1.60	0	0.00	0	0.00	4	5.40	0.74	-0.12
<b>Digestive system</b>	74	1.13	259	1.11	166	1.13	89	1.01	588	533.47	1.10*	4.74
Esophagus	2	0.65	8	0.73	11	1.62	3	0.75	24	24.77	0.97	-0.07
Stomach	10	1.47	29	1.23	18	1.27	8	0.99	65	52.58	1.24	1.08
Small intestine	1	1.21	4	1.33	2	1.01	1	0.80	8	7.05	1.13	0.08
Colon	34	1.12	125	1.15	87	1.25*	42	0.99	288	251.10	1.15*	3.20
Rectum, rectosigmoid junction	13	1.15	41	1.03	25	1.03	23	1.66*	102	89.28	1.14	1.10
Anus, anal canal	1	1.86	1	0.52	1	0.80	1	1.34	4	4.47	0.89	-0.04
Liver	1	0.52	5	0.72	2	0.45	1	0.36	9	15.99	0.56	-0.61
Gallbladder	2	2.12	6	1.83	1	0.49	2	1.68	11	7.45	1.48	0.31
Bile ducts, other biliary	0	0.00	2	0.40	2	0.61	1	0.46	5	11.79	0.42*	-0.59
Pancreas	9	1.14	29	1.04	16	0.91	7	0.66	61	64.00	0.95	-0.26
<b>Respiratory system</b>	76	1.59*	278	1.63*	183	1.70*	94	1.50*	631	389.15	1.62*	21.00
Nose, nasal cavity, ear	2	4.89	3	2.08	4	4.44*	0	0.00	9	3.28	2.74*	0.50
Larynx	4	1.24	14	1.24	16	2.40*	5	1.46	39	24.60	1.59*	1.25
Lung, bronchus	69	1.57*	259	1.64*	163	1.63*	89	1.52*	580	360.30	1.61*	19.08
<b>Female breast</b>	14	0.59*	92	1.06	50	0.86	31	0.85	187	205.54	0.91	-3.69
<b>Female genital system</b>	7	0.64	32	0.82	15	0.60*	14	0.94	68	90.06	0.76*	-4.39
Cervix uteri	0	0.00	4	1.03	1	0.45	1	0.87	6	8.40	0.71	-0.48
Corpus uteri	2	0.36	16	0.80	7	0.56	3	0.40	28	45.59	0.61*	-3.50
Ovary	4	1.25	7	0.60	6	0.79	7	1.49	24	27.04	0.89	-0.61
Vagina	0	0.00	0	0.00	0	0.00	1	3.69	1	1.59	0.63	-0.12
Vulva	1	1.70	5	2.31	1	0.69	2	2.05	9	5.18	1.74	0.76
<b>Male genital system</b>	71	1.22	214	1.01	133	0.96	63	0.75*	481	491.50	0.98	-1.62
Prostate	70	1.22	210	1.00	132	0.96	61	0.73*	473	487.22	0.97	-2.19
Testis	1	5.57	1	1.74	0	0.00	0	0.00	2	1.15	1.74	0.13
<b>Urinary system</b>	42	1.79*	100	1.19	48	0.89	35	1.07	225	193.82	1.16*	2.71
Urinary bladder	20	1.20	68	1.14	31	0.81	27	1.15	146	138.13	1.06	0.68
Kidney parenchyma	18	3.46*	23	1.22	15	1.23	6	0.82	62	43.56	1.42*	1.60
Renal pelvis, other urinary	4	2.65	9	1.69	2	0.60	2	1.02	17	12.13	1.40	0.42
Ureter	2	4.00	5	2.82	0	0.00	0	0.00	7	4.04	1.73	0.26
<b>Bone, joints</b>	0	0.00	1	1.22	1	2.01	0	0.00	2	1.83	1.09	0.02
<b>Soft tissue including heart</b>	3	2.83	6	1.59	4	1.67	1	0.66	14	8.73	1.60	0.46
<b>Kaposi sarcoma</b>	4	12.63*	4	3.74*	4	6.47*	0	0.00	12	2.33	5.14*	0.84
<b>Melanoma of skin</b>	18	3.25*	52	2.53*	31	2.25*	27	3.05*	128	48.68	2.63*	6.89
<b>Eye, orbit</b>	1	2.44	3	2.09	1	1.12	0	0.00	5	3.26	1.54	0.15
<b>Brain, central nervous system</b>	4	1.51	11	1.16	8	1.33	1	0.29	24	21.67	1.11	0.20
<b>Thyroid</b>	4	3.45	6	1.46	1	0.40	0	0.00	11	9.21	1.19	0.16
<b>Lymphatic, hematopoietic</b>	11	0.52*	83	1.09	43	0.88	27	0.88	164	176.80	0.93	-1.11
Hodgkin lymphoma	1	1.57	16	7.39*	10	7.90*	8	11.76*	35	4.75	7.37*	2.63
Non-Hodgkin lymphoma	7	0.78	44	1.34	23	1.05	13	0.93	87	77.74	1.12	0.80
Myeloma	2	0.55	12	0.92	7	0.84	3	0.58	24	30.23	0.79	-0.54
Leukemia	1	0.13*	11	0.39*	3	0.17*	3	0.28*	18	64.09	0.28*	-4.00
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-0.14
Chronic lymphocytic	0	0.00	0	0.00*	0	0.00*	0	0.00*	0	26.03	0.00*	-2.26
Acute non-lymphocytic	1	0.39	7	0.76	2	0.34	2	0.55	12	21.29	0.56*	-0.81
Chronic myeloid	0	0.00	3	0.81	1	0.43	0	0.00	4	8.59	0.47	-0.40

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 50,255 PYR and for male cancers on 64,887 PYR.

## Chronic Lymphocytic Leukemia Both Sexes, Long-term Follow-up

**Table 17.3.3:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, long-term follow-up, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<10 years		10-14 years		15-19 years		≥20 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	2,309	1.20*	291	1.09	97	1.01	21	0.85	2,718	2,314.31	1.17*	35.06
All excluding same site	2,309	1.21*	291	1.10	97	1.02	21	0.86	2,718	2,284.29	1.19*	37.67
<b>Buccal cavity, pharynx</b>	53	1.11	6	1.05	2	1.04	0	0.00	61	55.73	1.09	0.46
Lip	17	2.06*	4	4.15*	0	0.00	0	0.00	21	9.62	2.18*	0.99
Tongue	5	0.54	0	0.00	1	2.63	0	0.00	6	10.82	0.55	-0.42
Salivary gland	10	2.29*	2	3.28	0	0.00	0	0.00	12	5.26	2.28*	0.59
Mouth	10	0.80	0	0.00	1	1.95	0	0.00	11	14.67	0.75	-0.32
Nasopharynx	3	2.00	0	0.00	0	0.00	0	0.00	3	1.73	1.73	0.11
Tonsil	2	0.49	0	0.00	0	0.00	0	0.00	2	4.73	0.42	-0.24
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.50	0.00	-0.13
Hypopharynx	4	0.85	0	0.00	0	0.00	0	0.00	4	5.40	0.74	-0.12
<b>Digestive system</b>	499	1.12*	62	1.03	23	1.05	4	0.68	588	533.47	1.10*	4.74
Esophagus	21	1.01	1	0.36	2	2.02	0	0.00	24	24.77	0.97	-0.07
Stomach	57	1.28	5	0.89	3	1.51	0	0.00	65	52.58	1.24	1.08
Small intestine	7	1.21	1	1.18	0	0.00	0	0.00	8	7.05	1.13	0.08
Colon	246	1.18*	27	0.93	11	1.04	4	1.38	288	251.10	1.15*	3.20
Rectum, rectosigmoid junction	79	1.05	20	2.07*	3	0.90	0	0.00	102	89.28	1.14	1.10
Anus, anal canal	3	0.80	1	1.96	0	0.00	0	0.00	4	4.47	0.89	-0.04
Liver	8	0.60	0	0.00	1	1.42	0	0.00	9	15.99	0.56	-0.61
Gallbladder	9	1.44	2	2.45	0	0.00	0	0.00	11	7.45	1.48	0.31
Bile ducts, other biliary	4	0.42	0	0.00	1	1.75	0	0.00	5	11.79	0.42*	-0.59
Pancreas	54	1.01	5	0.69	2	0.75	0	0.00	61	64.00	0.95	-0.26
<b>Respiratory system</b>	537	1.65*	74	1.70*	14	0.91	6	1.52	631	389.15	1.62*	21.00
Nose, nasal cavity, ear	9	3.27*	0	0.00	0	0.00	0	0.00	9	3.28	2.74*	0.50
Larynx	34	1.61*	5	2.03	0	0.00	0	0.00	39	24.60	1.59*	1.25
Lung, bronchus	491	1.63*	69	1.70*	14	0.97	6	1.61	580	360.30	1.61*	19.08
<b>Female breast</b>	156	0.92	22	0.89	7	0.76	2	0.76	187	205.54	0.91	-3.69
<b>Female genital system</b>	54	0.72*	11	1.08	2	0.54	1	0.97	68	90.06	0.76*	-4.39
Cervix uteri	5	0.69	1	1.23	0	0.00	0	0.00	6	8.40	0.71	-0.48
Corpus uteri	25	0.66*	1	0.20	1	0.54	1	1.96	28	45.59	0.61*	-3.50
Ovary	17	0.76	6	1.89	1	0.84	0	0.00	24	27.04	0.89	-0.61
Vagina	0	0.00	1	5.44	0	0.00	0	0.00	1	1.59	0.63	-0.12
Vulva	7	1.67	2	3.09	0	0.00	0	0.00	9	5.18	1.74	0.76
<b>Male genital system</b>	418	1.03	45	0.77	16	0.77	2	0.45	481	491.50	0.98	-1.62
Prostate	412	1.02	43	0.74*	16	0.78	2	0.45	473	487.22	0.97	-2.19
Testis	2	1.93	0	0.00	0	0.00	0	0.00	2	1.15	1.74	0.13
<b>Urinary system</b>	190	1.18*	22	0.98	12	1.46	1	0.46	225	193.82	1.16*	2.71
Urinary bladder	119	1.04	17	1.06	9	1.52	1	0.63	146	138.13	1.06	0.68
Kidney parenchyma	56	1.55*	5	0.99	1	0.55	0	0.00	62	43.56	1.42*	1.60
Renal pelvis, other urinary	15	1.48	0	0.00	2	4.09	0	0.00	17	12.13	1.40	0.42
Ureter	7	2.07	0	0.00	0	0.00	0	0.00	7	4.04	1.73	0.26
<b>Bone, joints</b>	2	1.29	0	0.00	0	0.00	0	0.00	2	1.83	1.09	0.02
<b>Soft tissue including heart</b>	13	1.80	1	0.99	0	0.00	0	0.00	14	8.73	1.60	0.46
<b>Kaposi sarcoma</b>	12	5.99*	0	0.00	0	0.00	0	0.00	12	2.33	5.14*	0.84
<b>Melanoma of skin</b>	101	2.54*	15	2.52*	9	3.96*	3	4.68	128	48.68	2.63*	6.89
<b>Eye, orbit</b>	5	1.83	0	0.00	0	0.00	0	0.00	5	3.26	1.54	0.15
<b>Brain, central nervous system</b>	23	1.27	1	0.41	0	0.00	0	0.00	24	21.67	1.11	0.20
<b>Thyroid</b>	11	1.41	0	0.00	0	0.00	0	0.00	11	9.21	1.19	0.16
<b>Lymphatic, hematopoietic</b>	137	0.94	17	0.82	10	1.29	0	0.00	164	176.80	0.93	-1.11
Hodgkin lymphoma	27	6.64*	5	10.51*	3	18.31*	0	0.00	35	4.75	7.37*	2.63
Non-Hodgkin lymphoma	74	1.16	9	0.96	4	1.12	0	0.00	87	77.74	1.12	0.80
Myeloma	21	0.84	1	0.29	2	1.54	0	0.00	24	30.23	0.79	-0.54
Leukemia	15	0.28*	2	0.27*	1	0.37	0	0.00	18	64.09	0.28*	-4.00
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.61	0.00	-0.14
Chronic lymphocytic	0	0.00*	0	0.00	0	0.00	0	0.00	0	26.03	0.00*	-2.26
Acute non-lymphocytic	10	0.57	1	0.40	1	1.07	0	0.00	12	21.29	0.56*	-0.81
Chronic myeloid	4	0.56	0	0.00	0	0.00	0	0.00	4	8.59	0.47	-0.40

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 50,255 PYR and for male cancers on 64,887 PYR.

**Table 17.3.4:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	99	1.10	393	1.19*	218	0.99	150	1.07	860	779.49	1.10*	16.02
All excluding same site	99	1.11	393	1.21*	218	1.01	150	1.08	860	769.88	1.12*	17.93
<b>Buccal cavity, pharynx</b>	3	1.89	4	0.70	2	0.53	0	0.00	9	13.37	0.67	-0.87
Lip	0	0.00	0	0.00	1	3.26	0	0.00	1	1.09	0.92	-0.02
Tongue	0	0.00	1	0.80	0	0.00	0	0.00	1	2.91	0.34	-0.38
Salivary gland	1	5.63	0	0.00	0	0.00	0	0.00	1	1.52	0.66	-0.10
Mouth	2	3.52	1	0.48	1	0.75	0	0.00	4	4.81	0.83	-0.16
Nasopharynx	0	0.00	1	5.25	0	0.00	0	0.00	1	0.44	2.29	0.11
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	1.01	0.00	-0.20
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.06
Hypopharynx	0	0.00	1	2.75	0	0.00	0	0.00	1	0.83	1.21	0.03
<b>Digestive system</b>	28	1.18	109	1.27*	64	1.12	37	1.01	238	203.33	1.17*	6.90
Esophagus	0	0.00	0	0.00	1	0.68	0	0.00	1	5.22	0.19	-0.84
Stomach	6	3.15*	12	1.78	8	1.85	2	0.75	28	15.64	1.79*	2.46
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	2.63	0.00	-0.52
Colon	12	0.99	59	1.34*	40	1.36	24	1.26	135	104.77	1.29*	6.02
Rectum, rectosigmoid junction	3	0.82	15	1.14	11	1.30	7	1.36	36	30.38	1.18	1.12
Rectum	2	0.83	12	1.39	10	1.80	6	1.75	30	19.97	1.50*	2.00
Anus, anal canal	1	3.65	0	0.00	0	0.00	0	0.00	1	2.39	0.42	-0.28
Liver	1	2.28	2	1.24	0	0.00	0	0.00	3	3.90	0.77	-0.18
Gallbladder	1	1.75	5	2.47	0	0.00	2	2.64	8	4.63	1.73	0.67
Bile ducts, other biliary	0	0.00	0	0.00	1	0.78	1	1.11	2	4.55	0.44	-0.51
Pancreas	4	1.31	10	0.89	3	0.40	1	0.20	18	26.75	0.67	-1.74
<b>Respiratory system</b>	21	1.93*	66	1.61*	39	1.36	32	1.67*	158	99.62	1.59*	11.62
Nose, nasal cavity, ear	1	8.16	0	0.00	2	6.58	0	0.00	3	1.07	2.80	0.38
Larynx	0	0.00	3	2.46	1	1.26	0	0.00	4	2.81	1.42	0.24
Lung, bronchus	20	1.93*	62	1.58*	36	1.31	32	1.73*	150	95.47	1.57*	10.85
<b>Female breast</b>	14	0.59*	92	1.06	50	0.86	31	0.85	187	205.54	0.91	-3.69
<b>Female genital system</b>	7	0.64	32	0.82	15	0.60*	14	0.94	68	90.06	0.76*	-4.39
Cervix uteri	0	0.00	4	1.03	1	0.45	1	0.87	6	8.40	0.71	-0.48
Corpus uteri	2	0.36	16	0.80	7	0.56	3	0.40	28	45.59	0.61*	-3.50
Ovary	4	1.25	7	0.60	6	0.79	7	1.49	24	27.04	0.89	-0.61
Vagina	0	0.00	0	0.00	0	0.00	1	3.69	1	1.59	0.63	-0.12
Vulva	1	1.70	5	2.31	1	0.69	2	2.05	9	5.18	1.74	0.76
<b>Urinary system</b>	9	1.97	24	1.42	14	1.23	8	1.07	55	40.27	1.37*	2.93
Urinary bladder	4	1.41	14	1.35	11	1.58	6	1.30	35	24.82	1.41	2.03
Kidney parenchyma	3	2.24	6	1.21	3	0.88	1	0.44	13	12.00	1.08	0.20
Renal pelvis, other urinary	2	4.98	4	2.73	0	0.00	1	1.61	7	3.46	2.02	0.70
Ureter	1	7.97	2	4.35	0	0.00	0	0.00	3	1.08	2.78	0.38
<b>Bone, joints</b>	0	0.00	1	3.42	0	0.00	0	0.00	1	0.68	1.48	0.06
<b>Soft tissue including heart</b>	0	0.00	2	1.56	1	1.17	1	1.77	4	3.05	1.31	0.19
<b>Kaposi sarcoma</b>	2	45.42*	2	12.08*	2	17.53*	0	0.00	6	0.40	14.99*	1.11
<b>Melanoma of skin</b>	7	4.60*	10	1.77	9	2.34*	6	2.33	32	13.60	2.35*	3.66
<b>Eye, orbit</b>	0	0.00	1	2.05	1	3.24	0	0.00	2	1.12	1.78	0.17
<b>Brain, central nervous system</b>	0	0.00	1	0.31	2	0.94	1	0.76	4	7.49	0.53	-0.70
<b>Thyroid</b>	0	0.00	1	0.46	1	0.73	0	0.00	2	4.93	0.41	-0.58
<b>Lymphatic, hematopoietic</b>	1	0.14*	26	0.97	11	0.61	13	1.08	51	64.22	0.79	-2.63
Hodgkin lymphoma	0	0.00	4	5.70*	2	4.53	4	15.30*	10	1.60	6.23*	1.67
Non-Hodgkin lymphoma	0	0.00	17	1.37	5	0.58	5	0.86	27	30.20	0.89	-0.64
Myeloma	1	0.78	2	0.43	3	0.96	3	1.48	9	11.11	0.81	-0.42
Leukemia	0	0.00	3	0.33*	1	0.17*	1	0.26	5	21.30	0.23*	-3.24
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.55	0.00	-0.11
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	8.45	0.00*	-1.68
Acute non-lymphocytic	0	0.00	3	0.98	1	0.49	0	0.00	4	7.32	0.55	-0.66
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	2.88	0.00	-0.57

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Chronic Lymphocytic Leukemia

## Males

**Table 17.3.5:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	11,528	8,866										
	10,037	30,203										
	5,378	17,171										
	1,982	8,647										
	11,528	64,887										
<b>All subsequent cancers</b>	254	1.34*	835	1.24*	510	1.21*	259	1.05	1,858	1,534.82	1.21*	49.81
All excluding same site	254	1.36*	835	1.25*	510	1.22*	259	1.06	1,858	1,514.40	1.23*	52.95
<b>Buccal cavity, pharynx</b>	6	1.06	25	1.28	13	1.15	8	1.38	52	42.36	1.23	1.49
Lip	4	3.40	7	1.78	5	2.22	4	3.41	20	8.53	2.34*	1.77
Tongue	1	0.96	2	0.55	1	0.47	1	0.91	5	7.91	0.63	-0.45
Salivary gland	1	2.19	5	3.07	3	2.92	2	3.17	11	3.74	2.94*	1.12
Mouth	0	0.00	5	1.09	1	0.38	1	0.77	7	9.86	0.71	-0.44
Nasopharynx	0	0.00	1	1.64	1	2.92	0	0.00	2	1.30	1.54	0.11
Tonsil	0	0.00	1	0.57	1	1.01	0	0.00	2	3.72	0.54	-0.27
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-0.18
Hypopharynx	0	0.00	3	1.40	0	0.00	0	0.00	3	4.58	0.66	-0.24
<b>Digestive system</b>	46	1.09	150	1.02	102	1.14	52	1.01	350	330.14	1.06	3.06
Esophagus	2	0.81	8	0.92	10	1.87	3	0.98	23	19.55	1.18	0.53
Stomach	4	0.81	17	1.01	10	1.02	6	1.10	37	36.94	1.00	0.01
Small intestine	1	1.87	4	2.07	2	1.64	1	1.36	8	4.42	1.81	0.55
Colon	22	1.20	66	1.02	47	1.18	18	0.77	153	146.33	1.05	1.03
Rectum, rectosigmoid junction	10	1.31	26	0.98	14	0.88	16	1.84*	66	58.90	1.12	1.09
Anus, anal canal	0	0.00	1	1.07	1	1.74	1	3.16	3	2.09	1.44	0.14
Liver	0	0.00	3	0.57	2	0.60	1	0.50	6	12.09	0.50	-0.94
Gallbladder	1	2.69	1	0.79	1	1.34	0	0.00	3	2.81	1.07	0.03
Bile ducts, other biliary	0	0.00	2	0.64	1	0.50	0	0.00	3	7.24	0.41	-0.65
Pancreas	5	1.04	19	1.14	13	1.29	6	1.05	43	37.25	1.15	0.89
<b>Respiratory system</b>	55	1.49*	212	1.63*	144	1.82*	62	1.42*	473	289.53	1.63*	28.27
Nose, nasal cavity, ear	1	3.49	3	3.02	2	3.35	0	0.00	6	2.21	2.71	0.58
Larynx	4	1.38	11	1.09	15	2.55*	5	1.69	35	21.78	1.61*	2.04
Lung, bronchus	49	1.46*	197	1.66*	127	1.75*	57	1.41*	430	264.83	1.62*	25.46
<b>Male breast</b>	1	2.79	3	2.38	2	2.56	0	0.00	6	2.86	2.10	0.48
<b>Male genital system</b>	71	1.22	214	1.01	133	0.96	63	0.75*	481	491.50	0.98	-1.62
Prostate	70	1.22	210	1.00	132	0.96	61	0.73*	473	487.22	0.97	-2.19
Testis	1	5.57	1	1.74	0	0.00	0	0.00	2	1.15	1.74	0.13
<b>Urinary system</b>	33	1.75*	76	1.13	34	0.80	27	1.06	170	153.55	1.11	2.54
Urinary bladder	16	1.15	54	1.10	20	0.64*	21	1.11	111	113.31	0.98	-0.36
Kidney parenchyma	15	3.88*	17	1.22	12	1.37	5	0.99	49	31.57	1.55*	2.69
Renal pelvis, other urinary	2	1.81	5	1.29	2	0.85	1	0.74	10	8.67	1.15	0.20
Ureter	1	2.67	3	2.28	0	0.00	0	0.00	4	2.96	1.35	0.16
<b>Bone, joints</b>	0	0.00	0	0.00	1	3.23	0	0.00	1	1.15	0.87	-0.02
<b>Soft tissue including heart</b>	3	4.24	4	1.61	3	1.95	0	0.00	10	5.68	1.76	0.67
<b>Kaposi sarcoma</b>	2	7.34	2	2.22	2	3.97	0	0.00	6	1.93	3.10*	0.63
<b>Melanoma of skin</b>	11	2.74*	42	2.83*	22	2.22*	21	3.34*	96	35.08	2.74*	9.39
<b>Eye, orbit</b>	1	3.67	2	2.10	0	0.00	0	0.00	3	2.13	1.41	0.13
<b>Brain, central nervous system</b>	4	2.25	10	1.58	6	1.54	0	0.00	20	14.17	1.41	0.90
<b>Thyroid</b>	4	7.26*	5	2.57	0	0.00	0	0.00	9	4.28	2.10	0.73
<b>Lymphatic, hematopoietic</b>	10	0.72	57	1.16	32	1.04	14	0.75	113	112.58	1.00	0.06
Hodgkin lymphoma	1	2.29	12	8.20*	8	9.71*	4	9.55*	25	3.14	7.95*	3.37
Non-Hodgkin lymphoma	7	1.24	27	1.32	18	1.36	8	0.98	60	47.54	1.26	1.92
Myeloma	1	0.42	10	1.19	4	0.77	0	0.00	15	19.12	0.78	-0.63
Leukemia	1	0.18	8	0.42*	2	0.17*	2	0.29	13	42.79	0.30*	-4.59
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.06	0.00	-0.16
Chronic lymphocytic	0	0.00	0	0.00*	0	0.00*	0	0.00	0	17.58	0.00*	-2.71
Acute non-lymphocytic	1	0.58	4	0.65	1	0.26	2	0.87	8	13.97	0.57	-0.92
Chronic myeloid	0	0.00	3	1.20	1	0.65	0	0.00	4	5.71	0.70	-0.26

