

Cancer Statistics in Korea: Incidence, Mortality, Survival, and Prevalence in 2017

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Purpose

This study reports the cancer statistics and temporal trends in Korea on a nationwide scale, including incidence, survival, prevalence, and mortality in 2017.

Materials and Methods

The incidence, survival, and prevalence rates of cancer were evaluated using data from the Korea National Cancer Incidence Database from 1999 to 2017 with follow-up until December 31, 2018. Deaths from cancer were assessed using cause-of-death data from 1983 to 2017, obtained from Statistics Korea. Crude and age-standardized rates (ASRs) for incidence, mortality, and prevalence, and 5-year relative survival rates were calculated and trend analysis was performed.

Results

In 2017, newly diagnosed cancer cases and deaths from cancer numbered 232,255 (ASR, 264.4 per 100,000) and 78,863 (ASR, 76.6 per 100,000), respectively. The overall cancer incidence rates increased annually by 3.5% from 1999 to 2011 and decreased by 2.7% annually thereafter. Cancer mortality rates have been decreasing since 2002, by 2.8% annually. The 5-year relative survival rate for all patients diagnosed with cancer between 2013 and 2017 was 70.4%, which contributed to a prevalence of approximately 1.87 million cases by the end of 2017.

Conclusion

The burden of cancer measured by incidence and mortality rates have improved in Korea, with the exception of a few particular cancers that are associated with increasing incidence or mortality rates. However, cancer prevalence is increasing rapidly, with the dramatic improvement in survival during the past several years. Comprehensive cancer control strategies and efforts should continue, based on the changes of cancer statistics.

Key words

Incidence, Survival, Prevalence, Mortality, Neoplasms, Korea

Introduction

Recent studies on global burden of disease have revealed the huge burden imposed by cancer worldwide [1], and in contrast with the improvements detected for other non-communicable diseases, a worsening trend for cancer burden has been identified [2]. To precisely evaluate the cancer burden

and to appropriately manage cancer control plans or strategies at the level of nations, monitoring cancer statistics is of the utmost importance. In Korea, cancer is the leading cause of death, and the number of new cases increases each year [3]. This study reports the most recent nationwide statistics on cancer incidence, survival, prevalence, and mortality, and their temporal trends.

Materials and Methods

1. Data sources

The Korea National Cancer Incidence Database (KNCI DB) is a national, population-based database of cancer occurrence that includes information on patients diagnosed with cancer in hospitals across Korea and combined this with data provided by central and 11 regional cancer registries which included information regarding missing cancer patients; all this took 2 years to compile. Data from this database is used to examine cancer incidence, 5-year relative survival, and prevalence rates. The Korea Central Cancer Registry (KCCR)

has compiled KNCI DB, and reported related nationwide statistics from 1999 onward. Detailed information on the KCCR and KNCI DB is provided elsewhere [3,4]. Completeness is an important indicator of data quality, and the 2017 KNCI DB was estimated to be 98.2% complete using the method proposed by Ajiki et al. [5].

Mortality data including cause of death and mid-year population data from 1983 to 2017 were obtained from Statistics Korea [6]. To verify the accuracy of individual vital statuses when calculating survival and prevalence rates, the KNCI DB was linked to both mortality data and population resident registration data, which were obtained from the Ministry of the Interior and Safety.