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

**Table 17.3.6:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, <50 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	9	3.66*	20	1.62	19	1.39	38	2.00*	86	47.59	1.81*	43.17
All excluding same site	9	3.70*	20	1.63	19	1.40	38	2.02*	86	47.04	1.83*	43.79
<b>Buccal cavity, pharynx</b>	0	0.00	1	1.73	2	3.33	1	1.60	4	1.92	2.08	2.34
Lip	0	0.00	0	0.00	1	17.07	1	16.04	2	0.20	10.18*	2.03
Tongue	0	0.00	0	0.00	1	7.27	0	0.00	1	0.44	2.28	0.63
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.16
Mouth	0	0.00	1	6.79	0	0.00	0	0.00	1	0.49	2.04	0.57
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.09	0.00	-0.10
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.27	0.00	-0.30
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.06
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.19	0.00	-0.21
<b>Digestive system</b>	1	2.70	0	0.00	0	0.00	7	2.11	8	8.01	1.00	-0.02
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.59	0.00	-0.66
Stomach	0	0.00	0	0.00	0	0.00	1	3.33	1	0.79	1.27	0.24
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	0.00	-0.20
Colon	1	7.59	0	0.00	0	0.00	3	2.27	4	3.04	1.31	1.07
Rectum, rectosigmoid junction	0	0.00	0	0.00	0	0.00	0	0.00	0	1.63	0.00	-1.83
Anus, anal canal	0	0.00	0	0.00	0	0.00	1	20.89	1	0.14	7.03	0.96
Liver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.41
Gallbladder	0	0.00	0	0.00	0	0.00	1	32.79	1	0.07	14.42	1.05
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.17
Pancreas	0	0.00	0	0.00	0	0.00	1	2.51	1	0.96	1.04	0.05
<b>Respiratory system</b>	3	8.66*	6	3.07*	8	3.32*	9	2.60*	26	8.17	3.18*	20.04
Nose, nasal cavity, ear	0	0.00	1	36.08	0	0.00	0	0.00	1	0.09	11.00	1.02
Larynx	1	25.75	0	0.00	0	0.00	0	0.00	1	0.80	1.25	0.22
Lung, bronchus	2	6.67	5	2.94	8	3.77*	9	2.88*	24	7.25	3.31*	18.82
<b>Female breast</b>	0	0.00	1	0.49	2	1.01	1	0.50	4	6.47	0.62	-8.66
<b>Female genital system</b>	0	0.00	0	0.00	1	1.27	0	0.00	1	2.56	0.39	-5.46
Cervix uteri	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-1.55
Corpus uteri	0	0.00	0	0.00	1	2.70	0	0.00	1	1.19	0.84	-0.65
Ovary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.79	0.00	-2.75
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.02	0.00	-0.08
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.26
<b>Male genital system</b>	2	13.74*	1	1.03	2	1.22	8	1.89	13	6.99	1.86	9.94
Prostate	1	10.47	1	1.24	2	1.30	8	1.92	12	6.61	1.81	8.91
Testis	1	21.96	0	0.00	0	0.00	0	0.00	1	0.31	3.26	1.15
<b>Urinary system</b>	1	5.83	0	0.00	1	0.95	3	2.04	5	3.61	1.39	1.57
Urinary bladder	0	0.00	0	0.00	0	0.00	2	2.20	2	2.11	0.95	-0.12
Kidney parenchyma	1	13.83	0	0.00	1	2.48	1	2.02	3	1.34	2.23	1.86
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.17
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-0.05
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.07	0.00	-0.08
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.32
<b>Kaposi sarcoma</b>	0	0.00	1	5.33	0	0.00	0	0.00	1	0.40	2.51	0.68
<b>Melanoma of skin</b>	0	0.00	3	3.82	1	1.44	4	5.91*	8	2.34	3.42*	6.37
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.10	0.00	-0.11
<b>Brain, central nervous system</b>	1	16.46	1	3.67	0	0.00	0	0.00	2	0.83	2.42	1.32
<b>Thyroid</b>	1	16.29	0	0.00	0	0.00	0	0.00	1	0.67	1.49	0.37
<b>Lymphatic, hematopoietic</b>	0	0.00	5	4.23*	1	0.86	4	2.94	10	3.95	2.53*	6.80
Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	2	34.55*	2	0.28	7.21	1.94
Non-Hodgkin lymphoma	0	0.00	3	4.75	0	0.00	2	2.90	5	2.06	2.43	3.30
Myeloma	0	0.00	1	7.89	0	0.00	0	0.00	1	0.51	1.97	0.55
Leukemia	0	0.00	1	3.18	1	3.08	0	0.00	2	1.11	1.80	1.00
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	0.00	-0.07
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.41	0.00	-0.46
Acute non-lymphocytic	0	0.00	1	9.60	1	9.92	0	0.00	2	0.36	5.62	1.85
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 2,854 PYR and for male cancers on 6,044 PYR.



## Chronic Lymphocytic Leukemia Both Sexes, 50-59 Years of Age

**Table 17.3.7:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, 50-59 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	3,103	2,487	42	2.19*	139	1.48*	137	1.39*	138	1.27*	456	320.18	1.42*	56.06
All excluding same site			42	2.22*	139	1.50*	137	1.41*	138	1.28*	456	316.50	1.44*	57.58
<b>Buccal cavity, pharynx</b>			2	2.28	3	0.78	4	1.23	3	1.20	12	10.48	1.14	0.63
Lip			0	0.00	1	2.34	2	5.14	1	2.84	4	1.26	3.16	1.13
Tongue			1	5.39	0	0.00	0	0.00	1	1.90	2	2.23	0.90	-0.09
Salivary gland			1	19.21	0	0.00	1	4.63	1	4.48	3	0.72	4.14	0.94
Mouth			0	0.00	1	0.95	1	1.17	0	0.00	2	2.78	0.72	-0.32
Nasopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.39	0.00	-0.16
Tonsil			0	0.00	0	0.00	0	0.00	0	0.00	0	1.17	0.00	-0.48
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.14
Hypopharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	1.19	0.00	-0.49
<b>Digestive system</b>			6	1.64	20	1.11	15	0.81	24	1.14	65	61.25	1.06	1.55
Esophagus			0	0.00	0	0.00	0	0.00	2	1.67	2	4.10	0.49	-0.87
Stomach			1	2.66	1	0.55	2	1.15	1	0.54	5	5.77	0.87	-0.32
Small intestine			0	0.00	1	3.21	0	0.00	0	0.00	1	1.02	0.98	-0.01
Colon			2	1.43	10	1.41	8	1.04	12	1.27	32	25.62	1.25	2.63
Rectum, rectosigmoid junction			3	3.95	5	1.35	3	0.81	4	1.09	15	11.84	1.27	1.30
Anus, anal canal			0	0.00	1	4.25	0	0.00	0	0.00	1	0.73	1.38	0.11
Liver			0	0.00	1	1.47	0	0.00	0	0.00	1	2.30	0.43	-0.54
Gallbladder			0	0.00	0	0.00	0	0.00	1	4.02	1	0.63	1.58	0.15
Bile ducts, other biliary			0	0.00	0	0.00	0	0.00	0	0.00	0	1.20	0.00	-0.50
Pancreas			0	0.00	1	0.46	2	0.90	4	1.54	7	7.43	0.94	-0.18
<b>Respiratory system</b>			12	3.01*	44	2.25*	52	2.64*	35	1.77*	143	63.03	2.27*	33.01
Nose, nasal cavity, ear			0	0.00	0	0.00	2	13.24*	0	0.00	2	0.50	4.00	0.62
Larynx			0	0.00	0	0.00	3	1.81	3	2.46	6	5.17	1.16	0.34
Lung, bronchus			12	3.40*	44	2.52*	47	2.63*	32	1.74*	135	57.21	2.36*	32.11
<b>Female breast</b>			2	0.92	7	0.73	8	0.87	10	0.92	27	31.77	0.85	-5.30
<b>Female genital system</b>			2	1.84	3	0.63	1	0.23	5	1.10	11	14.69	0.75	-4.10
Cervix uteri			0	0.00	1	1.80	0	0.00	0	0.00	1	1.47	0.68	-0.52
Corpus uteri			2	3.38	1	0.38	0	0.00	2	0.80	5	8.12	0.62	-3.47
Ovary			0	0.00	0	0.00	1	0.81	3	2.17	4	4.21	0.95	-0.23
Vagina			0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.19
Vulva			0	0.00	1	8.68	0	0.00	0	0.00	1	0.45	2.21	0.61
<b>Male genital system</b>			3	1.19	18	1.15	29	1.38	24	0.93	74	64.84	1.14	6.02
Prostate			3	1.22	17	1.11	29	1.40	24	0.94	73	64.12	1.14	5.84
Testis			0	0.00	1	6.75	0	0.00	0	0.00	1	0.31	3.20	0.45
<b>Urinary system</b>			5	3.31*	8	1.08	8	1.03	10	1.15	31	25.42	1.22	2.30
Urinary bladder			2	2.18	4	0.86	3	0.59	8	1.35	17	16.62	1.02	0.16
Kidney parenchyma			3	5.82*	4	1.67	5	2.19	1	0.45	13	7.42	1.75	2.30
Renal pelvis, other urinary			0	0.00	0	0.00	0	0.00	1	2.00	1	1.38	0.73	-0.16
Ureter			0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.18
<b>Bone, joints</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.13
<b>Soft tissue including heart</b>			0	0.00	1	2.47	0	0.00	0	0.00	1	1.24	0.81	-0.10
<b>Kaposi sarcoma</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.35	0.00	-0.15
<b>Melanoma of skin</b>			4	5.88*	10	3.35*	5	1.87	11	4.22*	30	8.95	3.35*	8.69
<b>Eye, orbit</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.52	0.00	-0.21
<b>Brain, central nervous system</b>			1	3.28	1	0.75	2	1.70	0	0.00	4	3.91	1.02	0.04
<b>Thyroid</b>			1	5.50	3	4.14	0	0.00	0	0.00	4	1.97	2.03	0.84
<b>Lymphatic, hematopoietic</b>			3	2.09	9	1.34	5	0.75	10	1.29	27	22.58	1.20	1.83
Hodgkin lymphoma			0	0.00	3	9.44*	0	0.00	2	9.94*	5	0.85	5.91*	1.71
Non-Hodgkin lymphoma			3	4.36	6	1.88	4	1.26	5	1.35	18	10.75	1.67	2.99
Myeloma			0	0.00	0	0.00	1	0.89	1	0.76	2	3.73	0.54	-0.71
Leukemia			0	0.00	0	0.00	0	0.00	2	0.79	2	7.25	0.28*	-2.17
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.09
Chronic lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	3.10	0.00	-1.28
Acute non-lymphocytic			0	0.00	0	0.00	0	0.00	1	1.14	1	2.34	0.43	-0.55
Chronic myeloid			0	0.00	0	0.00	0	0.00	0	0.00	0	0.94	0.00	-0.39

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 9,002 PYR and for male cancers on 15,226 PYR.

## Chronic Lymphocytic Leukemia Both Sexes, 60-69 Years of Age

**Table 17.3.8:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, 60-69 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	108	1.52*	417	1.33*	286	1.10	165	0.92	976	823.07	1.19*	39.34
All excluding same site	108	1.54*	417	1.34*	286	1.12	165	0.93	976	813.29	1.20*	41.85
<b>Buccal cavity, pharynx</b>	2	0.87	14	1.56	6	0.98	4	1.14	26	20.90	1.24	1.31
Lip	1	3.01	3	2.20	2	1.98	2	3.09	8	3.35	2.39*	1.20
Tongue	0	0.00	2	1.11	0	0.00	0	0.00	2	4.17	0.48	-0.56
Salivary gland	0	0.00	2	3.12	1	1.92	1	2.52	4	1.71	2.35	0.59
Mouth	1	1.66	3	1.30	1	0.64	1	1.09	6	5.38	1.11	0.16
Nasopharynx	0	0.00	2	6.50	0	0.00	0	0.00	2	0.67	2.97	0.34
Tonsil	0	0.00	0	0.00	1	1.88	0	0.00	1	1.89	0.53	-0.23
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.63	0.00	-0.16
Hypopharynx	0	0.00	2	1.89	0	0.00	0	0.00	2	2.31	0.87	-0.08
<b>Digestive system</b>	16	1.10	65	1.02	64	1.19	38	0.94	183	172.95	1.06	2.58
Esophagus	2	2.19	4	1.06	7	2.47	1	0.55	14	9.35	1.50	1.20
Stomach	3	2.07	8	1.28	5	0.98	2	0.54	18	16.52	1.09	0.38
Small intestine	1	4.86	0	0.00	2	2.57	1	1.75	4	2.48	1.62	0.39
Colon	3	0.49	27	0.97	32	1.30	17	0.86	79	78.21	1.01	0.20
Rectum, rectosigmoid junction	6	2.11	14	1.15	10	1.05	14	2.20*	44	30.88	1.42*	3.38
Anus, anal canal	0	0.00	0	0.00	1	2.09	0	0.00	1	1.54	0.65	-0.14
Liver	0	0.00	2	0.90	1	0.55	0	0.00	3	5.81	0.52	-0.72
Gallbladder	0	0.00	1	1.36	0	0.00	0	0.00	1	2.10	0.48	-0.28
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	1	1.00	1	3.59	0.28	-0.67
Pancreas	1	0.57	8	1.03	6	0.92	2	0.41	17	20.92	0.81	-1.01
<b>Respiratory system</b>	33	2.26*	117	1.89*	75	1.57*	37	1.25	262	153.56	1.71*	27.89
Nose, nasal cavity, ear	1	9.29	0	0.00	0	0.00	0	0.00	1	1.11	0.90	-0.03
Larynx	2	1.69	8	1.75	6	2.00	2	1.34	18	10.26	1.75*	1.99
Lung, bronchus	29	2.19*	108	1.91*	69	1.56*	35	1.26	241	141.83	1.70*	25.51
<b>Female breast</b>	4	0.67	25	0.99	21	1.00	13	0.86	63	67.45	0.93	-2.80
<b>Female genital system</b>	1	0.32	10	0.81	4	0.43	5	0.81	20	30.90	0.65*	-6.86
Cervix uteri	0	0.00	1	0.86	1	1.32	0	0.00	2	2.68	0.75	-0.43
Corpus uteri	0	0.00	5	0.73	2	0.39	1	0.32	8	16.85	0.47*	-5.57
Ovary	0	0.00	2	0.58	1	0.36	3	1.55	6	8.98	0.67	-1.87
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.28
Vulva	1	11.27	2	4.80	0	0.00	1	2.51	4	1.32	3.04	1.69
<b>Male genital system</b>	24	1.60*	77	1.07	52	0.82	25	0.61*	178	190.90	0.93	-5.61
Prostate	24	1.62*	76	1.06	52	0.83	23	0.57*	175	189.54	0.92	-6.32
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.30	0.00	-0.13
<b>Urinary system</b>	10	1.74	36	1.41	18	0.84	14	0.90	78	68.38	1.14	2.47
Urinary bladder	4	1.03	27	1.54*	14	0.93	11	0.97	56	47.86	1.17	2.09
Kidney parenchyma	4	2.66	6	0.94	3	0.59	2	0.60	15	16.29	0.92	-0.33
Renal pelvis, other urinary	2	5.66	3	1.88	1	0.75	1	1.06	7	4.23	1.65	0.71
Ureter	2	16.72*	1	1.84	0	0.00	0	0.00	3	1.44	2.09	0.40
<b>Bone, joints</b>	0	0.00	1	3.87	1	5.11	0	0.00	2	0.64	3.13	0.35
<b>Soft tissue including heart</b>	0	0.00	2	1.91	1	1.15	0	0.00	3	2.84	1.05	0.04
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	3	20.90*	0	0.00	3	0.48	6.23*	0.65
<b>Melanoma of skin</b>	7	4.57*	18	2.74*	12	2.27*	8	2.07	45	17.25	2.61*	7.14
<b>Eye, orbit</b>	1	8.86	0	0.00	1	2.77	0	0.00	2	1.18	1.70	0.21
<b>Brain, central nervous system</b>	1	1.22	5	1.48	3	1.18	0	0.00	9	8.31	1.08	0.18
<b>Thyroid</b>	0	0.00	1	0.73	1	1.04	0	0.00	2	3.23	0.62	-0.32
<b>Lymphatic, hematopoietic</b>	6	1.25	24	1.12	17	0.92	12	0.85	59	58.94	1.00	0.02
Hodgkin lymphoma	1	5.71	5	7.30*	4	8.20*	4	13.37*	14	1.65	8.50*	3.18
Non-Hodgkin lymphoma	4	1.86	11	1.14	12	1.43	5	0.77	32	26.68	1.20	1.37
Myeloma	1	1.18	5	1.32	0	0.00	2	0.83	8	10.27	0.78	-0.58
Leukemia	0	0.00	3	0.41	1	0.16*	1	0.20	5	20.34	0.25*	-3.95
Acute lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.50	0.00	-0.13
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	8.49	0.00*	-2.18
Acute non-lymphocytic	0	0.00	2	0.83	1	0.46	1	0.58	4	6.85	0.58	-0.73
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	2.64	0.00	-0.68

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 15,891 PYR and for male cancers on 22,986 PYR.

# Chronic Lymphocytic Leukemia

## Both Sexes, ≥70 Years of Age

**Table 17.3.9:** Risk of subsequent primary cancers after chronic lymphocytic leukemia, both sexes, ≥70 years of age, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis													
	<1 year		1-4 years		5-9 years		≥10 years		Total					
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR		
<b>All subsequent cancers</b>	9,850	7,333	194	1.04	652	1.12*	286	1.05	68	0.83	1,200	1,123.48	1.07*	17.74
All excluding same site			194	1.05	652	1.13*	286	1.07	68	0.85	1,200	1,107.45	1.08*	21.45
<b>Buccal cavity, pharynx</b>			5	1.26	11	0.93	3	0.59	0	0.00	19	22.43	0.85	-0.80
Lip			3	3.49	3	1.18	1	0.91	0	0.00	7	4.81	1.46	0.51
Tongue			0	0.00	1	0.47	0	0.00	0	0.00	1	3.98	0.25	-0.69
Salivary gland			1	2.35	3	2.21	1	1.48	0	0.00	5	2.69	1.86	0.53
Mouth			1	0.96	1	0.32	0	0.00	0	0.00	2	6.02	0.33	-0.93
Nasopharynx			0	0.00	0	0.00	1	7.88	0	0.00	1	0.59	1.71	0.10
Tonsil			0	0.00	1	1.29	0	0.00	0	0.00	1	1.40	0.71	-0.09
Oropharynx			0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.11
Hypopharynx			0	0.00	2	2.08	0	0.00	0	0.00	2	1.72	1.16	0.06
<b>Digestive system</b>			51	1.08	174	1.17*	87	1.21	20	0.86	332	291.25	1.14*	9.45
Esophagus			0	0.00	4	0.71	4	1.58	0	0.00	8	10.73	0.75	-0.63
Stomach			6	1.21	20	1.31	11	1.55	4	1.79	41	29.51	1.39	2.66
Small intestine			0	0.00	3	1.74	0	0.00	0	0.00	3	3.37	0.89	-0.09
Colon			28	1.23	88	1.20	47	1.30	10	0.84	173	144.22	1.20*	6.67
Rectum, rectosigmoid junction			4	0.52	22	0.94	12	1.13	5	1.59	43	44.94	0.96	-0.45
Anus, anal canal			1	3.00	0	0.00	0	0.00	0	0.00	1	2.07	0.48	-0.25
Liver			1	0.80	2	0.51	1	0.55	1	1.87	5	7.50	0.67	-0.58
Gallbladder			2	2.68	5	2.11	1	0.86	0	0.00	8	4.65	1.72	0.78
Bile ducts, other biliary			0	0.00	2	0.59	2	1.13	0	0.00	4	6.84	0.59	-0.66
Pancreas			8	1.43	20	1.13	8	0.93	0	0.00	36	34.70	1.04	0.30
<b>Respiratory system</b>			28	0.97	111	1.27*	48	1.27	13	1.29	200	164.40	1.22*	8.25
Nose, nasal cavity, ear			1	3.89	2	2.47	2	5.09	0	0.00	5	1.58	3.16*	0.79
Larynx			1	0.63	6	1.30	7	3.96*	0	0.00	14	8.37	1.67	1.30
Lung, bronchus			26	0.97	102	1.24*	39	1.09	13	1.37	180	154.00	1.17*	6.03
<b>Female breast</b>			8	0.52	59	1.17	19	0.74	7	0.82	93	99.85	0.93	-3.04
<b>Female genital system</b>			4	0.60	19	0.89	9	0.86	4	1.18	36	41.92	0.86	-2.63
Cervix uteri			0	0.00	2	1.02	0	0.00	1	3.56	3	3.80	0.79	-0.36
Corpus uteri			0	0.00	10	0.99	4	0.85	0	0.00	14	19.43	0.72	-2.41
Ovary			4	1.98	5	0.76	4	1.20	1	0.89	14	13.07	1.07	0.41
Vagina			0	0.00	0	0.00	0	0.00	1	11.63	1	0.95	1.05	0.02
Vulva			0	0.00	2	1.24	1	1.11	1	2.77	4	3.34	1.20	0.29
<b>Male genital system</b>			42	1.04	118	0.96	50	0.95	6	0.46*	216	228.77	0.94	-6.19
Prostate			42	1.05	116	0.95	49	0.94	6	0.46	213	226.95	0.94	-6.76
Testis			0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.11
<b>Urinary system</b>			26	1.63*	56	1.12	21	0.90	8	1.13	111	96.41	1.15	3.38
Urinary bladder			14	1.19	37	1.00	14	0.80	6	1.13	71	71.53	0.99	-0.12
Kidney parenchyma			10	3.21*	13	1.34	6	1.36	2	1.56	31	18.51	1.67*	2.90
Renal pelvis, other urinary			2	1.87	6	1.81	1	0.66	0	0.00	9	6.37	1.41	0.61
Ureter			0	0.00	4	3.61	0	0.00	0	0.00	4	2.12	1.89	0.44
<b>Bone, joints</b>			0	0.00	0	0.00	0	0.00	0	0.00	0	0.81	0.00	-0.19
<b>Soft tissue including heart</b>			3	4.30	3	1.35	3	2.77	1	2.75	10	4.37	2.29*	1.31
<b>Kaposi sarcoma</b>			4	23.63*	3	5.48*	1	3.57	0	0.00	8	1.10	7.26*	1.60
<b>Melanoma of skin</b>			7	2.23	21	2.06*	13	2.55*	4	2.32	45	20.15	2.23*	5.76
<b>Eye, orbit</b>			0	0.00	3	3.94	0	0.00	0	0.00	3	1.46	2.06	0.36
<b>Brain, central nervous system</b>			1	0.68	4	0.88	3	1.47	1	1.76	9	8.62	1.04	0.09
<b>Thyroid</b>			2	3.51	2	1.14	0	0.00	0	0.00	4	3.34	1.20	0.15
<b>Lymphatic, hematopoietic</b>			2	0.14*	45	0.96	20	0.88	1	0.14*	68	91.33	0.74*	-5.41
Hodgkin lymphoma			0	0.00	8	7.61*	6	13.26*	0	0.00	14	1.98	7.08*	2.79
Non-Hodgkin lymphoma			0	0.00*	24	1.23	7	0.72	1	0.32	32	38.24	0.84	-1.45
Myeloma			1	0.39	6	0.74	6	1.55	0	0.00	13	15.72	0.83	-0.63
Leukemia			1	0.17*	7	0.39*	1	0.11*	0	0.00	9	35.39	0.25*	-6.12
Acute lymphocytic			0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.19
Chronic lymphocytic			0	0.00	0	0.00*	0	0.00	0	0.00	0	14.03	0.00*	-3.25
Acute non-lymphocytic			1	0.53	4	0.66	0	0.00	0	0.00	5	11.75	0.43*	-1.56
Chronic myeloid			0	0.00	3	1.22	1	0.83	0	0.00	4	4.84	0.83	-0.19

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 22,508 PYR and for male cancers on 20,632 PYR.