Table 1. Cancer incidence, deaths, and prevalence by sex in Korea, 2017

Site/Type	New cases			Deaths			Prevalent cases ^{a)}		
	Both sexes	Men	Women	Both sexes	Men	Women	Both sexes	Men	Women
All sites	232,255	122,292	109,963	78,863	48,866	29,997	1,867,405	819,838	1,047,567
Lip, oral cavity, and pharynx	3,667	2,625	1,042	1,199	928	271	25,450	17,007	8,443
Esophagus	2,483	2,239	244	1,423	1,290	133	10,403	9,319	1,084
Stomach	29,685	19,916	9,769	8,034	5,166	2,868	289,223	191,389	97,834
Colon and rectum	28,111	16,653	11,458	8,691	4,981	3,710	251,063	149,310	101,753
Liver ^{b)}	15,405	11,500	3,905	10,721	7,982	2,739	68,077	51,068	17,009
Gallbladder ^{c)}	6,846	3,555	3,291	4,717	2,392	2,325	22,375	11,479	10,896
Pancreas	7,032	3,733	3,299	5,782	2,976	2,806	11,776	6,172	5,604
Larynx	1,218	1,142	76	372	349	23	10,990	10,334	656
Lung ^{d)}	26,985	18,657	8,328	17,980	13,272	4,708	84,242	51,808	32,434
Breast	22,395	95	22,300	2,517	20	2,497	217,203	801	216,402
Cervix uteri	3,469	-	3,469	868	-	868	54,914	-	54,914
Corpus uteri	2,986	-	2,986	320	-	320	25,590	-	25,590
Ovary	2,702	-	2,702	1,149	-	1,149	21,013	-	21,013
Prostate	12,797	12,797	-	1,821	1,821	-	86,435	86,435	-
Testis	262	262	-	15	15	-	3,441	3,441	-
Kidney	5,299	3,617	1,682	1,000	687	313	42,513	28,611	13,902
Bladder	4,379	3,525	854	1,438	1,100	338	35,585	29,024	6,561
Brain and CNS	1,947	1,036	911	1,319	738	581	11,719	5,998	5,721
Thyroid	26,170	6,035	20,135	369	111	258	405,032	71,015	334,017
Hodgkin lymphoma	287	172	115	55	43	12	3,004	1,871	1,133
Non-Hodgkin lymphoma	4,762	2,708	2,054	1,786	997	789	32,519	18,475	14,044
Multiple myeloma	1,629	857	772	964	512	452	6,375	3,339	3,036
Leukemia	3,366	1,916	1,450	1,834	1,042	792	22,218	12,369	9,849
Other and ill-defined	18,373	9,252	9,121	4,489	2,444	2,045	126,245	60,573	65,672

CNS, central nervous system. ^{a)}Limited-duration prevalent cases on January 1, 2017. These are patients who were diagnosed between January 1, 1999 and December 31, 2017, and who were alive on January 1, 2018. Multiple primary cancer cases were counted multiple times, ^{b)}Includes the liver and intrahepatic bile duct, ^{c)}Includes the gallbladder and other/ unspecified parts of the biliary tract, ^{d)}Includes the lung and bronchus.

Table 2. Crude and age-standardized cancer incidence rates by sex in Korea, 2017

Site/Type	Crude incidence rate per 100,000			Age-standardized incidence rate per 100,000 ^{a)}		
	Both sexes	Men	Women	Both sexes	Men	Women
All sites	453.4	478.1	428.6	264.4	291.3	251.5
Lip, oral cavity, and pharynx	7.2	10.3	4.1	4.3	6.3	2.4
Esophagus	4.8	8.8	1.0	2.6	5.1	0.5
Stomach	57.9	77.9	38.1	32.0	46.4	19.6
Colon and rectum	54.9	65.1	44.7	29.7	38.8	21.8
Liver ^{b)}	30.1	45.0	15.2	16.5	26.8	7.2
Gallbladder ^{c)}	13.4	13.9	12.8	6.6	8.0	5.5
Pancreas	13.7	14.6	12.9	7.1	8.5	5.8
Larynx	2.4	4.5	0.3	1.3	2.6	0.1
Lung ^{d)}	52.7	72.9	32.5	27.1	42.1	15.5
Breast	43.7	0.4	86.9	28.0	0.2	55.6
Cervix uteri	6.8	-	13.5	4.4	-	8.7
Corpus uteri	5.8	-	11.6	3.7	-	7.3
Ovary	5.3	-	10.5	3.4	-	6.8
Prostate	25.0	50.0	-	12.9	28.9	-
Testis	0.5	1.0	-	0.5	1.0	-
Kidney	10.3	14.1	6.6	6.3	8.9	3.8
Bladder	8.5	13.8	3.3	4.3	8.0	1.5
Brain and CNS	3.8	4.1	3.6	2.9	3.1	2.7
Thyroid	51.1	23.6	78.5	36.8	17.0	57.2
Hodgkin lymphoma	0.6	0.7	0.4	0.5	0.6	0.4
Non-Hodgkin lymphoma	9.3	10.6	8.0	6.0	7.4	4.8
Multiple myeloma	3.2	3.4	3.0	1.7	2.0	1.5
Leukemia	6.6	7.5	5.7	5.2	6.2	4.3
Other and ill-defined	35.9	36.2	35.6	20.6	23.2	18.5

CNS, central nervous system. ^{a)}Age-adjusted using Segi's world standard population, ^{b)}Includes the liver and intrahepatic bile duct, ^{c)}Includes the gallbladder and other / unspecified parts of the biliary tract, ^{d)}Includes the lung and bronchus.

2. Cancer classification

All cancer cases had been registered in accordance with the *International Classification of Diseases for Oncology, 3rd edition* (ICD-O-3) [7], and were converted to the classification of the *International Classification of Diseases, 10th edition* (ICD-10) [8]. Only cases defined as malignant under the ICD-O-3 were included, with the exception of some hematopoietic diseases (myeloproliferative disorders / myelodysplastic syndromes). For mortality data, causes of death were coded according to the ICD-10. We classified cancers into 24 types, using a modified classification based on the taxonomy of 61 cancers used in *Cancer Incidence in Five Continents*, published by the International Association of Cancer Registries [9]. The summary staging system developed under the Surveillance, Epidemiology, and End Results (SEER) program (i.e., SEER summary staging) [10], was used to categorize the extent of tumor invasion or metastasis.

3. Statistical analyses

Incidence, mortality, and prevalence rates were expressed as crude rates (CRs) or age-standardized rates (ASRs) per 100,000 people. The CR was defined as the total number of newly diagnosed (for incidence) or deceased (for mortality) cases in a year divided by the mid-year population. The ASR, a weighted average of the age-specific rates in which the weights represent the proportions of people in the corresponding age groups in a standard population [11], was calculated to compare rates across different countries, regions, or time periods with different population age structures. ASRs were standardized using Segi's world standard population [12]. The lifetime probabilities of developing cancer were assessed as cumulative cancer risks from birth to life expectancy, assuming no other cause of death (i.e., the sum of the age-specific rates from birth to life expectancy), as follows [11]:

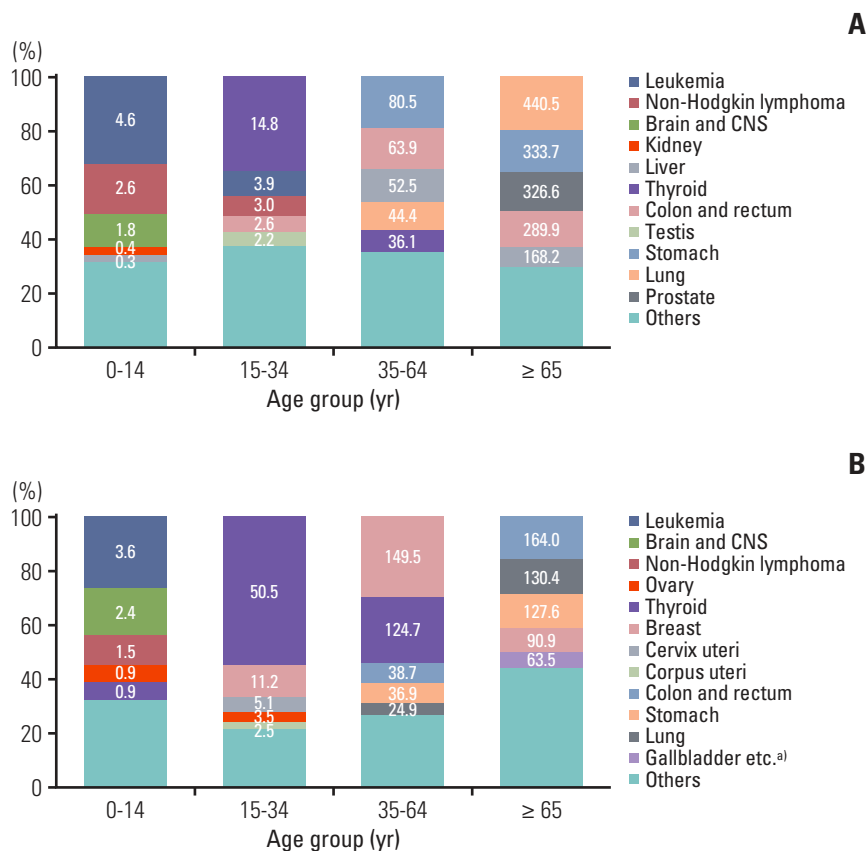


Fig. 1. The five common sites of cancer incidence by age group and sex for 2017 in Korea. (A) Men. (B) Women. Numbers on each section are age-specific incidence rates per 100,000. CNS, central nervous system. ^{a)}Includes the gallbladder and other/unspecified parts of the biliary tract.

$$\text{Cumulative risk of developing cancer from birth to life expectancy} = 100 \times \left(1 - e^{-\frac{\text{cumulative rate}}{100}}\right)$$

Trends in ASRs were estimated using Joinpoint regression [13], and the results were summarized as an annual percentage change using a linear model on the natural log-transformed ASRs.

The 5-year relative survival rates, defined as the ratio of observed survival of cancer patients to expected survival in the general population, were adjusted for the effects of other causes of death using the standard population life table provided by Statistics Korea [6]. Survival rates in this report, including previously published rates, were calculated using the newly updated life table. Relative survival rates were estimated using the Ederer II method [14] with some minor corrections, based on an algorithm devised by Paul Dickman [15]. Trends in 5-year relative survival rates were evaluated as percent differences in survival rates between 1993-1995 and 2013-2017.