**Table 17.4.1:** Characteristics of patients with an initial chronic myeloid leukemia, both sexes, SEER 1973-2000.

Characteristics	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Number of patients with 1st primary cancer</b>						
<b>Total</b>	4,520	100.0	3,485	100.0	8,005	100.0
<b>Initial treatment</b>						
Any radiation	235	5.2	154	4.4	389	4.9
With surgery	3	0.1	1	0.0	4	0.0
Without surgery	232	5.1	153	4.4	385	4.8
No radiation	4,285	94.8	3,331	95.6	7,616	95.1
With surgery	31	0.7	18	0.5	49	0.6
Without surgery	4,254	94.1	3,313	95.1	7,567	94.5
<b>Race</b>						
White	3,822	84.6	2,958	84.9	6,780	84.7
Black	414	9.2	337	9.7	751	9.4
Other	270	6.0	177	5.1	447	5.6
Unknown	14	0.3	13	0.4	27	0.3
<b>Age at 1st primary cancer diagnosis, years</b>						
< 30	406	9.0	241	6.9	647	8.1
30–49	1,015	22.5	689	19.8	1,704	21.3
50–69	1,633	36.1	1,165	33.4	2,798	35.0
70–79	948	21.0	728	20.9	1,676	20.9
≥ 80	518	11.5	662	19.0	1,180	14.7
<b>Number of patients with one or more primary cancers</b>						
One primary cancer only	4,341	96.0	3,347	96.0	7,688	96.0
1st and 2nd cancers	168	3.7	133	3.8	301	3.8
1st, 2nd, and 3rd cancers	11	0.2	4	0.1	15	0.2
1st, 2nd, 3rd, and additional cancers	0	0.0	1	0.0	1	0.0
<b>Other statistics</b>						
Median age at 1st cancer diagnosis	61.9	—	64.6	—	63.1	—
Median year of 1st cancer diagnosis	1988.5	—	1988.1	—	1988.3	—
Median person-years at risk	1.9	—	2.2	—	2.0	—
Percent histologically confirmed*						
Both 1st and 2nd cancers	—	93.9	—	87.0	—	90.9
1st, 2nd, and additional cancers	—	93.3	—	87.0	—	90.5
1st cancer only	—	5.0	—	8.0	—	6.3

\*Percent histologically confirmed among patients who developed a subsequent primary cancer.

# Chronic Myeloid Leukemia

## Both Sexes

**Table 17.4.2:** Risk of subsequent primary cancers after chronic myeloid leukemia, both sexes, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	Number starting interval	Person-years in interval	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
	8,005	5,618										
			5,879	13,333	1,699	4,214	371	1,250	8,005	24,415		
<b>All subsequent cancers</b>	74	1.03	191	1.19*	48	1.04	21	1.56	334	291.80	1.14*	17.29
All excluding same site	74	1.04	191	1.21*	48	1.06	21	1.57	334	288.51	1.16*	18.63
<b>Buccal cavity, pharynx</b>	7	3.69*	3	0.72	3	2.58	2	6.07	15	7.54	1.99*	3.05
Lip	0	0.00	2	3.18	1	6.44	0	0.00	3	1.14	2.63	0.76
Tongue	2	5.48	1	1.21	0	0.00	1	14.12	4	1.50	2.66	1.02
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.28
Mouth	4	8.02*	0	0.00	1	3.26	1	11.82	6	1.99	3.02*	1.64
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.31	0.00	-0.13
Tonsil	0	0.00	0	0.00	1	8.53	0	0.00	1	0.72	1.39	0.12
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.21	0.00	-0.08
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.73	0.00	-0.30
<b>Digestive system</b>	19	1.14	39	1.09	7	0.71	5	1.77	70	65.29	1.07	1.93
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	3.17	0.00	-1.30
Stomach	3	1.70	5	1.37	0	0.00	1	3.83	9	6.61	1.36	0.98
Small intestine	1	4.62	0	0.00	1	6.64	0	0.00	2	0.91	2.20	0.45
Colon	8	1.05	21	1.28	5	1.10	2	1.54	36	29.92	1.20	2.49
Rectum, rectosigmoid junction	2	0.70	6	0.98	1	0.60	1	2.13	10	11.13	0.90	-0.46
Anus, anal canal	0	0.00	1	2.96	0	0.00	0	0.00	1	0.62	1.62	0.16
Liver	0	0.00	3	2.57	0	0.00	0	0.00	3	2.13	1.41	0.36
Gallbladder	1	4.14	1	1.96	0	0.00	0	0.00	2	0.93	2.16	0.44
Bile ducts, other biliary	1	2.86	0	0.00	0	0.00	0	0.00	1	1.39	0.72	-0.16
Pancreas	3	1.51	2	0.46	0	0.00	1	2.93	6	7.85	0.76	-0.76
<b>Respiratory system</b>	12	0.99	43	1.61*	7	0.92	1	0.46	63	48.56	1.30	5.91
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.18
Larynx	0	0.00	1	0.56	0	0.00	0	0.00	1	3.24	0.31	-0.92
Lung, bronchus	12	1.08	41	1.66*	7	1.00	1	0.50	61	44.76	1.36*	6.65
<b>Female breast</b>	9	1.28	17	0.98	1	0.17*	2	1.23	29	31.76	0.91	-2.49
<b>Female genital system</b>	1	0.31	8	1.02	3	1.22	2	3.08	14	14.19	0.99	-0.17
Cervix uteri	0	0.00	2	1.98	2	6.53	0	0.00	4	1.82	2.20	1.97
Corpus uteri	1	0.63	3	0.78	1	0.83	2	6.39	7	6.98	1.00	0.02
Ovary	0	0.00	3	1.31	0	0.00	0	0.00	3	4.17	0.72	-1.05
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.20
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.61
<b>Male genital system</b>	9	0.64	28	0.93	9	1.11	2	0.77	48	54.96	0.87	-5.21
Prostate	9	0.65	27	0.91	9	1.14	2	0.79	47	54.01	0.87	-5.25
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.43
<b>Urinary system</b>	5	0.87	17	1.36	3	0.86	2	1.93	27	22.81	1.18	1.72
Urinary bladder	4	0.99	10	1.16	2	0.85	1	1.44	17	15.76	1.08	0.51
Kidney parenchyma	1	0.74	6	1.95	1	1.08	1	3.54	9	5.63	1.60	1.38
Renal pelvis, other urinary	0	0.00	1	1.27	0	0.00	0	0.00	1	1.43	0.70	-0.17
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.47	0.00	-0.19
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	71.38	1	0.28	3.51	0.29
<b>Soft tissue including heart</b>	0	0.00	2	3.02	0	0.00	0	0.00	2	1.21	1.65	0.32
<b>Kaposi sarcoma</b>	0	0.00	1	2.59	0	0.00	0	0.00	1	0.73	1.38	0.11
<b>Melanoma of skin</b>	2	1.30	4	1.09	1	0.83	0	0.00	7	6.81	1.03	0.08
<b>Eye, orbit</b>	0	0.00	1	4.25	1	14.85	0	0.00	2	0.43	4.68	0.64
<b>Brain, central nervous system</b>	0	0.00	2	1.19	0	0.00	0	0.00	2	3.06	0.65	-0.43
<b>Thyroid</b>	3	7.29*	2	1.99	0	0.00	0	0.00	5	1.85	2.70	1.29
<b>Lymphatic, hematopoietic</b>	7	1.27	18	1.47	8	2.24	3	2.82	36	22.39	1.61*	5.57
Hodgkin lymphoma	1	4.71	0	0.00	2	13.59*	0	0.00	3	0.89	3.38	0.87
Non-Hodgkin lymphoma	2	0.84	14	2.57*	1	0.60	2	3.97	19	9.97	1.91*	3.70
Myeloma	2	2.14	1	0.48	1	1.70	0	0.00	4	3.75	1.07	0.10
Leukemia	2	1.00	3	0.70	4	3.40	1	2.90	10	7.78	1.28	0.91
Acute lymphocytic	1	16.46	3	22.31*	2	49.98*	1	82.48*	7	0.25	28.30*	2.77
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	3.05	0.00	-1.25
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	2.61	0.00	-1.07
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	1.09	0.00	-0.45

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000. EAR for female cancers is based on 11,071 PYR and for male cancers on 13,344 PYR.

**Table 17.4.3:** Risk of subsequent primary cancers after chronic myeloid leukemia, females, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	30	1.18	87	1.42*	21	1.07	6	1.11	144	111.63	1.29*	29.24
All excluding same site	30	1.19	87	1.44*	21	1.08	6	1.12	144	110.41	1.30*	30.34
<b>Buccal cavity, pharynx</b>	1	2.21	1	0.92	1	2.91	0	0.00	3	1.98	1.52	0.93
Lip	0	0.00	0	0.00	1	43.81	0	0.00	1	0.14	7.29	0.78
Tongue	1	10.20	1	4.23	0	0.00	0	0.00	2	0.43	4.64	1.42
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.21
Mouth	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.62
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.07
Tonsil	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	0.00	-0.15
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.05	0.00	-0.04
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.13	0.00	-0.12
<b>Digestive system</b>	7	1.11	25	1.72*	4	0.92	2	1.68	38	26.39	1.44*	10.49
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.72	0.00	-0.65
Stomach	1	1.92	2	1.73	0	0.00	0	0.00	3	2.09	1.44	0.82
Small intestine	0	0.00	0	0.00	0	0.00	0	0.00	0	0.37	0.00	-0.33
Colon	3	0.94	15	2.05*	4	1.83	1	1.65	23	13.30	1.73*	8.76
Rectum, rectosigmoid junction	0	0.00	3	1.32	0	0.00	0	0.00	3	4.10	0.73	-1.00
Rectum	0	0.00	1	0.68	0	0.00	0	0.00	1	2.69	0.37	-1.52
Anus, anal canal	0	0.00	1	5.38	0	0.00	0	0.00	1	0.34	2.93	0.59
Liver	0	0.00	1	3.41	0	0.00	0	0.00	1	0.53	1.87	0.42
Gallbladder	1	6.65	1	3.01	0	0.00	0	0.00	2	0.60	3.32	1.26
Bile ducts, other biliary	1	7.47	0	0.00	0	0.00	0	0.00	1	0.56	1.77	0.39
Pancreas	1	1.23	2	1.06	0	0.00	1	6.35	4	3.44	1.16	0.51
<b>Respiratory system</b>	3	1.00	19	2.49*	4	1.54	0	0.00	26	13.93	1.87*	10.91
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.15	0.00	-0.14
Larynx	0	0.00	1	3.98	0	0.00	0	0.00	1	0.46	2.19	0.49
Lung, bronchus	3	1.05	17	2.34*	4	1.62	0	0.00	24	13.28	1.81*	9.68
<b>Female breast</b>	9	1.28	17	0.98	1	0.17*	2	1.23	29	31.76	0.91	-2.49
<b>Female genital system</b>	1	0.31	8	1.02	3	1.22	2	3.08	14	14.19	0.99	-0.17
Cervix uteri	0	0.00	2	1.98	2	6.53	0	0.00	4	1.82	2.20	1.97
Corpus uteri	1	0.63	3	0.78	1	0.83	2	6.39	7	6.98	1.00	0.02
Ovary	0	0.00	3	1.31	0	0.00	0	0.00	3	4.17	0.72	-1.05
Vagina	0	0.00	0	0.00	0	0.00	0	0.00	0	0.22	0.00	-0.20
Vulva	0	0.00	0	0.00	0	0.00	0	0.00	0	0.67	0.00	-0.61
<b>Urinary system</b>	3	2.45	6	2.06	0	0.00	0	0.00	9	5.32	1.69	3.33
Urinary bladder	2	2.69	3	1.72	0	0.00	0	0.00	5	3.17	1.58	1.65
Kidney parenchyma	1	2.66	3	3.24	0	0.00	0	0.00	4	1.70	2.35	2.07
Renal pelvis, other urinary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.44	0.00	-0.40
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.14	0.00	-0.12
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.11	0.00	-0.10
<b>Soft tissue including heart</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.46	0.00	-0.42
<b>Kaposi sarcoma</b>	0	0.00	1	37.81	0	0.00	0	0.00	1	0.05	20.80	0.86
<b>Melanoma of skin</b>	1	2.04	0	0.00	0	0.00	0	0.00	1	2.29	0.44	-1.17
<b>Eye, orbit</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.15
<b>Brain, central nervous system</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	1.15	0.00	-1.04
<b>Thyroid</b>	1	4.10	1	1.61	0	0.00	0	0.00	2	1.14	1.75	0.77
<b>Lymphatic, hematopoietic</b>	4	2.01	7	1.48	4	2.67	0	0.00	15	8.65	1.73	5.74
Hodgkin lymphoma	1	14.16	0	0.00	1	17.81	0	0.00	2	0.31	6.39	1.52
Non-Hodgkin lymphoma	0	0.00	6	2.72	0	0.00	0	0.00	6	4.05	1.48	1.77
Myeloma	2	5.75	0	0.00	0	0.00	0	0.00	2	1.50	1.33	0.45
Leukemia	1	1.50	1	0.65	3	6.50*	0	0.00	5	2.79	1.79	2.00
Acute lymphocytic	1	48.88	1	20.55	1	65.31	0	0.00	3	0.09	33.81*	2.63
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.06	0.00	-0.96
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.98	0.00	-0.88
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.40	0.00	-0.36

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.



# Chronic Myeloid Leukemia

## Males

**Table 17.4.4:** Risk of subsequent primary cancers after chronic myeloid leukemia, males, SEER 1973-2000.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<1 year		1-4 years		5-9 years		≥10 years		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>All subsequent cancers</b>	44	0.94	104	1.05	27	1.02	15	1.86*	190	180.17	1.05	7.37
All excluding same site	44	0.95	104	1.06	27	1.04	15	1.88*	190	178.10	1.07	8.92
<b>Buccal cavity, pharynx</b>	6	4.16*	2	0.65	2	2.45	2	8.36	12	5.57	2.16*	4.82
Lip	0	0.00	2	3.62	0	0.00	0	0.00	2	1.00	2.00	0.75
Tongue	1	3.75	0	0.00	0	0.00	1	19.83	2	1.07	1.87	0.70
Salivary gland	0	0.00	0	0.00	0	0.00	0	0.00	0	0.45	0.00	-0.34
Mouth	4	11.74*	0	0.00	1	5.28	1	18.68	6	1.31	4.59*	3.52
Nasopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.23	0.00	-0.17
Tonsil	0	0.00	0	0.00	1	11.52	0	0.00	1	0.55	1.83	0.34
Oropharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.16	0.00	-0.12
Hypopharynx	0	0.00	0	0.00	0	0.00	0	0.00	0	0.60	0.00	-0.45
<b>Digestive system</b>	12	1.16	14	0.65	3	0.54	3	1.84	32	38.90	0.82	-5.17
Esophagus	0	0.00	0	0.00	0	0.00	0	0.00	0	2.45	0.00	-1.84
Stomach	2	1.62	3	1.20	0	0.00	1	5.64	6	4.52	1.33	1.11
Small intestine	1	7.41	0	0.00	1	11.86	0	0.00	2	0.54	3.68	1.09
Colon	5	1.12	6	0.66	1	0.43	1	1.45	13	16.62	0.78	-2.71
Rectum, rectosigmoid junction	2	1.07	3	0.77	1	1.01	1	3.46	7	7.03	1.00	-0.02
Anus, anal canal	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.21
Liver	0	0.00	2	2.29	0	0.00	0	0.00	2	1.59	1.26	0.31
Gallbladder	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.24
Bile ducts, other biliary	0	0.00	0	0.00	0	0.00	0	0.00	0	0.83	0.00	-0.62
Pancreas	2	1.70	0	0.00	0	0.00	0	0.00	2	4.42	0.45	-1.81
<b>Respiratory system</b>	9	0.99	24	1.25	3	0.60	1	0.69	37	34.64	1.07	1.77
Nose, nasal cavity, ear	0	0.00	0	0.00	0	0.00	0	0.00	0	0.28	0.00	-0.21
Larynx	0	0.00	0	0.00	0	0.00	0	0.00	0	2.78	0.00	-2.08
Lung, bronchus	9	1.09	24	1.38	3	0.66	1	0.76	37	31.48	1.18	4.14
<b>Male breast</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.34	0.00	-0.26
<b>Male genital system</b>	9	0.64	28	0.93	9	1.11	2	0.77	48	54.96	0.87	-5.21
Prostate	9	0.65	27	0.91	9	1.14	2	0.79	47	54.01	0.87	-5.25
Testis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.57	0.00	-0.43
<b>Urinary system</b>	2	0.44	11	1.15	3	1.17	2	2.58	18	17.49	1.03	0.38
Urinary bladder	2	0.60	7	1.01	2	1.10	1	1.85	12	12.59	0.95	-0.44
Kidney parenchyma	0	0.00	3	1.40	1	1.64	1	5.14	5	3.93	1.27	0.81
Renal pelvis, other urinary	0	0.00	1	1.84	0	0.00	0	0.00	1	0.98	1.02	0.01
Ureter	0	0.00	0	0.00	0	0.00	0	0.00	0	0.33	0.00	-0.25
<b>Bone, joints</b>	0	0.00	0	0.00	0	0.00	1	114.91*	1	0.17	5.76	0.62
<b>Soft tissue including heart</b>	0	0.00	2	4.89	0	0.00	0	0.00	2	0.75	2.67	0.94
<b>Kaposi sarcoma</b>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.68	0.00	-0.51
<b>Melanoma of skin</b>	1	0.96	4	1.64	1	1.29	0	0.00	6	4.52	1.33	1.11
<b>Eye, orbit</b>	0	0.00	1	6.89	1	25.17	0	0.00	2	0.26	7.56	1.30
<b>Brain, central nervous system</b>	0	0.00	2	1.91	0	0.00	0	0.00	2	1.91	1.05	0.07
<b>Thyroid</b>	2	11.91*	1	2.60	0	0.00	0	0.00	3	0.71	4.23	1.72
<b>Lymphatic, hematopoietic</b>	3	0.85	11	1.46	4	1.93	3	4.69	21	13.74	1.53	5.44
Hodgkin lymphoma	0	0.00	0	0.00	1	10.99	0	0.00	1	0.57	1.74	0.32
Non-Hodgkin lymphoma	2	1.37	8	2.48*	1	1.07	2	6.78	13	5.92	2.20*	5.31
Myeloma	0	0.00	1	0.81	1	3.05	0	0.00	2	2.25	0.89	-0.19
Leukemia	1	0.75	2	0.73	1	1.40	1	4.67	5	5.00	1.00	0.00
Acute lymphocytic	0	0.00	2	23.31*	1	40.48	1	127.75*	4	0.16	25.22*	2.88
Chronic lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.99	0.00	-1.49
Acute non-lymphocytic	0	0.00	0	0.00	0	0.00	0	0.00	0	1.63	0.00	-1.22
Chronic myeloid	0	0.00	0	0.00	0	0.00	0	0.00	0	0.69	0.00	-0.52

\*P < 0.05. Notes: See Appendices for definitions of cancer sites and "all excluding same site." Abbreviations: O = observed number of subsequent (2nd, 3rd, etc.) primary cancers; E = expected number of subsequent primary cancers; O/E = ratio of observed to expected cancers; PYR = person-years at risk; EAR = excess absolute risk per 10,000 person-years = [(O-E)/PYR] × 10,000.

# Chapter 18

## New Malignancies Following Childhood Cancer

Peter D. Inskip, Lynn A. G. Ries, Randi J. Cohen, Rochelle E. Curtis

### Synopsis

The incidence of subsequent primary cancers was evaluated in a cohort of 23,819 2-month survivors of childhood cancer diagnosed at ages less than 18 years during 1973-2000 and followed for an average of 8.3 years. The most common types of childhood cancers were leukemias, lymphomas, cancers of the central nervous system (CNS), and bone and soft tissue sarcomas. Childhood cancer survivors were at more than 6-fold increase in risk of developing a new cancer relative to the general population ( $O/E=6.07$ ,  $O=352$ ,  $EAR=15$  per 10,000 person-years), and the cumulative incidence of second cancers after 25 years was 3.5%. Most common were subsequent primary cancers of the female breast, brain, bone, thyroid gland, and soft tissue, as well as melanoma of the skin and acute non-lymphocytic leukemia (ANLL). The greatest risks of subsequent cancers occurred among patients previously diagnosed with Ewing sarcoma ( $O/E=14.84$ ,  $EAR=44$ ), Hodgkin lymphoma ( $O/E=9.55$ ,  $EAR=39$ ), primitive neuroectodermal tumor of the CNS ( $O/E=12.54$ ,  $EAR=26$ ), and retinoblastoma ( $O/E=14.71$ ,  $EAR=24$ ). Risk of second solid cancers was significantly higher among persons whose initial treatment for childhood cancer included radiotherapy, whereas the excess of subsequent ANLL was more closely related to chemotherapy. Childhood cancer survivors are at markedly increased risk of developing a variety of new primary cancers compared with the general population, but the magnitude of excess risk and specific types of second cancers vary widely by type of first cancer.

### Childhood Cancers

Childhood cancers are a heterogeneous group of diseases that vary widely in incidence, age at diagnosis, type of treatment, survival, and, most probably, etiology. Leukemia, lymphoma, and central nervous system (CNS) tumors account for nearly 60% of the total number of cases. In 1998, an estimated 12,400 children younger than age 20 years were diagnosed with cancer, and 2,500 children died due to their cancer (Ries et al, 1999). Incidence rates for most, but not all, types of childhood cancer are

higher among males than females and among whites than blacks (Ries et al, 1999, 2004). Because of dramatic improvements in the therapy for many types of childhood cancers, survival is far better today than it was 30 or 40 years ago, and the population of long-term childhood cancer survivors is growing. Current 5-year relative survival rates for childhood acute lymphocytic leukemia (ALL), Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), germ cell tumors, Wilms tumor, and retinoblastoma range between 70% and 93% (Ries et al, 1999). Treatment gains have been less dramatic for acute non-lymphocytic leukemia (ANLL), CNS cancer, neuroblastoma first diagnosed at age 5 years or older, Ewing sarcoma, and rhabdomyosarcoma (Ries et al, 1999, 2004). Five-year survival rates for most types of childhood cancers are somewhat better in whites than in blacks (Ries et al, 1999).

Treatment regimens have varied widely by type of first cancer and have changed over time. Historically, radiation was commonly used as part of initial therapy for CNS cancers, HL, rhabdomyosarcoma, and Ewing sarcoma; it was used much less often for osteosarcoma, fibrosarcoma, and germ cell cancers. Multidrug chemotherapy regimens, including alkylating agents, were introduced in the 1960s and modified during the ensuing decades (Friedman and Meadows, 1999; Ebb et al, 2005; Weinstein and Tarbell, 2005). As the medical community came to better understand the adverse late effects of radiation, it sought ways to lower radiation exposures without compromising survival. These included reducing the usage of prophylactic CNS irradiation in patients with ALL, avoiding or deferring the use of cranial radiotherapy in very young children with brain tumors, and reducing dose and field size in children with HL (Pollack, 1994; Kalapurakal and Thomas, 1997; Shusterman and Meadows, 2000; Donaldson, 2002; Bhatia, 2003; Bhatia et al, 2003). In light of the leukemogenic effects of alkylating agents (Tucker et al, 1987a), there have been parallel efforts to identify new drugs that are equally or more effective with less associated toxicity (Friedman and Meadows, 1999).

The etiology of childhood cancers is largely unknown. For very-early-age-at-onset cancers, such as retinoblastoma, neuroblastoma, Wilms tumor, and ALL of infancy,

*Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; O/E=ratio of observed to expected cancers; CI=confidence interval; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as  $[(O-E)/PYR] \times 10,000$ ).*

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**Table 18.A:** Descriptive characteristics of persons diagnosed with different histopathologic types of childhood cancer, both sexes, SEER 1973-2000.

Histopathologic type*	Total	Number		Median		Initial therapy (%)	
		Female	Male	Age at DX	PYR	RT	Surgery
All first cancers	23,819	10,964	12,855	8.2	5.8	38.1	49.6
Leukemia	6,440	2,833	3,607	5.2	4.8	26.6	0.3
Acute lymphocytic	4,905	2,122	2,783	4.8	5.8	29.4	0.2
Acute non-lymphocytic	1,007	498	509	8.5	1.5	13.8	0.7
Hodgkin lymphoma	1,744	838	906	15.1	10.4	64.2	23.1
Non-Hodgkin lymphoma	1,038	322	716	12.1	5.7	39.4	23.6
Brain, CNS	4,344	1,948	2,396	7.6	4.8	57.3	75.4
Ependymoma	374	151	223	4.2	3.4	63.4	94.4
Astrocytoma	2,242	1,059	1,183	8.8	6.5	45.6	78.6
PNET (brain, CNS)	859	327	532	6.4	3.5	81.3	92.9
Neuroblastoma	1,461	691	770	1.6	4.0	31.6	64.1
Retinoblastoma	581	301	280	1.3	8.2	27.5	88.1
Wilms tumor	1,188	625	563	3.2	8.8	49.9	95.4
Bone, joints	1,352	584	768	13.7	4.0	27.7	68.4
Osteosarcoma	752	337	415	13.9	3.9	6.5	80.5
Ewing sarcoma	479	198	281	13.3	3.4	62.0	46.6
Soft tissue sarcoma	1,759	807	952	10.3	5.9	45.4	76.6
Rhabdomyosarcoma	769	309	460	6.6	4.8	64.5	62.3
Fibrosarcoma <sup>†</sup>	448	237	211	12.8	9.0	17.9	92.4
Other <sup>‡</sup>	538	259	279	12.5	4.5	41.3	84.0
Germ cell tumors <sup>§</sup>	1,206	601	605	14.6	7.0	21.7	86.2
Carcinomas/epithelial <sup>  </sup>	1,606	1,017	589	15.5	9.3	24.5	89.9
Other <sup>¶</sup>	1,100	397	703	7.9	3.6	26.1	47.5

Notes: Includes children surviving 2 months or more after diagnosis.

Abbreviations: DX=diagnosis; PYR=person-years at risk; RT=initial radiation; CNS=central nervous system; PNET=primitive neuroectodermal tumor.

\*Categories and ordering based on International Classification of Childhood Cancer (ICCC) (Kramarova and Stiller, 1996).

†Also includes neurofibrosarcoma.

‡Does not include Kaposi sarcoma.

§Includes intracranial and intraspinal germ cell tumors, other or unspecified nongonadal germ cell tumors, gonadal germ cell tumors, gonadal carcinomas, other or unspecified malignant gonadal tumors.

||Includes adrenocortical carcinoma (N=38), thyroid carcinoma (N=592), nasopharyngeal carcinoma (N=77), malignant melanoma (N=466), skin carcinoma other than melanoma (N=3), and other or unspecified carcinoma (N=430).

¶Includes Burkitt lymphoma (N=335), unspecified lymphoma (N=143), miscellaneous lymphoreticular cancers (N=55), other tumors of sympathetic nervous system (N=55), non-central nervous system PNET (N=48), renal carcinoma (N=53), hepatoblastoma (N=191), hepatic carcinoma (N=61), and other or unspecified cancers (N=159).

prenatal exposures or genetic factors may play predominant roles. Ionizing radiation is known to induce leukemia, sarcomas, and CNS cancers but probably explains only a small minority of childhood tumors (Inskip, 1999). Congenital anomalies have been associated with Wilms tumor and leukemia, while infectious agents and immune factors may be related to certain types of leukemia and lymphoma (Ries et al, 1999). A strong genetic component has been identified in retinoblastoma, while leukemia, CNS cancer, and bone and soft tissue sarcomas may arise as part of the Li-Fraumeni familial cancer syndrome (Malkin et al, 1992; Hisada et al, 1998; Eng and Maher, 1999; Nichols et al, 2001). In addition, leukemia, CNS cancer, and soft tissue sarcoma occur in association with neurofibromatosis type 1 (Heyn et al, 1993; Eng and Maher, 1999).

## Results and Discussion

### Characteristics of Study Population

A total of 23,819 children (age <18 years) with cancer who survived 2 or more months following diagnosis were observed for an average of 8.3 years (median, 5.8 years) (Table 18.A). There were 12,951 5-year survivors, 8,424 10-year survivors, and 2,637 20-year survivors. ALL was the most common type of first cancer, accounting for 21% of the total, while cancers of the CNS accounted for an additional 18%. Fifty-four percent of the study population was male and 46% female, but there was a female predominance among cases of retinoblastoma, Wilms tumor, fibrosarcoma, cutaneous melanoma, and carcinomas. Eighty-one percent of the cohort was white, 10% black, and 9% other or of unknown race. Blacks were overrepresented among cases with osteosarcoma, retinoblastoma, soft tissue sarcoma, and Wilms tumor

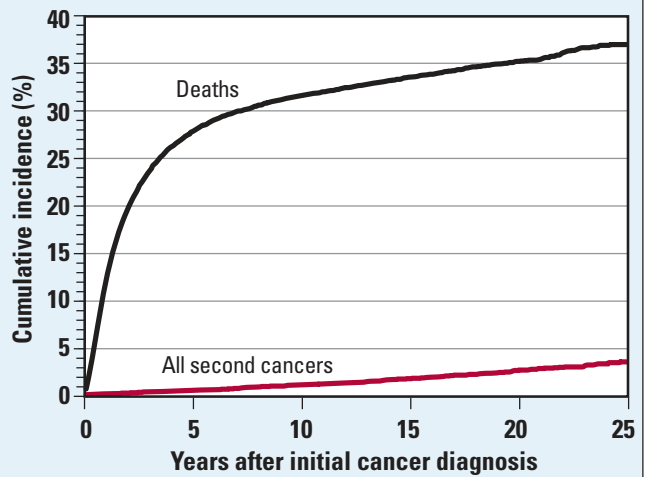
relative to their frequency in the cohort as a whole (data not shown). The median age at diagnosis was less than 5 years for retinoblastoma, neuroblastoma, Wilms tumor, ALL, and ependymoma; 5 to 9 years for ANLL, astrocytoma, primitive neuroectodermal tumor (PNET), and rhabdomyosarcoma; and 10 to 16 years for lymphoma, bone sarcoma, fibrosarcoma, germ cell tumors, various carcinomas, and melanoma. Patients diagnosed at very young ages often were followed into adolescence, and those diagnosed as teenagers were often followed into early adulthood. The maximum age at the end of follow-up was 44 years. Radiation was part of the initial course of therapy for a high proportion (>60%) of patients with HL, PNET, Ewing sarcoma, and rhabdomyosarcoma but rarely was given for osteosarcoma, fibrosarcoma, ANLL, or germ cell cancers. Initial treatment commonly included surgery, except for leukemia and lymphoma.

### Overall Results

During the period of follow-up, 352 new primary cancers were diagnosed in 327 individuals. This represents a more than 6-fold increase in incidence relative to the general population (O/E=6.07, 95% CI=5.45-6.74, EAR=15 per 10,000 person-years) (Table 18.B), which is similar to risks reported for 3 other large cohorts from North America (Neglia et al, 2001), Great Britain (Jenkinson et al, 2004), and Nordic countries (Olsen et al, 1993) for contemporaneous periods. Eighteen childhood cancer patients developed 2 new malignancies, and 3 developed 3 or more new malignancies. Risks were similar for females (O/E=5.80, O=176, EAR=15) and males (O/E=6.36, O=176, EAR=15) but were somewhat higher for blacks (O/E=8.38, O=33, EAR=16) than whites (O/E=5.72, O=287, EAR=14). Subsequent cancer risks varied by age at diagnosis of the first cancer; however, patterns depended on type of first cancer and latency (or attained age). For all new cancers combined, the relative risk increased over the first 10 years following diagnosis of the initial cancer to nearly 8-fold and then decreased to less than 4-fold among 20-year survivors (Table 18.B). In contrast, the excess absolute risk increased with time, from 7 excess cancers per 10,000 person-years in the first year of follow-up to 26 among persons surviving more than 20 years. The cumulative incidence of developing a second cancer at 25 years, adjusted for the competing risk of death due to other causes, was 3.5% (95% CI=3.0%-4.1%) (Figure 18.1). In comparison, the 25-year cumulative competing risk of death, based on all deaths excluding deaths among patients with a second cancer, was 37.6% (95% CI=36.7%-38.5%). Most of the deaths due to other causes were attributed to the first cancer (data not shown).

Numerous types of subsequent primary cancers occurred significantly more often than expected among childhood cancer patients, and the patterns of excess risk for specific cancer sites changed over time (Table 18.B). The most common types were cancers of the female breast, brain/CNS, bone, thyroid gland, and soft tissue, as well as melanoma and ANLL. Significantly high rates

**Figure 18.1:** Cumulative incidence of developing a second cancer and cumulative probability of death due to competing causes among children with any primary cancer, SEER 1973-2000.



Note: The competing cause of death is based on all deaths excluding deaths among patients with a second cancer.

also were noted for new malignancies of the buccal cavity, digestive system, respiratory system, testis, urinary tract, eye, and CNS other than brain, as well as NHL. Relative and excess absolute risks for specific types of cancer generally were similar for males and females, with some exceptions (data not shown). The excess of urinary tract cancers occurred exclusively among males. The relative and excess absolute risks for ANLL and the relative (but not absolute) risk for thyroid cancer were higher among males than females, whereas the relative and absolute risks of subsequent bone cancer were higher in females.

Elevated O/E ratios for some new primary cancers (notably ANLL, melanoma, and cancers of the female and male genital tracts) were apparent within the first 5 years after diagnosis of the first cancer (Table 18.B). For other cancers (including those of the buccal cavity, stomach, female breast, urinary tract, soft tissues, and cranial nerves or spinal cord), the relative risk appeared greater for long-term survivors. In particular, there was a late-emerging excess of stomach cancer, 15 or more years after initial therapy. Observed-to-expected ratios for NHL and cancers of the bone, brain, and thyroid gland varied erratically with time. The relative risks for all latency intervals combined were similar for new primary solid cancers and leukemia, but the absolute risk was decidedly higher for subsequent solid cancers (Table 18.B). Solid cancers accounted for 81% of all subsequent cancers, and the temporal change in risk since initial diagnosis resembled that for all subsequent cancers combined. For subsequent leukemia, both the O/E and EAR peaked between 1 and 5 years after the first cancer, and no cases were observed 15 or more years after initial diagnosis. As childhood cancer survivors mature to the ages at which cancer incidence rates in the population increase sharply, it remains to be

**Table 18.B:** Risk of subsequent primary cancers following childhood cancer (ages 0-17 years), by time since diagnosis of first cancer, both sexes.

	Years after first primary cancer diagnosis															
	<1 yr		1-4 yr		5-9 yr		10-14 yr		15-19 yr		≥20 yr		Total			
	23,819		20,415		12,951		8,424		5,234		2,637		23,819			
Number starting interval	18,350		63,463		52,583		33,856		19,330		9,003		196,585			
Person-years in interval	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>Subsequent primary cancer</b>	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
All subsequent cancers	16	5.39*	83	7.74*	92	7.83*	72	5.77*	57	4.98*	32	3.71*	352	58.00	6.07*	14.96
All solid cancers	13	7.46*	53	8.15*	75	9.52*	63	6.77*	54	5.93*	27	3.70*	285	41.84	6.81*	12.37
Buccal cavity, pharynx	0	0.00	2	11.83*	4	18.19*	6	25.32*	4	18.73*	1	5.54	17	1.06	16.06*	0.81
Tongue	0	0.00	1	60.15	0	0.00	1	23.32	1	21.94	0	0.00	3	0.18	16.38*	0.14
Salivary gland	0	0.00	1	16.08	2	24.68*	3	36.97*	2	32.79*	0	0.00	8	0.34	23.37*	0.39
Digestive system	1	9.77	4	12.94*	5	15.29*	4	8.30*	8	12.95*	3	4.65	25	2.48	10.07*	1.15
Stomach	0	0.00	0	0.00	0	0.00	0	0.00	3	41.78*	3	43.34*	6	0.25	23.61*	0.29
Small intestine	0	0.00	1	148.04*	1	79.34*	1	49.82	0	0.00	0	0.00	3	0.09	32.79*	0.15
Colon	1	106.96*	1	19.66	0	0.00	0	0.00	1	4.42	0	0.00	3	0.79	3.78	0.11
Rectum, rectosigmoid junction	0	0.00	0	0.00	3	60.24*	0	0.00	0	0.00	0	0.00	3	0.43	7.02*	0.13
Pancreas	0	0.00	1	68.97	1	43.38	0	0.00	3	70.63*	0	0.00	5	0.16	30.31*	0.25
Respiratory system	0	0.00	1	6.21	3	17.72*	2	10.20*	1	4.16	1	3.37	8	1.11	7.19*	0.35
Nose, nasal cavity, ear	0	0.00	0	0.00	2	65.46*	0	0.00	0	0.00	0	0.00	2	0.13	15.08*	0.09
Lung, bronchus	0	0.00	1	22.20	1	13.86	2	18.65*	1	6.01	0	0.00	5	0.64	7.82*	0.22
Female breast	0	0.00	0	0.00	2	8.92*	13	18.42*	16	12.38*	8	4.64*	39	3.99	9.78*	3.69
Female genital system	1	12.85	4	9.06*	3	3.55	1	0.80	1	0.78	0	0.00	10	4.91	2.04	0.54
Cervix uteri	0	0.00	1	11.19	1	3.19	0	0.00	0	0.00	0	0.00	2	2.11	0.95	-0.01
Corpus uteri	0	0.00	0	0.00	0	0.00	1	12.54	1	8.14	0	0.00	2	0.41	4.87	0.17
Ovary	1	17.63	2	6.95	1	2.35	0	0.00	0	0.00	0	0.00	4	2.03	1.97	0.21
Male genital system	1	10.45	5	9.08*	5	4.76*	0	0.00	1	0.95	0	0.00	12	4.59	2.61*	0.73
Testis	1	11.34	5	9.49*	4	3.88*	0	0.00	1	0.97	0	0.00	11	4.48	2.46*	0.64
Urinary system	0	0.00	2	4.66	1	4.25	1	4.44	4	15.82*	0	0.00	8	1.58	5.07*	0.33
Urinary bladder	0	0.00	0	0.00	0	0.00	0	0.00	2	16.19*	0	0.00	2	0.52	3.82	0.08
Kidney parenchyma	0	0.00	2	5.46	0	0.00	1	9.83	2	16.29*	0	0.00	5	1.03	4.86*	0.20
Melanoma of skin <sup>†</sup>	5	61.74*	3	5.72*	6	5.54*	5	3.41*	3	2.10	3	2.85	25	5.63	4.44*	0.99
Eye, orbit	1	11.54	1	5.61	1	22.88	1	30.01	0	0.00	0	0.00	4	0.39	10.16*	0.18
Brain	2	4.20	7	4.43*	14	11.27*	6	7.25*	2	3.84	1	3.5	32	4.93	6.49*	1.38
Other central nervous system	0	0.00	2	12.83*	2	18.70*	2	29.27*	0	0.00	2	88.13*	8	0.45	17.90*	0.38
Thyroid	1	11.04	4	7.24*	8	7.90*	11	9.16*	3	2.78	3	4.1	30	4.67	6.43*	1.29
Bone, joints	1	6.84	12	20.94*	11	20.20*	7	19.40*	2	11.85*	2	32.04*	35	1.86	18.86*	1.69
Osteosarcoma	0	0.00	8	26.71*	7	25.06*	5	28.24*	1	14.40	0	0.00	21	0.92	22.79*	1.02
Chondrosarcoma	1	117.72*	1	27.45	2	43.48*	2	41.33*	1	24.69	0	0.00	7	0.20	34.78*	0.35
Soft tissue including heart	0	0.00	5	8.99*	10	21.35*	4	10.72*	8	31.38*	2	14.39*	29	1.97	14.75*	1.38
(Neuro)Fibrosarcoma	0	0.00	2	17.80*	7	57.01*	2	19.57*	4	55.20*	1	25.07	16	0.48	33.43*	0.79
Non-Hodgkin lymphoma	2	10.95*	3	4.03	4	4.64*	1	1.10	3	3.59	3	5.39*	16	4.09	3.91*	0.61
Hodgkin lymphoma	0	0.00	2	1.72	2	1.29	0	0.00	0	0.00	0	0.00	4	5.58	0.72	-0.08
Leukemia	0	0.00	24	10.87*	9	6.63*	5	6.32*	0	0.00	0	0.00	38	5.88	6.46*	1.63
Acute lymphocytic	0	0.00	3	1.89	3	3.73	2	5.94	0	0.00	0	0.00	8	3.50	2.29	0.23
Acute non-lymphocytic	0	0.00	19	38.66*	6	14.31*	3	9.44*	0	0.00	0	0.00	28	1.72	16.28*	1.34
Chronic myeloid	0	0.00	2	23.78*	0	0.00	0	0.00	0	0.00	0	0.00	2	0.47	4.24	0.08

Notes: EAR for female sites is based on 94,789 PYR and for male sites on 101,795 PYR.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P < 0.05.

†Ten of 25 subsequent melanomas occurred among children with an initial melanoma.

seen whether the excess cancer risk will broaden to include the common adult carcinomas and increase in proportion to the background risk.

The patterns of excess risk over time in the SEER cohort are similar to those observed in previous studies of multiple primary cancers in children (Little et al, 1991, 1998a; Olsen et al, 1993; de Vathaire et al, 1999a; Jenkinson

et al, 2004). The wave-like temporal pattern for excess leukemia fits the pattern commonly observed following acute exposure to leukemogens and strongly suggests an effect of treatment. A decreasing relative risk for solid cancers with increasing follow-up time may reflect increases in background incidence rates unrelated to the initial childhood cancer or its treatment. However, part of



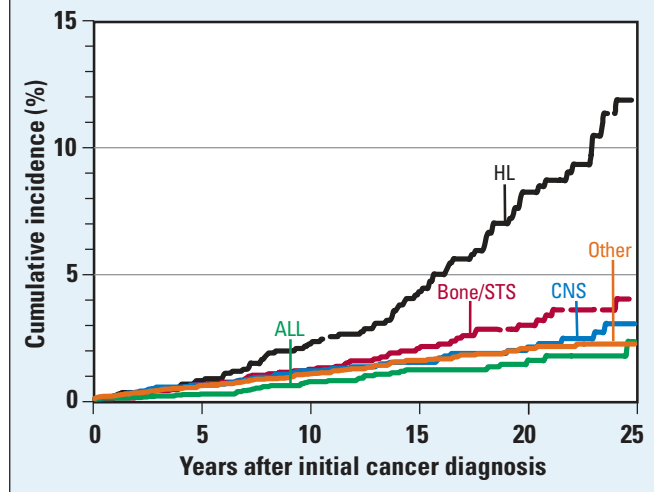
the decrease in relative risk in later follow-up intervals may reflect underascertainment of new cancers among long-term survivors. An estimated 14% of childhood cancer cases are lost to follow-up by SEER (Ries et al, 1999). In addition, new primary cancers occurring among persons who moved outside of geographic areas covered by SEER registries would not be recorded in SEER files.

Childhood cancer patients whose initial treatment included radiotherapy were at higher risk of developing a new cancer than those not given radiotherapy (Table 18.C). Subsequent cancer sites showing the greatest increased risk following radiotherapy among 5-year survivors included breast, brain, bone and soft tissue, thyroid gland, digestive system (especially stomach and pancreas), and lung. Because subsequent courses of radiotherapy were often given for several types of initial cancer (particularly HL), and because prophylactic craniospinal irradiation for ALL was not coded as radiation treatment until 1988, some of the persons classified in the “no radiation” group probably did receive radiation. This would imply that actual differences in O/E ratios for the irradiated and nonirradiated groups are greater than indicated in Table 18.C, for some types of subsequent cancers. Previous epidemiologic studies have documented excesses of cancers of the female breast, thyroid gland, brain and CNS, salivary gland, bone, and stomach associated with radiotherapy during childhood (Tucker et al, 1987a,b, 1991; Ron et al, 1988, 1995; Neglia et al, 1991; Newton et al, 1991; Hancock et al, 1993; Bhatia et al, 1996; Hawkins et al, 1996; Kuttesch et al, 1996; Wong et al, 1997; Karlsson et al, 1998; Le Vu et al, 1998; Little et al, 1998b; Schneider et al, 1998; Walter et al, 1998; de Vathaire et al, 1999b; Garwicz et al, 2000; Metayer et al, 2000; Bhatia and Sklar, 2002; Sigurdson et al, 2005).

The O/E ratios for ANLL and cancer of the buccal cavity differed little by radiotherapy history, while the O/E ratios for cancers of the female and male genital tract and for cutaneous melanoma were higher among persons not known to have received radiation. Chemotherapy likely was more important than radiotherapy in causing subsequent ANLL. At least 23 of the 28 ANLL cases were known to have received chemotherapy for their childhood cancer. Chemotherapy probably contributed to the increased risks of other subsequent cancers, because previous studies have linked alkylating agents with second primary bone and soft tissue sarcomas (Tucker et al, 1987b; Newton et al, 1991; Hawkins et al, 1996; Le Vu et al, 1998), lung cancer (Kaldor et al, 1992; Swerdlow et al, 1992; Travis et al, 2002), and bladder cancer (Travis et al, 1995). Melanoma has not been clearly linked to radiotherapy or chemotherapy, although a recent small study of childhood cancer survivors reported increased risks associated with radiation doses greater than 15 Gy or treatment with alkylating agents and spindle inhibitors combined (Guérin et al, 2003).

The largest relative risks for all types of subsequent cancers combined were seen among patients with initial diagnoses of Ewing sarcoma, retinoblastoma, and PNET, while the largest absolute risks were seen following

**Figure 18.2:** Cumulative incidence of developing a second cancer among children with selected first primary cancers: Hodgkin lymphoma (HL), bone and soft tissue sarcomas (Bone/STS), brain and other central nervous system cancers (CNS), acute lymphocytic leukemia (ALL) and other cancer sites (Other).



Ewing sarcoma, HL, and PNET (Table 18.D). The cumulative incidence of second cancer at 25 years after HL was 11.8% (95% CI=9.1%-14.9%), decidedly higher than for most other types of childhood cancers (Figure 18.2). (Because of the small numbers of second cancers, PNET is grouped with other brain and CNS cancers, and Ewing sarcoma with other bone sarcomas.) Patients with Ewing sarcoma, HL, and PNET were frequently treated with both radiotherapy and chemotherapy. Patients diagnosed with lymphomas, bone sarcomas, and carcinomas plus melanomas also tended to be older, and to have attained ages at which background incidence rates for many cancers are higher. The high relative risk of cancer in patients with retinoblastoma probably reflects the combination of genetic predisposition to multiple cancers, sensitivity to radiogenic cancer, and very low background cancer risk in the general population during the early years of life. Overall, females and males had similar excess risks of subsequent cancer after most types of first cancer (Table 18.D). However, risks following HL and fibrosarcoma were higher in females, and risks following a first Wilms tumor, retinoblastoma, carcinoma, or ependymoma were higher among males. A large part of the sex difference in subsequent cancer after HL can be explained by the occurrence of radiation-related breast cancer (discussed later in this chapter).

The EAR for new primary solid cancers was higher among persons whose first cancer was diagnosed between the ages of 10 and 17 years than at younger ages (Table 18.E); however, it was difficult to separate the effects of age at initial cancer diagnosis from the effects related to the type of first cancer, its treatment, and time since initial diagnosis (or attained age). HL rarely occurs before the age of 10 years, but it accounted for a large part of the excess risk for the group aged 10-17 years



**Table 18.C:** Risk of subsequent primary cancers following childhood cancer (ages 0-17 years), by time since diagnosis of first cancer and by initial treatment with radiation, both sexes.

	Years after first primary cancer diagnosis															
	<1 yr		1-4 yr		5-9 yr		10-14 yr		15-19 yr		≥20 yr		Total			
Radiation, no. pts	9,063		7,670		4,940		3,607		2,492		1,359		9,063			
Radiation, PYR	6,971		23,726		21,142		15,269		9,629		4,695		81,432			
No radiation, no. pts	13,905		12,054		7,577		4,530		2,555		1,172		13,905			
No radiation, PYR	10,764		37,596		29,691		17,405		8,998		3,857		108,311			
<b>Subsequent primary cancer</b>	<b>O</b>	<b>O/E</b>	<b>O</b>	<b>O/E</b>	<b>O</b>	<b>O/E</b>	<b>O</b>	<b>O/E</b>	<b>O</b>	<b>O/E</b>	<b>O</b>	<b>O/E</b>	<b>O</b>	<b>E</b>	<b>O/E</b>	<b>EAR</b>
<b>All subsequent cancers</b>																
Any radiation	4	3.69	37	9.39*	56	11.69*	43	7.67*	36	6.50*	21	5.02*	197	25.14	7.84*	21.10
No radiation	12	6.72*	41	6.41*	34	5.21*	28	4.38*	16	2.94*	11	2.79*	142	30.48	4.66*	10.30
<b>All solid cancers</b>																
Any radiation	2	3.17	23	9.68*	45	14.06*	38	9.16*	34	7.77*	18	5.13*	160	18.24	8.77*	17.41
No radiation	11	10.44*	27	6.94*	29	6.62*	24	5.01*	16	3.67*	9	2.68*	116	21.83	5.31*	8.69
<b>Buccal cavity, pharynx</b>																
Any radiation	0	0.00	2	30.97*	1	11.15	1	9.47	3	29.07*	0	0.00	7	0.47	15.03*	0.80
No radiation	0	0.00	0	0.00	3	24.52*	5	40.81*	1	9.82	1	12.37	10	0.55	18.25*	0.87
<b>Salivary gland</b>																
Any radiation	0	0.00	1	42.37	1	31.06	0	0.00	2	67.91*	0	0.00	4	0.15	27.13*	0.47
No radiation	0	0.00	0	0.00	1	21.75	3	70.11*	0	0.00	0	0.00	4	0.18	22.03*	0.35
<b>Digestive system</b>																
Any radiation	1	29.01	1	9.46	3	22.73*	2	9.45*	5	17.19*	2	6.59	14	1.08	12.99*	1.59
No radiation	0	0.00	2	10.40*	2	10.94*	2	7.95	3	9.95*	1	3.35	10	1.29	7.74*	0.80
<b>Stomach</b>																
Any radiation	0	0.00	0	0.00	0	0.00	0	0.00	2	60.12*	2	61.83*	4	0.11	35.89*	0.48
No radiation	0	0.00	0	0.00	0	0.00	0	0.00	1	28.08	1	30.81	2	0.13	15.24*	0.17
<b>Pancreas</b>																
Any radiation	0	0.00	1	191.15*	1	112.06*	0	0.00	3	151.26*	0	0.00	5	0.07	69.36*	0.61
No radiation	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.08	0.00	-0.01
<b>Respiratory system</b>																
Any radiation	0	0.00	1	16.81	1	14.10	2	22.51*	1	8.81	1	7.45	6	0.48	12.38*	0.68
No radiation	0	0.00	0	0.00	2	21.78*	0	0.00	0	0.00	0	0.00	2	0.57	3.48	0.13
<b>Lung, bronchus</b>																
Any radiation	0	0.00	1	56.44	0	0.00	2	42.30*	1	13.05	0	0.00	4	0.28	14.20*	0.46
No radiation	0	0.00	0	0.00	1	25.56	0	0.00	0	0.00	0	0.00	1	0.32	3.09	0.06
<b>Female breast</b>																
Any radiation	0	0.00	0	0.00	2	22.91*	11	37.47*	11	19.21*	5	6.71*	29	1.71	16.91*	7.14
No radiation	0	0.00	0	0.00	0	0.00	2	5.21	5	7.48*	3	3.44	10	2.08	4.81*	1.48
<b>Female genital system</b>																
Any radiation	0	0.00	0	0.00	1	2.99	1	1.85	1	1.67	0	0.00	3	2.14	1.40	0.22
No radiation	1	21.97	4	15.49*	2	4.18	0	0.00	0	0.00	0	0.00	7	2.56	2.73*	0.83
<b>Male genital system</b>																
Any radiation	0	0.00	0	0.00	1	2.22	0	0.00	1	1.86	0	0.00	2	2.15	0.93	-0.03
No radiation	1	18.03	5	16.03*	4	7.19*	0	0.00	0	0.00	0	0.00	10	2.24	4.46*	1.41
<b>Urinary system</b>																
Any radiation	0	0.00	0	0.00	1	10.74	0	0.00	1	8.28	0	0.00	2	0.64	3.12	0.17
No radiation	0	0.00	1	3.66	0	0.00	1	8.65	1	8.25	0	0.00	3	0.87	3.44	0.20
<b>Melanoma of skin</b>																
Any radiation	0	0.00	1	4.93	1	2.25	1	1.52	3	4.28	0	0.00	6	2.57	2.34	0.42
No radiation	5	107.52*	2	6.68	5	8.41*	4	5.34*	0	0.00	3	6.48*	19	2.82	6.74*	1.49
<b>Brain, CNS</b>																
Any radiation	1	5.19	4	6.40*	12	22.54*	5	12.41*	2	7.16	3	18.88*	27	2.19	12.32*	3.05
No radiation	1	3.14	5	4.75*	4	5.18*	2	4.34	0	0.00	0	0.00	12	3.00	4.00*	0.83
<b>Thyroid</b>																
Any radiation	0	0.00	2	9.48*	5	12.33*	7	13.27*	0	0.00	3	8.12*	17	2.08	8.18*	1.83
No radiation	1	19.31	1	3.14	3	5.29*	4	6.36*	3	5.83*	0	0.00	12	2.41	4.99*	0.89

**Table 18.C:** Continued.

Subsequent primary cancer	Years after first primary cancer diagnosis												Total			
	<1 yr		1-4 yr		5-9 yr		10-14 yr		15-19 yr		≥20 yr		O	E	O/E	EAR
	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E				
Bone, joints																
Any radiation	0	0.00	8	35.36*	8	34.82*	5	30.09*	1	11.85	1	30.39	23	0.80	28.83*	2.73
No radiation	1	12.13	4	12.26*	3	10.08*	2	10.94*	1	12.76	1	37.89	12	0.99	12.07*	1.02
Soft tissue including heart																
Any radiation	0	0.00	3	15.17*	8	42.94*	2	12.04*	4	31.91*	2	27.90*	19	0.81	23.48*	2.23
No radiation	0	0.00	2	5.90	1	3.76	2	10.32*	2	16.64*	0	0.00	7	1.09	6.45*	0.55
Hodgkin lymphoma																
Any radiation	0	0.00	1	2.13	2	3.05	0	0.00	0	0.00	0	0.00	3	2.51	1.20	0.06
No radiation	0	0.00	1	1.55	0	0.00	0	0.00	0	0.00	0	0.00	1	2.85	0.35	-0.17
Non-Hodgkin lymphoma																
Any radiation	2	27.79*	1	3.48	2	5.65	0	0.00	2	4.90	2	7.15	9	1.81	4.97*	0.88
No radiation	0	0.00	2	4.65	2	4.19	1	2.17	0	0.00	1	4.12	6	2.11	2.85*	0.36
Acute lymphocytic leukemia																
Any radiation	0	0.00	2	3.71	2	6.48	1	6.60	0	0.00	0	0.00	5	1.30	3.85*	0.45
No radiation	0	0.00	1	1.00	1	2.12	1	5.73	0	0.00	0	0.00	3	2.09	1.44	0.08
Acute non-lymphocytic leukemia																
Any radiation	0	0.00	8	44.63*	3	17.69*	1	6.97	0	0.00	0	0.00	12	0.72	16.66*	1.39
No radiation	0	0.00	10	33.92*	2	8.51	2	12.26*	0	0.00	0	0.00	14	0.94	14.93*	1.21

Notes: EAR for female sites is based on 38,218 (any radiation) and 53,447 (no radiation) PYR, and for male sites on 43,214 (any radiation) and 54,864 (no radiation) PYR. Patients with unknown treatment, unknown radiation, or no known treatment were excluded (N=851, O=13).

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000); pts=patients; CNS=central nervous system.

\*P <0.05.

at first diagnosis. For this age group, O/E ratios for subsequent solid cancers were similar among patients with HL and those with other forms of cancer through the first 10 years of follow-up; only among patients who survived more than 10 years was the O/E clearly higher for those diagnosed with HL. This temporal pattern may be explained by the frequent use of extended field radiotherapy in HL patients and a latency period of 10 years or more before most radiation-related solid cancers begin to appear. The excess of subsequent leukemia occurred entirely within the first 15 years of follow-up, regardless of age at diagnosis and type of the first cancer (Table 18.E).

### Risks of Specific Subsequent Primary Cancers by Type of First Primary Cancer

#### Acute Lymphocytic Leukemia

Children diagnosed with ALL had a nearly 5-fold relative risk of developing a new cancer (O/E=4.70, O=39); however, the overall excess absolute risk (EAR=8) was low compared with risks following most other childhood cancers (Tables 18.D and 18.F). The relative risk grew to 8-fold for the 5- to 9-year follow-up interval, then declined. Most of the absolute excess was due to subsequent cancers of the salivary glands, brain and other CNS, bone, and thyroid gland, with the temporal patterns of relative risk generally consistent with a radiation effect. Previous studies of ALL have found that cranial irradiation, given to prevent or treat CNS involvement, is related to a par-

ticularly high risk of subsequent primary brain cancer, as well as new cancers of the head and neck (Neglia et al, 1991; Bhatia et al, 2002; Bhatia, 2003), whereas excess leukemias have been linked to the use of epipodophyllotoxins (Pui et al, 1989, 2003). It is possible that genetic predisposition related to neurofibromatosis type 1 or Li-Fraumeni syndrome played a role in the excess cancer incidence after ALL (Hisada et al, 1998; Eng and Maher, 1999).

#### Hodgkin Lymphoma

In our survey, HL was the initial cancer associated with 87 of the 352 new primary cancers following childhood cancers (O/E=9.55, EAR=39) (Tables 18.D and 18.G). A strong increasing trend over time was apparent, with the EAR rising to more than 90 among children surviving 15 years or more (data not shown). Risks were higher among females, mainly due to a notably high risk of breast cancer (O/E=24.61, EAR=23) (Table 18.G). In addition, significantly elevated risks of more than 9-fold were seen for subsequent cancers of the salivary gland, stomach, pancreas, lung, bone, soft tissue, and thyroid gland, as well as for ANLL and NHL, based on smaller numbers. Radiotherapy clearly contributed to the excess risk of solid cancers among 5-year survivors. The increased risk of breast cancer after mantle radiotherapy for HL is well established (Tucker et al, 1988; Hancock et al, 1993; van Leeuwen et al, 1994a, 2000, 2003; Bhatia et al, 1996, 2003; Travis et al, 1996, 2003; Metayer et al, 2000). Radiation also may have contributed to the increases seen for

**Table 18.D:** Risk of subsequent primary cancers of all types combined following childhood cancer (ages 0-17 years), by type of first cancer, both sexes.

Number starting interval Person-years in interval	Females 10,964 94,789			Males 12,855 101,795			Total 23,819 196,584			
	O	O/E	EAR	O	O/E	EAR	O	E	O/E	EAR
<b>Type of first cancer</b>										
All first cancers	176	5.80*	15.37	176	6.36*	14.57	352	58.00	6.07*	14.96
Leukemia	20	4.23*	6.93	26	4.78*	8.05	46	10.17	4.52*	7.53
Acute lymphocytic	18	4.80*	7.83	21	4.61*	7.60	39	8.30	4.70*	7.70
Acute non-lymphocytic	1	1.69	1.74	2	4.65	8.28	3	1.02	2.93	4.66
Hodgkin lymphoma	59	11.74*	56.72	28	6.86*	22.82	87	9.11	9.55*	38.95
Non-Hodgkin lymphoma	4	4.74*	12.43	9	5.29*	12.85	13	2.54	5.11*	12.72
Brain, CNS	21	5.00*	11.53	35	7.76*	17.28	56	8.71	6.43*	14.68
Ependymoma	0	0.00	-2.63	4	14.47*	28.68	4	0.51	7.79*	15.86
Astrocytoma	11	4.11*	9.40	16	5.66*	12.84	27	5.50	4.91*	11.25
PNET (brain, CNS)	6	10.56*	23.83	9	14.32*	26.91	15	1.20	12.54*	25.61
Neuroblastoma	7	7.87*	12.06	4	4.10*	5.72	11	1.87	5.90*	8.82
Retinoblastoma	6	11.60*	17.59	9	17.92*	30.17	15	1.02	14.71*	23.56
Wilms tumor	5	4.07*	5.81	9	8.56*	14.32	14	2.28	6.14*	9.73
Bone, joints	13	7.08*	23.87	13	8.46*	23.36	26	3.37	7.71*	23.61
Osteosarcoma	5	4.46*	14.36	5	6.08*	15.87	10	1.94	5.14*	15.10
Ewing sarcoma	7	13.79*	42.74	8	15.90*	45.92	15	1.01	14.84*	44.39
Soft tissue including heart	16	6.80*	19.78	12	5.10*	12.12	28	4.71	5.95*	15.67
Rhabdomyosarcoma	5	7.88*	18.19	6	6.81*	14.40	11	1.52	7.26*	15.93
Fibrosarcoma <sup>†</sup>	7	7.95*	25.32	2	2.74	5.79	9	1.61	5.59*	16.03
Other	4	4.90*	15.53	4	5.45*	14.89	8	1.55	5.16*	15.20
Germ cell tumors	8	3.50*	9.87	9	4.68*	13.34	17	4.21	4.04*	11.53
Carcinomas/epithelial <sup>‡</sup>	15	2.67*	8.33	15	6.06*	20.85	30	8.10	3.71*	12.69
Other <sup>§</sup>	2	2.44	4.16	7	6.32*	12.82	9	1.93	4.67*	9.52

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR] × 10,000); CNS=central nervous system; PNET=primitive neuroectodermal tumor.

\*P < 0.05.

<sup>†</sup>Also includes neurofibrosarcoma.

<sup>‡</sup>Includes adrenocortical carcinoma (N=38), thyroid carcinoma (N=592), nasopharyngeal carcinoma (N=77), malignant melanoma (N=466), skin carcinoma other than melanoma (N=3), and other or unspecified carcinoma (N=430).

<sup>§</sup>Includes Burkitt lymphoma (N=335), unspecified lymphoma (N=143), miscellaneous lymphoreticular cancers (N=55), other tumors of sympathetic nervous system (N=55), non-CNS PNET (N=48), renal carcinoma (N=53), hepatoblastoma (N=191), hepatic carcinoma (N=61), and other or unspecified cancers (N=159).

cancers of the digestive system, thyroid, lung, bone, and soft tissue among long-term survivors, as observed in other HL study populations (Tucker et al, 1988; van Leeuwen et al, 1994a; Metayer et al, 2000; Dores et al, 2002; Travis et al, 2002). The high relative risk for subsequent ANLL, reaching an increase of 75-fold during the first 15 years of follow-up, is consistent with previous studies linking excess ANLL following HL to treatment with alkylating agents (Tucker et al, 1987a, 1988; Kaldor et al, 1990; Swerdlow et al, 1992, 1997; van Leeuwen et al, 1994a,b). Misclassification of the original HL or depressed cell-mediated immunity associated with HL (Slivnick et al, 1990) may be related to the excess of NHL. Recent trends toward use of lower radiation doses, smaller radiation fields, and less toxic chemotherapy may reduce the risk of new malignancies in the future (Moppett et al, 2001; Donaldson, 2002).

### Non-Hodgkin Lymphoma

The risk of developing a new malignancy following childhood NHL (O/E=5.11, O=13, EAR=13) was decided-

ly lower than that for HL (Table 18.G). However, significantly elevated risks were seen for ANLL and cancers of the female breast and thyroid, based on small numbers of cases. For breast cancer, the excess was confined to 15-year survivors (O/E=29.62) and is probably related to initial treatment with radiation. Radiation is no longer part of standard therapy for many patients with childhood NHL (Kalapurakal and Thomas, 1997). The increased risk of ANLL among NHL survivors within the first 5 years after initial diagnosis appears related to treatment with chemotherapy, including alkylating agents and/or epipodophyllotoxins (Hawkins et al, 1992; Travis et al, 1994a; Leung et al, 2001). The excess thyroid cancer occurred within the first 5 years after diagnosis of NHL and may reflect increased detection due to close medical surveillance.

### Central Nervous System Cancers

Relative and excess absolute risks of developing a new cancer were highest following a first PNET (O/E=12.54, O=15, EAR=26), intermediate following ependymoma

**Table 18.E:** Risk of subsequent primary solid cancers and leukemia following a first childhood cancer, by age at first cancer diagnosis, type of first cancer (Hodgkin lymphoma, other) and years after first primary cancer diagnosis, both sexes.

Age at diagnosis of first cancer (yr)	First cancer	Years after first primary cancer diagnosis												Total			
		<1 yr		1-4 yr		5-9 yr		10-14 yr		15-19 yr		≥20 yr		O	E	O/E	EAR
		O	O/E	O	O/E	O	O/E	O	O/E	O	O/E	O	O/E				
<b>Subsequent primary solid cancer</b>																	
<5	Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.04	0.00	-1.19
	Other	2	2.73	11	5.66*	21	17.58*	17	14.92*	12	10.31*	2	2.06	65	7.14	9.10*	8.43
	All 1st cancers	2	2.72	11	5.64*	21	17.50*	17	14.85*	12	10.24*	2	2.04	65	7.18	9.05*	8.38
5-9	Hodgkin lymphoma	0	0.00	1	25.71	0	0.00	1	12.04	1	11.99	0	0.00	3	0.33	9.13*	12.36
	Other	1	4.71	11	14.22*	6	6.37*	11	9.67*	3	2.52	1	1.11	33	5.16	6.39*	7.51
	All 1st cancers	1	4.52	12	14.77*	6	5.98*	12	9.83*	4	3.14	1	1.05	36	5.49	6.56*	7.78
10-17	Hodgkin lymphoma	0	0.00	6	8.24*	11	8.98*	13	8.12*	22	13.66*	10	7.31*	62	6.66	9.31*	31.62
	Other	10	15.18*	24	7.97*	37	8.13*	21	3.94*	16	3.17*	14	3.50*	122	22.50	5.42*	14.04
	All 1st cancers	10	12.69*	30	8.03*	48	8.46*	34	4.90*	38	5.70*	24	4.47*	184	29.16	6.31*	17.52
<b>Subsequent leukemia</b>																	
<5	Hodgkin lymphoma	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0.00	-0.34
	Other	0	0.00	7	5.96*	2	3.44	2	7.05	0	0.00	0	0.00	11	2.71	4.06*	1.21
	All 1st cancers	0	0.00	7	5.95*	2	3.43	2	7.01	0	0.00	0	0.00	11	2.72	4.05*	1.20
5-9	Hodgkin lymphoma	0	0.00	0	0.00	2	127.20*	1	92.46*	0	0.00	0	0.00	3	0.06	50.62*	13.60
	Other	0	0.00	2	5.48	1	4.11	0	0.00	0	0.00	0	0.00	3	1.00	2.99	0.54
	All 1st cancers	0	0.00	2	5.22	3	11.58*	1	6.32	0	0.00	0	0.00	6	1.06	5.65*	1.26
10-17	Hodgkin lymphoma	0	0.00	2	17.44*	2	19.71*	2	26.80*	0	0.00	0	0.00	6	0.42	14.43*	3.19
	Other	0	0.00	13	24.43*	2	4.85	0	0.00	0	0.00	0	0.00	15	1.69	8.90*	1.88
	All 1st cancers	0	0.00	15	23.19*	4	7.79*	2	5.75	0	0.00	0	0.00	21	2.10	9.99*	2.14

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P < 0.05.

(O/E=7.79, O=4, EAR=16), and lowest following an astrocytoma (O/E=4.91, O=27, EAR=11) (Table 18.D). This result parallels the use of radiation to treat the primary tumor (Tables 18.A and 18.H). Risk of subsequent CNS cancer (mostly brain cancer) was significantly increased following a first CNS cancer, with the excesses among those surviving 5 or more years, possibly related to radiotherapy. In the absence of radiotherapy, chemotherapy has not been related to subsequent primary CNS tumors (Little et al, 1998b; Garwicz et al, 2000). However, chemotherapy, which was commonly used for childhood brain cancer (Black, 1991a,b; Pollack, 1994), is likely to account for the excess of leukemia. It is noteworthy that the only 2 cases of subsequent chronic myelogenous leukemia observed in the entire cohort of childhood cancer survivors occurred among patients diagnosed previously with astrocytoma. Craniospinal radiation fields were more commonly used for PNETs than for astrocytomas because of the greater tendency of PNETs to spread throughout the CNS (Black, 1991a,b; Pollack, 1994; Fine et al, 2005), so that radiation exposure covered more extensive volumes of tissue. In a prior study of second cancers in PNET (medulloblastoma) patients, which partially overlapped with the present study, excesses of ALL were seen, along with cancers of the salivary glands, uterine cervix, CNS, and thyroid gland, with a majority

of the solid cancers arising in or near the radiation fields (Goldstein et al, 1997). In the present study, bone and soft tissue sarcomas were increased following astrocytoma, possibly due to a combination of treatment and genetic susceptibility (Inskip, 2003). Recent trends in the treatment of childhood CNS cancer include less use of cranial radiotherapy and greater use of chemotherapy (Moppett et al, 2001).

### Bone Sarcoma

The large risk of subsequent cancer following Ewing sarcoma (O/E=14.84, O=15, EAR=44) was due mostly to new cancers of the bone, soft tissue, and breast, as well as ANLL (Table 18.I). Several studies of Ewing sarcoma have reported an increased risk of subsequent osteosarcoma and soft tissue sarcomas related to high radiation doses (41-60 Gy) and alkylating agents (Suit, 1975; Tucker et al, 1987b; Travis et al, 1994b; Hawkins et al, 1996; Kuttesch et al, 1996; Le Vu et al, 1998). Notably high risks of leukemia have been associated with multiagent chemotherapy for Ewing sarcoma (Dunst et al, 1998). A similar constellation of excess cancers was observed after osteosarcoma in our survey (Table 18.I), although relative and absolute risks (O/E=5.14, O=10, EAR=15) were lower than for Ewing sarcoma. The risk of subsequent breast cancer was increased markedly among patients with

**Table 18.F:** Risk of subsequent primary cancers among 4,905 children (ages 0-17 years) diagnosed with acute lymphocytic leukemia, by years after diagnosis of initial cancer, both sexes.

Subsequent primary cancer	Years after first primary cancer diagnosis									
	<5 yr		5-9 yr		≥10 yr		Total			
	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
All subsequent cancers	7	2.73*	14	8.16*	18	4.47*	39	8.30	4.70*	7.70
Any radiation†	1	1.28	8	12.31*	5	2.3	14	3.60	3.89*	6.93
All solid cancers	6	4.08*	13	12.31*	17	5.78*	36	5.47	6.58*	7.66
Any radiation†	1	2.25	8	19.88*	5	3.13*	14	2.45	5.72*	7.70
Buccal cavity, pharynx	1	31.99	1	30.54	2	25.34*	4	0.14	27.98*	0.97
Salivary gland	1	95.60*	1	75.88	1	36.99	3	0.05	59.20*	0.74
Digestive system	1	12.83	0	0.00	1	6.17	2	0.28	7.19	0.43
Brain, CNS	1	1.87	7	24.27*	3	10.22*	11	1.12	9.86*	2.48
Thyroid	1	18.27	2	20.97*	5	12.58*	8	0.55	14.61*	1.87
Bone, joints	1	8.06	1	8.12	2	15.41*	4	0.38	10.61*	0.91
Osteosarcoma	0	0.00	0	0.00	2	31.18*	2	0.19	10.33*	0.45
Soft tissue including heart	1	6.98	1	11.69	0	0.00	2	0.36	5.56	0.41
Melanoma of skin	0	0.00	0	0.00	2	4.25	2	0.62	3.20	0.35
Other	1	0.65	2	2.10	3	1.27	6	4.86	1.24	0.29

Notes: Number of patients (PYR at risk in interval) for <5, 5-9, and ≥10 time intervals are: 4,905 (17,699), 2,723 (10,742), and 1,688 (11,403), respectively.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000); CNS=central nervous system.

\*P <0.05.

†Radiotherapy data are known to be incomplete for patients with acute leukemia because cranial irradiation given to prevent CNS involvement was not reportable to SEER before 1988.

Ewing sarcoma or osteosarcoma, probably due in part to thoracic radiotherapy for lung metastases, although genetic predisposition may have played a role. A recent study showed that breast cancer incidence was increased among survivors of bone or soft tissue sarcoma who did not receive chest radiotherapy, and that a family history of sarcoma was predictive of breast cancer risk among childhood cancer survivors (Kenney et al, 2004).

Germline mutations in p53, which underlie most cases of Li-Fraumeni syndrome, have been found in up to 3% of children with osteosarcomas (McIntyre et al, 1994).

Unlike osteosarcoma, Ewing sarcoma is not considered part of Li-Fraumeni syndrome.

### Soft Tissue Sarcoma

Six-fold increased risks of subsequent cancers were observed among children with soft tissue sarcoma, with 28 new cancers observed among 27 children (O/E=5.95) (Table 18.D). Significant elevations in risk were seen among children with rhabdomyosarcoma (O/E=7.26, O=11, EAR=16), fibromatous neoplasms (O/E=5.59, O=9, EAR=16), and other soft tissue sarcomas (O/E=5.16, O=8, EAR=15) (Table 18.J). Excesses were found for subsequent ANLL, melanoma, bone and soft tissue sarcomas, and cancers of the female breast and buccal cavity. A more detailed analysis of SEER data found that combined modality treatment with radiation and chemotherapeutic agents was associated with a significantly higher risk of subsequent malignancies than initial treatment with surgery alone, with risks being especially high for subsequent ANLL, melanoma, breast cancer, and sarcomas (Cohen et al, 2005). Our results are consistent with

clinical surveys of second cancers following combined modality treatment for childhood rhabdomyosarcoma (Heyn et al, 1993, 1994). In these trials, the observed excess of ANLL was attributed to therapy with alkylating agents and topoisomerase II inhibitors (doxorubicin, etoposide). Previous studies have shown that germline mutations in p53 occur in up to 10% of children with soft tissue sarcomas (Hartley et al, 1993) and that genetic susceptibility greatly increases the risk of second cancers among children treated for soft tissue sarcomas (Heyn et al, 1993; Kenney et al, 2004).

### Retinoblastoma

Retinoblastoma patients had a high relative risk of developing a new cancer (O/E=14.71, O=15, EAR=24) (Table 18.K). Risks were greater among those who received radiation as part of their initial treatment (O/E=44.08, O=12) than among those who did not (O/E=4.2, O=3). The risks of subsequent cancer were most pronounced for cancers of the bone, soft tissue, and eye/orbit, as well as ALL, consistent with the exceptional risks of second cancer reported among children with familial or bilateral retinoblastoma (Draper et al, 1986; Eng et al, 1993; Wong et al, 1997; Kleinerman et al, 2005). Although subsequent cancer risks are elevated in heritable cases both with and without exposure to radiotherapy, the relative risks of sarcomas associated with radiotherapy are substantially higher for heritable than for nonheritable (sporadic) cases, indicating gene-environment interaction (Wong et al, 1997; Moll et al, 2001; Fletcher et al, 2004; Kleinerman et al, 2005). The array of second cancers reported after retinoblastoma includes cancers of the nasal cavity, brain,



**Table 18.G:** Risk of subsequent primary cancers among children (ages 0-17 years) diagnosed with lymphoma, by years after diagnosis of initial cancer, both sexes.

Subsequent primary cancer	Years after first primary cancer diagnosis											
	<5 yr		5-9 yr		10-14 yr		≥15 yr		Total			
	O	O/E	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>First primary cancer: Hodgkin lymphoma (N=1,744)</b>												
All subsequent cancers	11	7.55*	18	9.93*	20	9.33*	38	10.29*	87	9.11	9.55*	38.95
Any radiation	5	5.18*	14	10.80*	16	9.84*	33	11.36*	68	6.79	10.01*	42.74
All solid cancers	7	7.66*	11	8.51*	14	8.28*	33	10.53*	65	7.03	9.25*	28.99
Any radiation	3	4.96	9	9.73*	12	9.33*	29	11.74*	53	5.29	10.03*	33.32
Salivary gland	0	0.00	0	0.00	0	0.00	2	119.77*	2	0.05	39.47*	0.97
Digestive system	0	0.00	1	17.97	0	0.00	6	23.16*	7	0.44	15.87*	3.28
Stomach	0	0.00	0	0.00	0	0.00	4	146.34*	4	0.05	85.31*	1.98
Pancreas	0	0.00	1	262.44*	0	0.00	1	50.12	2	0.03	63.45*	0.98
Lung, bronchus	0	0.00	0	0.00	2	98.12*	1	11.03	3	0.13	22.26*	1.43
Female breast	0	0.00	2	38.01*	8	48.00*	13	18.43*	23	0.93	24.61*	23.19
Female genital	1	10.55	1	6.11	0	0.00	1	2.26	3	0.95	3.17	2.16
Bones, joints	3	32.88*	0	0.00	0	0.00	2	81.25*	5	0.20	25.06*	2.40
Osteosarcoma	2	42.17*	0	0.00	0	0.00	0	0.00	2	0.09	22.17*	0.95
Soft tissue including heart	1	15.42	2	34.69*	0	0.00	3	54.88*	6	0.22	26.76*	2.89
Fibrosarcoma	0	0.00	2	114.29*	0	0.00	2	121.01*	4	0.07	60.53*	1.97
Melanoma of skin	0	0.00	2	9.00*	1	3.45	1	2.14	4	1.10	3.65	1.45
Brain, CNS	0	0.00	2	15.30*	0	0.00	0	0.00	2	0.54	3.70	0.73
Thyroid	1	8.18	1	5.17	3	14.09*	3	9.98*	8	0.83	9.65*	3.59
Non-Hodgkin lymphoma	2	18.63*	2	16.75*	0	0.00	5	19.82*	9	0.63	14.33*	4.19
Acute non-lymphocytic leukemia	2	34.52*	4	77.57*	3	75.77*	0	0.00	9	0.19	46.19*	4.40
Other	1	1.75	1	1.45	3	4.14	1	1.11	6	2.89	2.08	1.56
<b>First primary cancer: Non-Hodgkin lymphoma (N=1,038)</b>												
All subsequent cancers	8	13.68*	2	3.40	0	0.00	3	3.91	13	2.54	5.11*	12.72
All solid cancers	3	8.56*	1	2.53	0	0.00	3	4.92	7	1.80	3.89*	6.33
Female breast	0	0.00	0	0.00	0	0.00	2	29.62*	2	0.10	20.75*	7.49
Thyroid	2	72.64*	0	0.00	0	0.00	0	0.00	2	0.18	11.26*	2.22
Hodgkin lymphoma	2	26.34*	0	0.00	0	0.00	0	0.00	2	0.28	7.25	2.10
Acute non-lymphocytic leukemia	2	74.65*	0	0.00	0	0.00	0	0.00	2	0.07	26.74*	2.34
Other	2	4.41	2	4.62	0	0.00	1	1.72	5	1.92	2.61	3.75

Notes: Number of patients (PYR in interval) for <5, 5-9, 10-14, and ≥15 time intervals are 1,744 (7,181), 1,261 (5,390), 910 (3,807), and 605 (3,620), respectively, for Hodgkin lymphoma; and 1,038 (3,450), 557 (2,285), 367 (1,445), and 205 (1,041), respectively, for non-Hodgkin lymphoma.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000); CNS=central nervous system.

\*P <0.05.

pineal gland, uterine corpus, female breast, lung, and bladder, as well as melanoma (Kleinerman et al, 2005). However, these tumors were not observed in our study (except for 1 case of nasal cavity cancer), possibly due to the young attained age of the population.

### Neuroblastoma

A nearly 6-fold elevation in subsequent cancer risk was observed among children with neuroblastoma (O/E=5.90, O=11, EAR=9), with the highest risks among those surviving 10 or more years (Table 18.K). Significantly elevated risks were seen for subsequent cancers of the kidney, digestive system, and thyroid gland, although based on small numbers. In a European cohort of 544 children who survived 5 or more years after neuroblastoma, the most common new malignancies involved the thyroid (O=5) and breast (O=3), with risks

associated with radiotherapy but not chemotherapy (Rubino et al, 2003). The absence of breast cancer in our study may be related to the early onset of neuroblastoma, as most of the cohort has not yet reached the ages at which breast cancer tends to occur. It has been suggested that neuroblastoma patients may be prone to thyroid cancer independent of treatment (de Vathaire et al, 1992, 1999b), but this remains unclear.

### Wilms Tumor

Risk of a new primary cancer was increased approximately 6-fold among children with Wilms tumor, who were followed for an average of 10 years (O/E=6.14, O=14, EAR=10) (Table 18.K). One-half of the new cancers consisted of soft tissue sarcoma, cancer of the urinary system (1 bladder and 1 kidney), or ANLL. In a study of 5,278 Wilms tumor patients diagnosed between



**TABLE 18.H:** Risk of subsequent cancers among children (ages 0-17 years) diagnosed with central nervous system cancer, by years after diagnosis of initial cancer, both sexes.

Subsequent primary cancer	Years after first primary cancer diagnosis									
	<5 yr		5-9 yr		≥10 yr		Total			
	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>First primary cancer: Astrocytoma (N=2,242)</b>										
All subsequent cancers	14	11.43*	6	5.25*	7	2.23	27	5.50	4.91*	11.25
All radiation	9	17.51*	5	8.96*	3	1.63	17	2.92	5.83*	15.07
All solid cancers	10	13.72*	6	8.00*	6	2.46	22	3.92	5.61*	9.46
All radiation	6	19.72*	5	13.60*	3	2.09	14	2.11	6.64*	12.72
Digestive system	1	30.11	1	33.30	0	0.00	2	0.22	8.91*	0.93
Bone, joints	3	40.71*	1	16.60	0	0.00	4	0.19	20.97*	1.99
Soft tissue including heart	1	15.21	2	40.83*	0	0.00	3	0.19	15.75*	1.47
Melanoma of skin	1	19.63	0	0.00	1	2.52	2	0.55	3.65	0.76
Brain, CNS	4	18.41*	1	7.54	2	11.49*	7	0.52	13.36*	3.39
Brain	3	15.16*	0	0.00	1	6.20	4	0.48	8.32*	1.84
Other CNS	1	51.48	1	93.22*	1	77.58*	3	0.04	69.70*	1.55
Non-Hodgkin lymphoma	1	11.18	0	0.00	1	4.33	2	0.41	4.90	0.83
Leukemia	3	11.38*	0	0.00	0	0.00	3	0.55	5.49*	1.28
Chronic myelogenous leukemia	2	209.41*	0	0.00	0	0.00	2	0.05	43.52*	1.02
Other	0	0.00	1	1.82	3	1.59	4	2.87	1.39	0.59
<b>First primary cancer: PNET of CNS (N=859)</b>										
All subsequent cancers	3	8.02*	8	32.79*	4	6.92*	15	1.20	12.54*	25.61
Any radiation	2	6.26	8	35.80*	4	7.39*	14	1.08	12.91*	26.59
All solid cancers	2	9.27*	6	39.39*	4	9.14*	12	0.81	14.90*	20.77
Any radiation	2	10.86*	6	42.99*	4	9.80*	12	0.73	16.39*	23.20
Digestive system	1	94.88*	1	167.57*	1	35.66	3	0.04	67.35*	5.48
Pancreas	1	†	0	0.00	1	†	2	0.00	†	3.71
Bones, soft tissues	0	0.00	2	68.37*	0	0.00	2	0.10	19.29*	3.52
Brain, CNS	1	13.23	1	28.48	3	83.12*	5	0.15	34.06*	9.00
Brain	1	14.53	1	31.08	1	30.06	3	0.13	22.34*	5.32
Other CNS	0	0.00	0	0.00	2	†	2	0.01	159.71*	3.69
Leukemia	1	10.38	2	55.47*	0	0.00	3	0.17	18.00*	5.26
Acute lymphocytic leukemia	0	0.00	2	88.26*	0	0.00	2	0.11	18.40*	3.51
Other	0	0.00	2	14.53*	0	0.00	2	0.73	2.72	2.35

Notes: Includes children surviving 2 or more months after diagnosis. Number of patients (PYR in interval) for <5, 5-9, and ≥10 time intervals are 2,242 (7,828), 1,304 (5,259), and 842 (6,026), respectively, for astrocytoma; and 859 (2,570), 351 (1,382), and 212 (1,439), respectively, for PNET.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000); PNET=primitive neuroectodermal tumor; CNS=central nervous system.

\*P <0.05.

†O/E >500.00.

1969 and 1991, abdominal irradiation and treatment of relapse with etoposide were associated with an increased risk of second cancer, with 7 of 43 second cancers being ANLL (Breslow et al, 1995; Shearer et al, 2001). Since Wilms tumor tends to occur at a very young age, relatively few survivors in the present study were followed into adulthood.

#### Germ Cell, Trophoblastic, or Other Gonadal Cancers

In this study, the most common first primary tumors in this category were cancer of the ovary (70%) among

females and cancers of the testis (64%) and pineal gland (14%) among males. The risk of subsequent cancer was increased approximately 4-fold (O/E=3.50 in females and 4.68 in males) (Tables 18.D and 18.K). Among females, this was attributable mainly to 3 cases of cancer of the reproductive system (O/E=7.23), 2 of which arose in the contralateral ovary. The increased risk of subsequent cancer among males was attributable to 7 cases of contralateral testicular cancer (O/E=19.06), consistent with the tendency to bilateral disease reported in the literature (Buetow, 1995).

**Table 18.I:** Risk of subsequent cancers among children (ages 0-17 years) diagnosed with bone sarcomas, by years after diagnosis of initial cancer, both sexes.

Subsequent primary cancer	Years after first primary cancer diagnosis									
	<5 yr		5-9 yr		≥10 yr		Total			
	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>First primary cancer: Osteosarcoma (N=752)</b>										
All subsequent cancers	3	7.15*	0	0.00	7	6.28*	10	1.94	5.14*	15.10
All solid cancers	2	7.71	0	0.00	7	7.62*	9	1.46	6.15*	14.13
Female breast	0	0.00	0	0.00	3	16.93*	3	0.19	15.96*	10.41
Bone and soft tissue sarcoma	1	18.69	0	0.00	2	64.43*	3	0.11	26.50*	5.41
Soft tissue	0	0.00	0	0.00	2	96.81*	2	0.06	35.15*	3.64
Other	2	5.49	0	0.00	2	2.21	4	1.64	2.44	4.42
<b>First primary cancer: Ewing sarcoma (N=479)</b>										
All subsequent cancers	3	11.40*	6	27.53*	6	11.33*	15	1.01	14.84*	44.39
Any radiation	1	6.27	6	45.94*	4	10.47*	11	0.67	16.37*	50.47
All solid cancers	1	6.26	4	26.80*	6	14.14*	11	0.73	15.00*	32.58
Any radiation	1	10.38	4	45.16*	4	13.03*	9	0.49	18.29*	41.58
Female breast	0	0.00	0	0.00	2	38.51*	2	0.06	35.79*	12.80
Bone, joints	1	51.22	1	110.44*	1	152.34*	3	0.04	85.37*	9.41
Osteosarcoma	1	99.91*	1	226.58*	1	403.59*	3	0.02	177.51*	9.47
Soft tissue including heart	0	0.00	3	381.44*	1	92.13*	4	0.03	126.37*	12.59
Fibrosarcoma	0	0.00	2	†	0	0.00	2	0.01	245.58*	6.32
Acute non-lymphocytic leukemia	2	171.82*	1	135.86*	0	0.00	3	0.03	105.37*	9.43
Other	0	0.00	1	5.25	2	4.44	3	0.86	3.49	6.80

Notes: Number of patients (PYR in interval) for <5, 5-9, and ≥10 time intervals are 752 (2,385), 346 (1,393), and 217 (1,556), respectively, for osteosarcoma; and 479 (1,510), 205 (791), and 114 (851), respectively, for Ewing sarcoma.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P <0.05.

†O/E >500.00.

**Table 18.J:** Risk of subsequent cancers among children (ages 0-17 years) diagnosed with soft tissue sarcomas, by years after diagnosis of initial cancer, both sexes.

Subsequent primary cancer	Years after first primary cancer diagnosis									
	<5 yr		5-9 yr		≥10 yr		Total			
	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>First primary cancer: Rhabdomyosarcoma (N=769)</b>										
All subsequent cancers	3	8.05*	1	3.42	7	8.23*	11	1.52	7.26*	15.93
Any radiation	2	8.64	0	0.00	5	10.25*	7	0.90	7.76*	16.48
All solid cancers	1	4.59	1	5.40	6	9.26*	8	1.05	7.61*	11.67
Any radiation	1	7.41	0	0.00	4	11.00*	5	0.61	8.14*	11.85
Bone, soft tissue	1	24.80	1	31.89	2	46.25*	4	0.11	34.81*	6.53
Bone, joints	1	51.51	1	56.13	1	49.75	3	0.06	52.33*	4.94
Female breast	0	0.00	0	0.00	2	29.28*	2	0.07	27.91*	8.04
Acute non-lymphocytic leukemia	2	107.83*	0	0.00	0	0.00	2	0.05	40.20*	3.28
Other	0	0.00	0	0.00	3	4.17	3	1.28	2.34	2.89
<b>First primary cancer: Fibrosarcoma (N=448)</b>										
All subsequent cancers	4	13.32*	3	8.93*	2	2.05	9	1.61	5.59*	16.03
Any radiation	2	44.35*	3	65.48*	2	21.87*	7	0.18	38.38*	120.84
All solid cancers	3	16.15*	2	8.59	2	2.56	7	1.20	5.83*	12.58
Any radiation	1	34.98	2	60.57*	2	27.38*	5	0.13	37.14*	86.24
Bone, soft tissue	1	29.30	2	81.01*	0	0.00	3	0.09	32.38*	6.31
Bone, joints	1	54.34	1	80.50*	0	0.00	2	0.04	45.69*	4.25
Female genital system	1	57.71	0	0.00	1	9.27	2	0.16	12.90*	7.64
Other	2	8.04	1	3.55	1	1.20	4	1.36	2.93	5.72
<b>First primary cancer: Other soft tissue sarcomas (N=538)</b>										
All subsequent cancers	2	6.50	1	3.47	5	5.24*	8	1.55	5.16*	15.20
Any radiation	2	16.88*	0	0.00	5	13.58*	7	0.59	11.85*	40.61
All solid cancers	1	5.29	1	5.03	5	6.42*	7	1.17	6.00*	13.75
Any radiation	1	13.84	0	0.00	5	16.54*	6	0.45	13.47*	35.19
Buccal cavity, pharynx	0	0.00	0	0.00	2	103.43*	2	0.03	65.19*	4.64
Melanoma of skin	1	56.22	0	0.00	1	8.59	2	0.16	12.24*	4.33
Other	1	3.52	1	3.94	2	2.44	4	1.36	2.95	6.23

Notes: Number of patients (PYR in interval) for <5, 5-9, and ≥10 time intervals are 769 (2,484), 386 (1,587), and 263 (1,882), respectively, for persons with rhabdomyosarcoma; 448 (1,715), 301 (1,278), and 215 (1,615), respectively, for persons with fibrosarcoma (or neurofibrosarcoma); and 538 (1,763), 265 (1,079), and 172 (1,401), respectively, for those with other soft tissue sarcomas.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P < 0.05.

**Table 18.K:** Risk of subsequent cancers among children (ages 0-17 years) diagnosed with retinoblastoma, neuroblastoma, Wilms tumor, and germ cell tumors, by years after diagnosis of initial cancer, both sexes.

Subsequent primary cancer	Years after first primary cancer diagnosis									
	<5 yr		5-9 yr		≥10 yr		Total			
	O	O/E	O	O/E	O	O/E	O	E	O/E	EAR
<b>First primary cancer: Retinoblastoma (N=581)</b>										
All subsequent cancers	4	10.55*	7	40.05*	4	8.59*	15	1.02	14.71*	23.56
Any radiation	3	26.04*	5	100.99*	4	37.22*	12	0.27	44.08*	72.45
All solid cancers	3	13.46*	6	60.84*	3	9.60*	12	0.63	18.93*	19.16
Any radiation	2	29.18*	5	179.69*	3	41.42*	10	0.17	59.24*	60.74
Bone and soft tissue	1	32.35	4	187.97*	3	63.52*	8	0.10	80.47*	13.32
Bone	1	166.88*	4	331.57*	0	0.00	5	0.04	114.35*	8.35
Soft tissue	0	0.00	0	0.00	3	139.13*	3	0.06	53.86*	4.96
Eye	1	45.85	1	†	0	0.00	2	0.02	81.09*	3.33
Acute lymphocytic leukemia	1	9.50	1	25.40	1	39.49	3	0.17	17.65*	4.77
Other	1	4.53	1	8.88	0	0.00	2	0.73	2.76	2.15
<b>First primary cancer: Neuroblastoma (N=1,461)</b>										
All subsequent cancers	3	3.86	2	6.23	6	7.81*	11	1.87	5.90*	8.82
Any radiation	0	0.00	2	21.02*	3	8.23*	5	0.67	7.49*	12.28
All solid cancers	2	4.39	2	10.99*	6	11.41*	10	1.16	8.59*	8.54
Any radiation	0	0.00	2	37.21*	3	11.90*	5	0.43	11.72*	12.96
Digestive system	0	0.00	0	0.00	3	124.97*	3	0.07	45.32*	2.83
Brain, CNS	1	6.44	1	12.44	0	0.00	2	0.31	6.36	1.63
Thyroid	0	0.00	1	130.58*	1	14.37	2	0.08	24.65*	1.85
Kidney	1	14.30	0	0.00	2	314.79*	3	0.09	33.60*	2.81
Other	1	1.96	0	0.00	0	0.00	1	1.31	0.76	-0.30
<b>First primary cancer: Wilms tumor (N=1,188)</b>										
All subsequent cancers	5	7.35*	1	2.31	8	6.87*	14	2.28	6.14*	9.73
Any radiation	2	6.40	0	0.00	4	5.35*	6	1.28	4.69*	7.49
All solid cancers	1	2.52	1	3.91	8	9.69*	10	1.48	6.77*	7.07
Any radiation	0	0.00	0	0.00	4	7.41*	4	0.85	4.70*	5.00
Bone, soft tissue	1	15.89	0	0.00	4	43.79*	5	0.21	23.66*	3.97
Soft tissue	1	23.80	0	0.00	3	66.77*	4	0.11	36.14*	3.23
Urinary system	0	0.00	0	0.00	2	98.08*	2	0.09	22.15*	1.59
Acute non-lymphocytic leukemia	3	83.80*	0	0.00	0	0.00	3	0.09	32.06*	2.41
Other	1	1.90	1	2.93	2	1.97	4	1.88	2.12	1.76
<b>First primary cancer: Germ cell tumors (N=1,206)</b>										
All subsequent cancers	8	8.99*	6	6.80*	3	1.23	17	4.21	4.04*	11.53
All solid cancers	8	14.19*	6	9.59*	3	1.51	17	3.17	5.36*	12.46
Female breast	0	0.00	0	0.00	2	6.02	2	0.36	5.53	2.83
Female genital system	1	19.74	2	25.80*	0	0.00	3	0.41	7.23*	4.46
Ovary	1	29.68	1	27.27	0	0.00	2	0.16	12.28*	3.17
Testis	5	71.67*	2	19.68*	0	0.00	7	0.37	19.06*	12.51
Other	2	2.62	2	2.95	1	0.62	5	3.06	1.63	1.75

Notes: Number of patients (PYR in interval) for <5, 5-9, and ≥10 time intervals are 581 (2,279), 381 (1,570), and 261 (2,085), respectively, for persons with retinoblastoma; 1,461 (4,489), 676 (2,696), and 419 (3,168), respectively, for those with neuroblastoma; 1,188 (4,650), 794 (3,346), and 549 (4,051), respectively, for persons with Wilms tumor; and 1,206 (4,470), 740 (2,964), and 477 (3,662), respectively, for persons with germ cell tumors.

Abbreviations: O=observed number of subsequent (2nd, 3rd, etc.) primary cancers; E=expected number of subsequent primary cancers; O/E=ratio of observed to expected cancers; PYR=person-years at risk; EAR=excess absolute risk (excess cancers per 10,000 person-years, calculated as [(O-E)/PYR]×10,000).

\*P <0.05.

†O/E >500.00.

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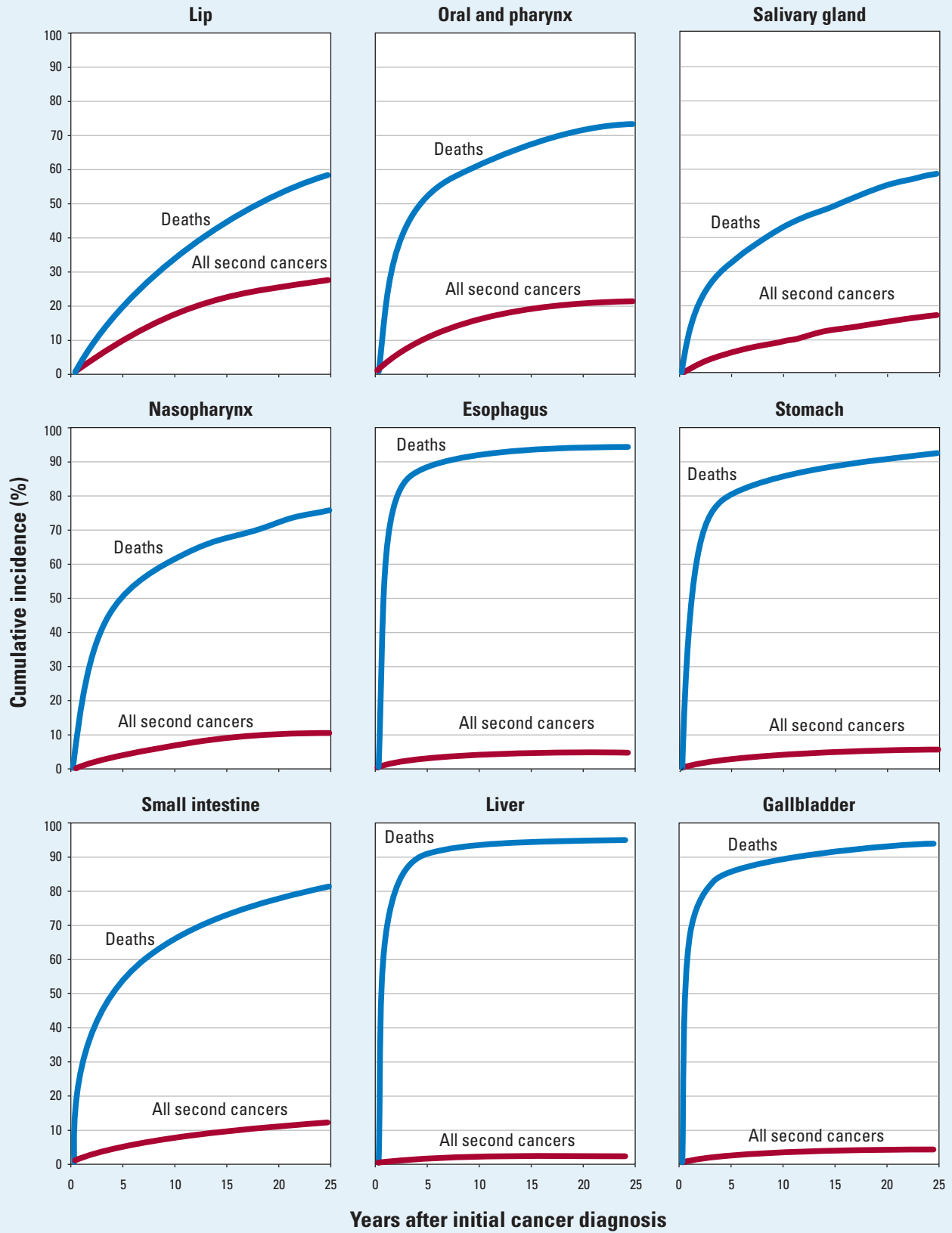
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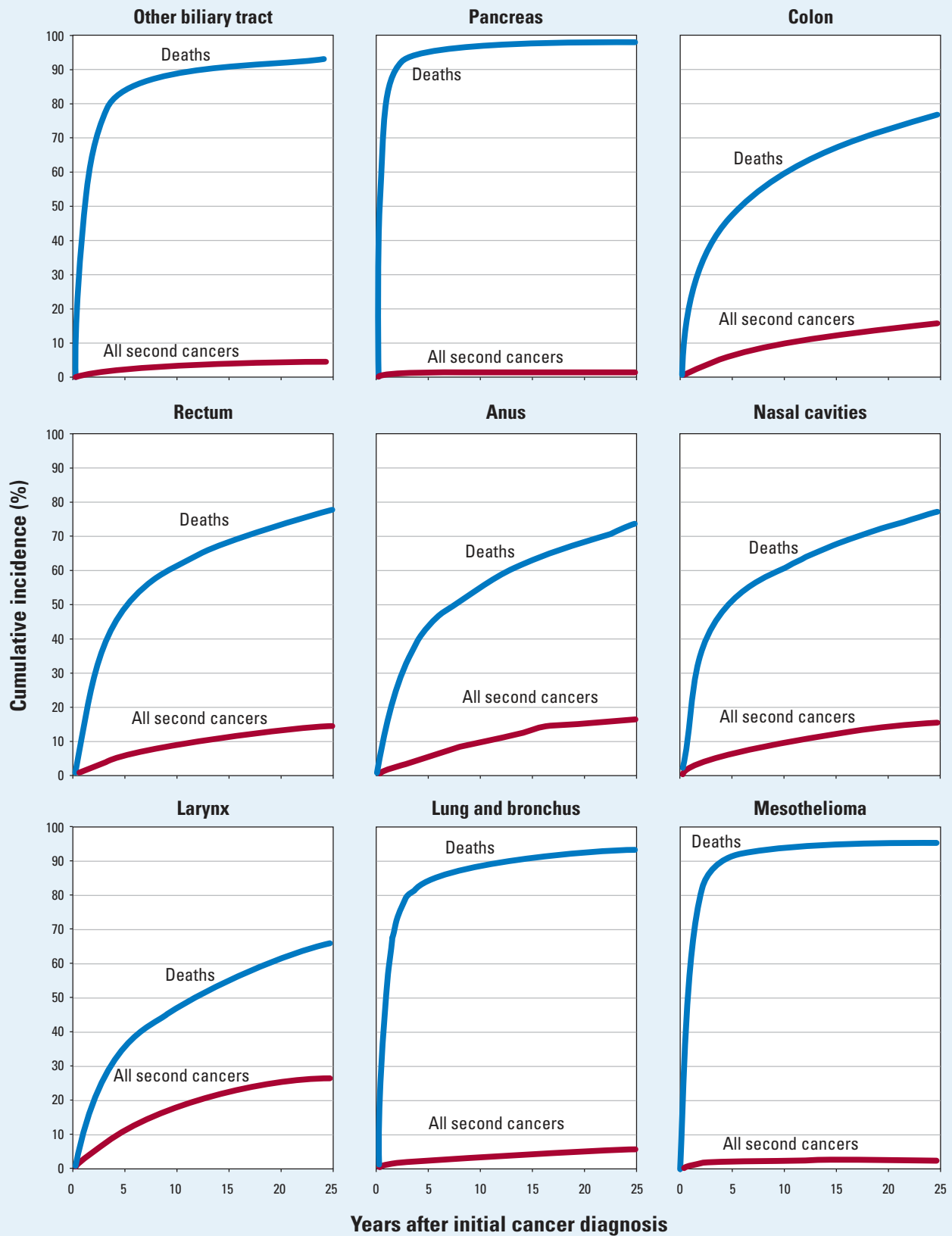
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**Appendix 1: Cumulative incidence of developing a second cancer and cumulative probability of death due to competing causes, by site of initial cancer, SEER 1973–2000.**



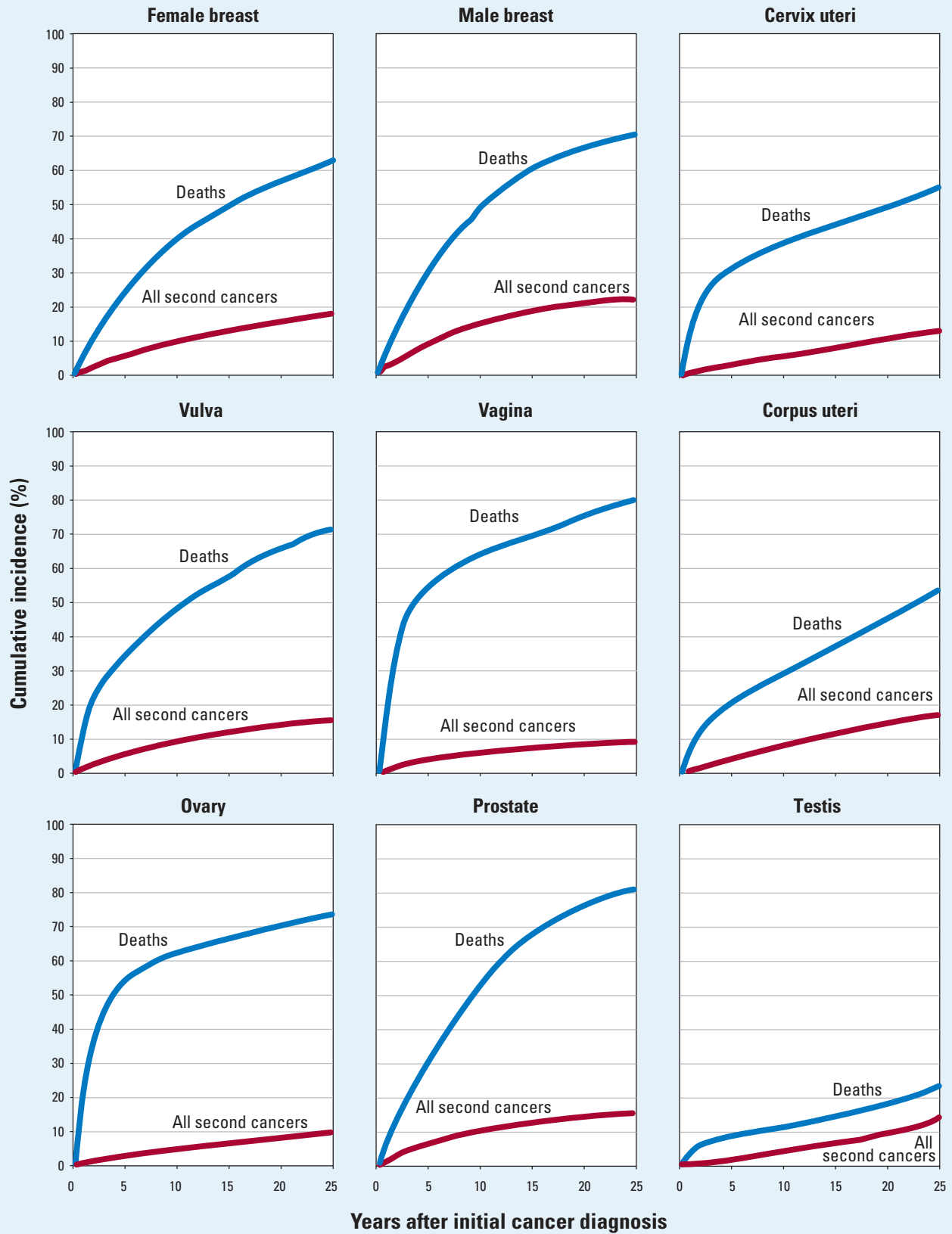
Notes: See Appendices for definitions of cancer sites. The competing cause of death is based on all deaths excluding deaths among patients with a second cancer.

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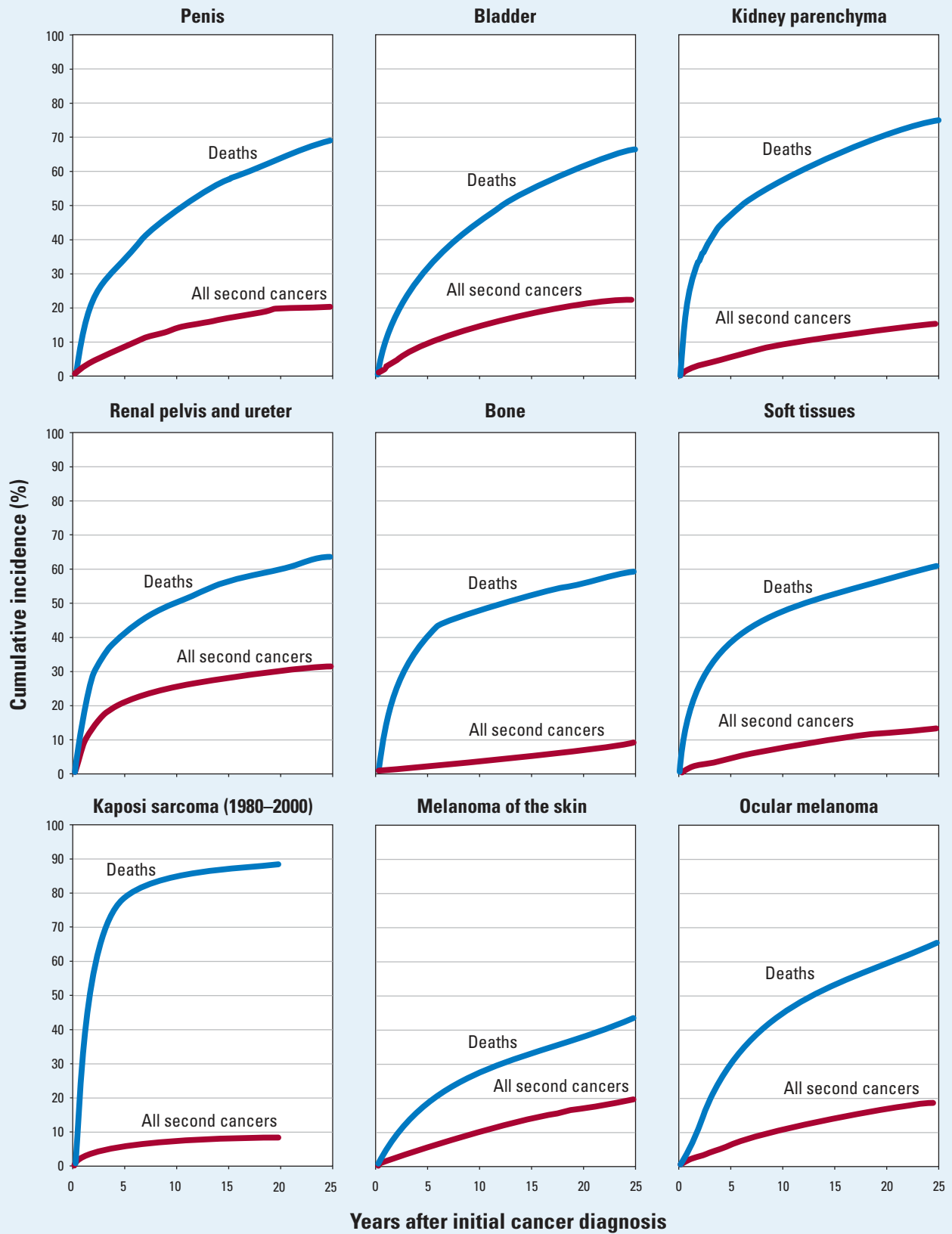
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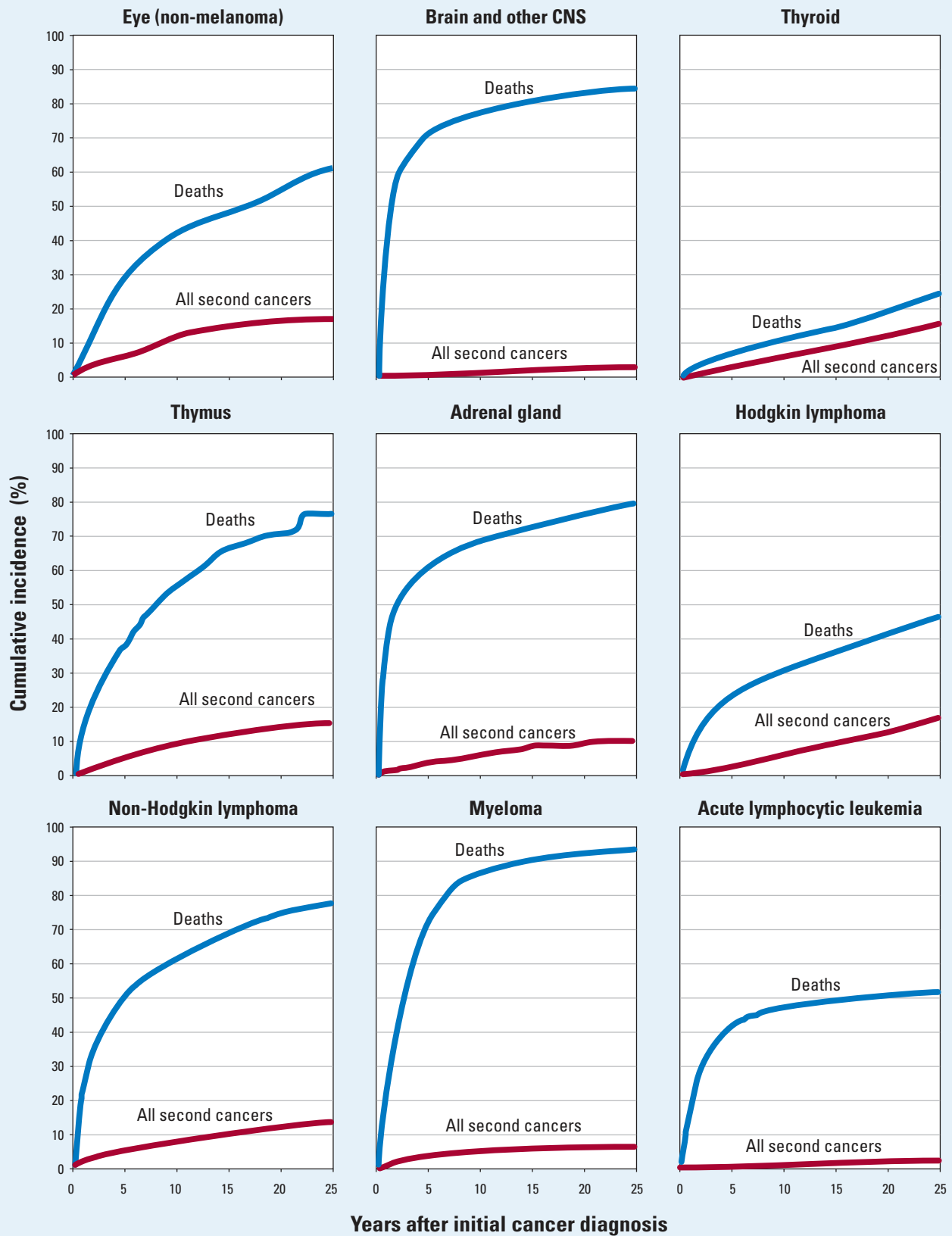
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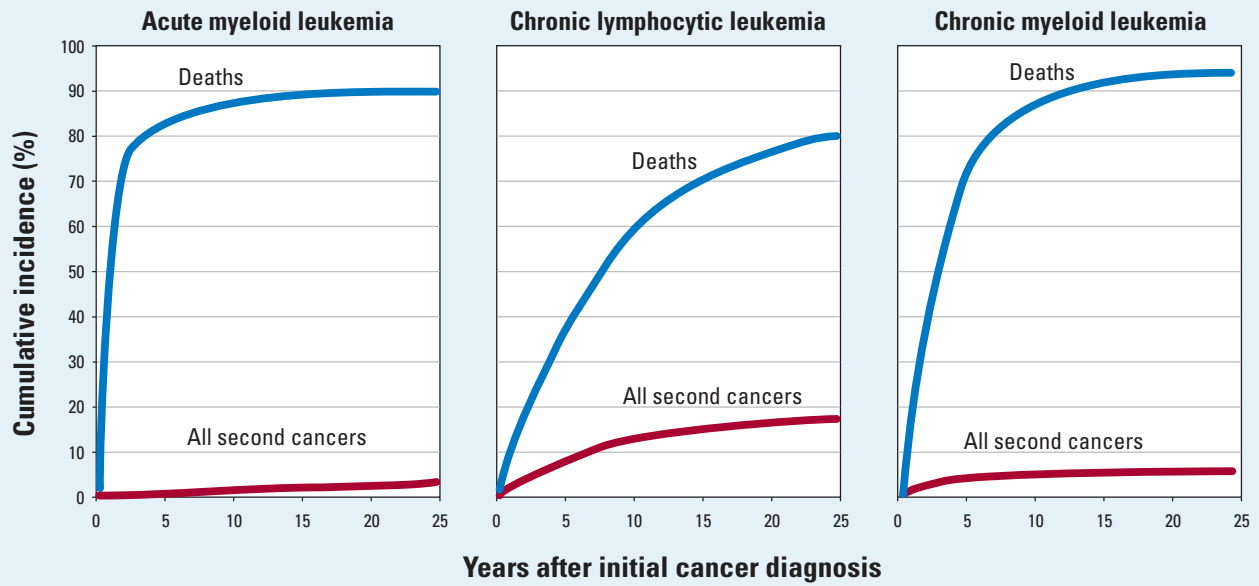
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**Appendix 1: Cumulative incidence of developing a second cancer and cumulative probability of death due to competing causes, by site of initial cancer, SEER 1973–2000.**



Notes: See Appendices for definitions of cancer sites. The competing cause of death is based on all deaths excluding deaths among patients with a second cancer.

## Appendix 2.A: Initial primary cancer site definitions.

Cancer site name	SEER site recode	ICD-O-2 site code	ICD-O-2 histology (type)
Lip	20010	C000-C009	All histologies excluding 9050-9055, 9140, 9590-9989
Oral and pharynx	20020, 20040, 20050, 20070, 20080, 20090	C019-C069, C090-C109, C129-C139	All histologies excluding 9050-9055, 9140, 9590-9989
Tongue	20020	C019-C029	All histologies excluding 9050-9055, 9140, 9590-9989
Gum and mouth	20040, 20050	C030-C069	All histologies excluding 9050-9055, 9140, 9590-9989
Tonsil	20070	C090-C099	All histologies excluding 9050-9055, 9140, 9590-9989
Oropharynx	20080	C100-C109	All histologies excluding 9050-9055, 9140, 9590-9989
Hypopharynx	20090	C129-C139	All histologies excluding 9050-9055, 9140, 9590-9989
Salivary gland	20030	C079-C089	All histologies excluding 9050-9055, 9140, 9590-9989
Nasopharynx	20060	C110-C119	All histologies excluding 9050-9055, 9140, 9590-9989
Esophagus	21010	C150-C159	All histologies excluding 9050-9055, 9140, 9590-9989
Stomach	21020	C160-C169	All histologies excluding 9050-9055, 9140, 9590-9989
Small intestine	21030	C170-C179	All histologies excluding 9050-9055, 9140, 9590-9989
Liver	21071, 21072	C220-C221	All histologies excluding 9050-9055, 9140, 9590-9989
Gallbladder	21080	C239	All histologies excluding 9050-9055, 9140, 9590-9989
Other biliary tract	21090	C240-C249	All histologies excluding 9050-9055, 9140, 9590-9989
Pancreas	21100	C250-C259	All histologies excluding 9050-9055, 9140, 9590-9989
Colon	21041-21049	C180-C189, C260	All histologies excluding 9050-9055, 9140, 9590-9989
Rectum	21051-21052	C199, C209	All histologies excluding 9050-9055, 9140, 9590-9989
Anus	21060	C210-C212, C218	All histologies excluding 9050-9055, 9140, 9590-9989
Lung and bronchus	22030	C340-C349	All histologies excluding 9050-9055, 9140, 9590-9989
Larynx	22020	C320-C329	All histologies excluding 9050-9055, 9140, 9590-9989
Nasal cavities	22010	C300-C301, C310-C319	All histologies excluding 9050-9055, 9140, 9590-9989
Mesothelioma	36010	Any site	9050-9055
Breast, females	26000*	C500-C509, Sex=Female	All histologies excluding 9050-9055, 9140, 9590-9989
Breast, males	26000*	C500-C509, Sex=Male	All histologies excluding 9050-9055, 9140, 9590-9989
Cervix uteri	27010	C530-C539	All histologies excluding 9050-9055, 9140, 9590-9989
Vagina	27050	C529	All histologies excluding 9050-9055, 9140, 9590-9989
Vulva	27060	C510-C519	All histologies excluding 9050-9055, 9140, 9590-9989
Corpus uteri	27020	C540-C549	All histologies excluding 9050-9055, 9140, 9590-9989
Ovary	27040	C569	All histologies excluding 9050-9055, 9140, 9590-9989
Prostate	28010	C619	All histologies excluding 9050-9055, 9140, 9590-9989
Testis	28020	C620-C629	All histologies excluding 9050-9055, 9140, 9590-9989
Penis	28030	C600-C609	All histologies excluding 9050-9055, 9140, 9590-9989
Bladder	29010	C670-C679	All histologies excluding 9050-9055, 9140, 9590-9989
Kidney parenchyma	29020*	C649, age at diagnosis $\geq 18$	All histologies excluding 9050-9055, 9140, 9590-9989
Renal pelvis and ureter	29020*, 29030	C659, C669	All histologies excluding 9050-9055, 9140, 9590-9989
Bone	23000	C400-C419	All histologies excluding 9050-9055, 9140, 9590-9989
Soft tissues	24000	C380, C470-C479, C490-C499	All histologies excluding 9050-9055, 9140, 9590-9989
Kaposi sarcoma	36020	Any site	9140
Melanoma of skin	25010	C440-C449	8720-8790
Ocular melanoma	30000*	C690-C699	8720-8790
Eye (non-melanoma)	30000*	C690-C699	All histologies excluding 8720-8799, 9050-9055, 9140, 9510-9512, 9590-9989
Retinoblastoma	30000*	C690-C699	9510-9512
Brain and other CNS	31010, 31040	C700-C729	All histologies excluding 9050-9055, 9140, 9590-9989
Thyroid	32010	C739	All histologies excluding 9050-9055, 9140, 9590-9989
Thymus	32020*	C379	All histologies excluding 9050-9055, 9140, 9590-9989
Adrenal gland	32020*	C740-C749	All histologies excluding 9050-9055, 9140, 9490, 9500, 9590-9989
Hodgkin lymphoma	33011-33012	Any site	9650-9667
Non-Hodgkin lymphoma	33041-33042	Any site	9590-9595, 9670-9677, 9680-9688, 9690-9698, 9700-9717, 9823, 9827
Myeloma	34000	Any site	9731-9732
Acute lymphocytic leukemia	35011	Any site	9821, 9826, 9828
Acute myeloid leukemia	35021	Any site	9840-9841, 9861, 9866, 9867, 9871-9874, 9910
Chronic lymphocytic leukemia	35012	C420, C421, C424	9823
Chronic myeloid leukemia	35022	Any site	9863, 9868
Childhood cancers	—	Any site, age at diagnosis $\leq 17$	Any histology

\* SEER site recodes with a star (\*) indicate that the cancer site grouping is based not only on the SEER site recode but on the given ICD-O-2 codes, sex, age, and/or histologic type.

## Appendix 2.B: Subsequent primary cancer site definitions.

Subsequent primary cancer	SEER site recode	ICD-O-2 site code	ICD-O-2 histology (type)
<b>All subsequent cancers</b>	<b>20010-25010, 26000-37000</b>	<b>Any site</b>	<b>All histologies excluding non-melanoma skin (i.e., excluding ICD-O-2 site C440-C449 with the following histologies 8000-8004, 8010-8045, 8050-8082, 8090-8110, 8720-8790)</b>
<b>Buccal cavity, pharynx</b>	<b>20010-20100</b>	<b>C000-C009, C019-C069, C079-C119, C129-C140, C142-C148</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
Lip	20010	C000-C009	All histologies excluding 9050-9055, 9140, 9590-9989
Tongue	20020	C019-C029	All histologies excluding 9050-9055, 9140, 9590-9989
Salivary gland	20030	C079-C089	All histologies excluding 9050-9055, 9140, 9590-9989
Mouth	20040, 20050	C030-C069	All histologies excluding 9050-9055, 9140, 9590-9989
Nasopharynx	20060	C110-C119	All histologies excluding 9050-9055, 9140, 9590-9989
Tonsil	20070	C090-C099	All histologies excluding 9050-9055, 9140, 9590-9989
Oropharynx	20080	C100-C109	All histologies excluding 9050-9055, 9140, 9590-9989
Hypopharynx	20090	C129-C139	All histologies excluding 9050-9055, 9140, 9590-9989
<b>Digestive system</b>	<b>21010-21130</b>	<b>C150-C189, C199, C209-C212, C218, C220-C221, C239-C260, C268-C269, C480-C482, C488</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
Esophagus	21010	C150-C159	All histologies excluding 9050-9055, 9140, 9590-9989
Stomach	21020	C160-C169	All histologies excluding 9050-9055, 9140, 9590-9989
Small intestine	21030	C170-C179	All histologies excluding 9050-9055, 9140, 9590-9989
Colon	21041-21049	C180-C189, C260	All histologies excluding 9050-9055, 9140, 9590-9989
Rectum, rectosigmoid junction	21051-21052	C199, C209	All histologies excluding 9050-9055, 9140, 9590-9989
Rectum	21052	C209	All histologies excluding 9050-9055, 9140, 9590-9989
Anus, anal canal	21060	C210-C212, C218	All histologies excluding 9050-9055, 9140, 9590-9989
Liver	21071	C220	All histologies excluding 9050-9055, 9140, 9590-9989
Gallbladder	21080	C239	All histologies excluding 9050-9055, 9140, 9590-9989
Bile ducts, other biliary	21072, 21090	C221, C240-C249	All histologies excluding 9050-9055, 9140, 9590-9989
Pancreas	21100	C250-C259	All histologies excluding 9050-9055, 9140, 9590-9989
<b>Respiratory system</b>	<b>22010-22030, 22050-22060</b>	<b>C300-C301, C310-C329, C339-C349, C381-C384, C388, C390, C398-C399</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
Nose, nasal cavity, ear	22010	C300-C301, C310-C319	All histologies excluding 9050-9055, 9140, 9590-9989
Larynx	22020	C320-C329	All histologies excluding 9050-9055, 9140, 9590-9989
Lung, bronchus	22030	C340-C349	All histologies excluding 9050-9055, 9140, 9590-9989
<b>Female breast</b>	<b>26000*</b>	<b>C500-C509, Sex=Female</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Male breast</b>	<b>26000*</b>	<b>C500-C509, Sex=Male</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Female genital system</b>	<b>27010-27070</b>	<b>C510-C519, C529-C549, C559, C569-C589</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
Cervix uteri	27010	C530-C539	All histologies excluding 9050-9055, 9140, 9590-9989
Corpus uteri	27020	C540-C549	All histologies excluding 9050-9055, 9140, 9590-9989
Ovary	27040	C569	All histologies excluding 9050-9055, 9140, 9590-9989
Vagina	27050	C529	All histologies excluding 9050-9055, 9140, 9590-9989
Vulva	27060	C510-C519	All histologies excluding 9050-9055, 9140, 9590-9989
<b>Male genital system</b>	<b>28010-28040</b>	<b>C600-C609, C619-C639</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
Prostate	28010	C619	All histologies excluding 9050-9055, 9140, 9590-9989
Testis	28020	C620-C629	All histologies excluding 9050-9055, 9140, 9590-9989
<b>Urinary system</b>	<b>29010-29040</b>	<b>C649, C659, C669-C689</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
Urinary bladder	29010	C670-C679	All histologies excluding 9050-9055, 9140, 9590-9989
Kidney parenchyma	29020*	C649	All histologies excluding 9050-9055, 9140, 9590-9989
Renal pelvis, other urinary	29020*, 29030, 29040	C659, C669, C680-C689	All histologies excluding 9050-9055, 9140, 9590-9989
Ureter	29030	C669	All histologies excluding 9050-9055, 9140, 9590-9989
<b>Bone, joints</b>	<b>23000</b>	<b>C400-C419</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Soft tissue including heart</b>	<b>24000</b>	<b>C380, C470-C479, C490-C499</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Kaposi sarcoma</b>	<b>36020</b>	<b>Any site</b>	<b>9140</b>
<b>Melanoma of skin</b>	<b>25010</b>	<b>C440-C449</b>	<b>8720-8790</b>
<b>Eye, orbit</b>	<b>30000</b>	<b>C690-C699</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Brain, central nervous system</b>	<b>31010, 31040</b>	<b>C700-C729</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Thyroid</b>	<b>32010</b>	<b>C739</b>	<b>All histologies excluding 9050-9055, 9140, 9590-9989</b>
<b>Lymphatic, hematopoietic</b>	<b>33011-35043</b>	<b>Any site</b>	<b>9590-9595, 9650-9667, 9670-9677, 9680-9688, 9690-9698, 9700-9717, 9731-9732, 9800-9804, 9820-9828, 9830, 9840-9842, 9850, 9860-9864, 9866-9868, 9870-9874, 9880, 9890-9894, 9900, 9910, 9930-9932, 9940-9941</b>
Hodgkin lymphoma	33011-33012	Any site	9650-9667
Non-Hodgkin lymphoma	33041-33042	Any site	9590-9595, 9670-9677, 9680-9688, 9690-9698, 9700-9717, 9823, 9827
Myeloma	34000	Any site	9731-9732
<b>Leukemia</b>	<b>35011-35043</b>	<b>Any site</b>	<b>9800-9804, 9820-9828, 9830, 9840-9842, 9850, 9860-9864, 9866-9868, 9870-9874, 9880, 9890-9894, 9900, 9910, 9930-9932, 9940-9941</b>
Acute lymphocytic	35011	Any site	9821, 9826, 9828
Chronic lymphocytic	35012	C420, C421, C424	9823
Acute non-lymphocytic	35021, 35023*, 35031, 35041, 35043*	Any site	9801, 9802, 9840-9842, 9861, 9862, 9866, 9867, 9871-9874, 9891, 9892, 9910, 9931, 9932
Chronic myeloid	35022	Any site	9863, 9868

\* SEER site recodes with a star (\*) indicate that the cancer site grouping is based not only on the SEER site recode but also on the given ICD-O-2 codes, sex, and/or histologic type.

## Appendix 2.C: All subsequent cancers excluding same-site definitions.

First primary site	All subsequent cancers excluding same-site definition
Lip	All subsequent cancers excluding cancer of the lip
Oral and pharynx	All subsequent cancers excluding cancers of the oral cavity and pharynx
Tongue	All subsequent cancers excluding cancer of the tongue
Gum and mouth	All subsequent cancers excluding cancers of the gum and mouth
Tonsil	All subsequent cancers excluding cancer of the tonsil
Oropharynx	All subsequent cancers excluding cancer of the oropharynx
Hypopharynx	All subsequent cancers excluding cancer of the hypopharynx
Salivary gland	All subsequent cancers excluding cancer of the salivary gland
Nasopharynx	All subsequent cancers excluding cancer of the nasopharynx
Esophagus	All subsequent cancers excluding cancer of the esophagus
Stomach	All subsequent cancers excluding cancer of the stomach
Small intestine	All subsequent cancers excluding cancer of the small intestine
Liver	All subsequent cancers excluding cancer of the liver
Gallbladder	All subsequent cancers excluding cancer of the gallbladder
Other biliary tract	All subsequent cancers excluding cancer of the other biliary tract
Pancreas	All subsequent cancers excluding cancer of the pancreas
Colon	All subsequent cancers excluding cancers of the colon, rectum and anus
Rectum	All subsequent cancers excluding cancers of the colon, rectum and anus
Anus	All subsequent cancers excluding cancer of the anus
Lung and bronchus	All subsequent cancers excluding cancers of the lung and bronchus
Larynx	All subsequent cancers excluding cancer of the larynx
Nasal cavities	All subsequent cancers excluding cancer of the nasal cavities
Mesothelioma	All subsequent cancers excluding mesothelioma
Breast, females	All subsequent cancers excluding cancer of the breast, females
Breast, males	All subsequent cancers excluding cancer of the breast, males
Cervix uteri	All subsequent cancers excluding cancer of the cervix uteri
Vagina	All subsequent cancers excluding cancer of the vagina
Vulva	All subsequent cancers excluding cancer of the vulva
Corpus uteri	All subsequent cancers excluding cancers of the female genital system
Ovary	All subsequent cancers excluding cancers of the female genital system
Prostate	All subsequent cancers excluding cancer of the prostate
Testis	All subsequent cancers excluding cancer of the testis
Penis	All subsequent cancers excluding cancer of the penis
Bladder	All subsequent cancers excluding cancers of the renal pelvis, ureter, bladder and other urinary
Kidney parenchyma	All subsequent cancers excluding cancer of the kidney parenchyma
Renal pelvis and ureter	All subsequent cancers excluding cancers of the renal pelvis, ureter, bladder and other urinary
Bone	All subsequent cancers excluding cancer of the bone
Soft tissues	All subsequent cancers excluding cancer of the soft tissues
Kaposi sarcoma	All subsequent cancers excluding Kaposi sarcoma
Melanoma of skin	All subsequent cancers excluding melanoma of skin
Ocular melanoma	All subsequent cancers excluding ocular melanoma
Eye (non-melanoma)	All subsequent cancers excluding cancer of the eye (non-melanoma)
Brain and other CNS	All subsequent cancers excluding cancers of the brain and other central nervous system
Thyroid	All subsequent cancers excluding cancer of the thyroid
Thymus	All subsequent cancers excluding cancer of the thymus
Adrenal gland	All subsequent cancers excluding cancer of the adrenal gland
Hodgkin lymphoma	All subsequent cancers excluding Hodgkin lymphoma
Non-Hodgkin lymphoma	All subsequent cancers excluding non-Hodgkin lymphoma
Myeloma	All subsequent cancers excluding myeloma
Acute lymphocytic leukemia	All subsequent cancers excluding lymphocytic leukemia*
Acute myeloid leukemia	All subsequent cancers excluding non-lymphocytic leukemia**
Chronic lymphocytic leukemia	All subsequent cancers excluding lymphocytic leukemia*
Chronic myeloid leukemia	All subsequent cancers excluding non-lymphocytic leukemia**

\* Definition of lymphocytic leukemia is ICD-O-2 histology (type): 9820, 9821, 9822, 9823, 9824, 9825, 9826, 9828, 9850, 9940-9941.

\*\* Definition of non-lymphocytic leukemia is ICD-O-2 histology (type): 9800, 9803-9804, 9830, 9840, 9841, 9860-9861, 9863-9864, 9866-9868, 9870, 9871-9874, 9880, 9890-9891, 9893, 9894, 9900, 9910, 9930 and ICD-O-2 site C420, C421, C424, and ICD-O-2 histology (type) 9827.

## Appendix 2.D: Histology/primary site group definitions.

Chapter number	Site and histology name	ICD-O-2 histology/primary site codes
4	Esophagus, squamous cell carcinoma	8010, 8012, 8051-8052, 8070-8075, 8082, 8094, 8120
4	Esophagus, adenocarcinoma	8140, 8144-8145, 8200, 8210-8211, 8260-8263, 8310, 8430, 8480-8481, 8490, 8550, 8560, 8570
4	Stomach, cardia	C160
4	Stomach, excluding cardia	C161-C166, C168, C169
4	Small intestine, adenocarcinoma	8140-8141, 8144, 8150, 8210-8211, 8260-8263, 8480-8481, 8490, 8550, 8560, 8570
6	Lung and bronchus, small cell carcinoma	8041-8045
6	Lung and bronchus, non-small cell carcinoma	8000-8040, 8046-9989
7	Female breast, infiltrating ductal carcinoma, NOS*	8500
7	Female breast, lobular carcinoma	8520
10	Testis, testicular seminoma	9060-9063
10	Testis, testicular non-seminoma	9070-9071, 9073, 9080-9085, 9100-9102

\* Not Otherwise Specified.