Prevalent cases were defined as the number of cancer pati-

ents alive on January 1, 2018 among all patients diagnosed with cancer between 1999 and 2017. Limited-duration prevalence was calculated using SEER*Stat 8.1.2 software (National Cancer Institute, Bethesda, MD). $p < 0.05$ was considered statistically significant. SEER*Stat, Joinpoint 4.7.0 (National Cancer Institute), and SAS ver. 9.4 (SAS Institute Inc., Cary, NC) were used for statistical analysis.

Results

1. Incidence

In 2017, there were 232,255 newly diagnosed cancer cases in Korea, of which 122,292 (52.7%) were reported in men and 109,963 (47.3%) were reported in women (Table 1). Stomach, colorectal, and lung cancers were commonly diagnosed in both sexes; these were followed by prostate cancer and liver

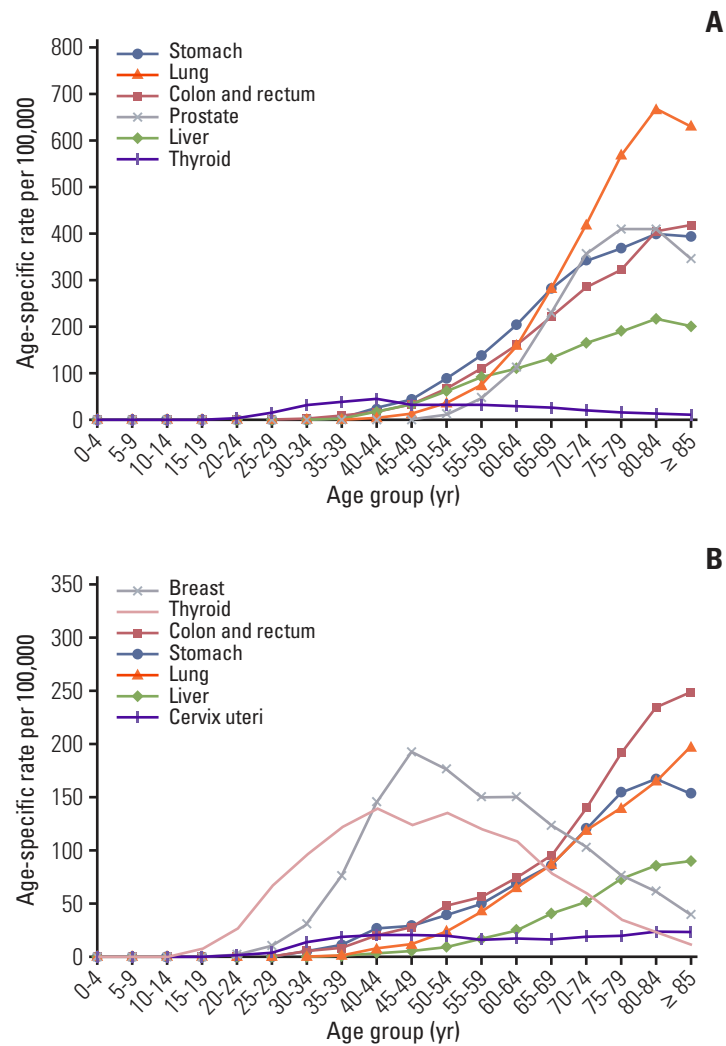


Fig. 2. Age-specific incidence rates of common cancers for 2017 in Korea. (A) Men. (B) Women.

Table 3. The top 10 leading causes of death in Korea, 2017

Rank	Cause of death	No. of deaths	Percentage of all deaths	Age-standardized mortality rate per 100,000 ^{a)}
	All causes	285,534	100.0	270.1
1	Cancer	78,863	27.6	76.6
2	Heart disease	30,852	10.8	27.2
3	Cerebrovascular disease	22,745	8.0	19.7
4	Pneumonia	19,378	6.8	15.6
5	Intentional self-harm (suicide)	12,463	4.4	16.7
6	Diabetes mellitus	9,184	3.2	8.0
7	Disease of liver	6,797	2.4	7.5
8	Chronic lower respiratory diseases	6,750	2.4	5.4
9	Hypertensive diseases	5,775	2.0	4.6
10	Transport accidents	5,028	1.8	6.4
	Others	87,699	30.7	82.5

Source: Mortality Data, 2017, Statistics Korea [6]. ^{a)}Age-adjusted using Segi's world standard population.

Table 4. Crude and age-standardized cancer mortality rates by sex in Korea, 2017

Site/Type	Crude mortality rate per 100,000			Age-standardized mortality rate per 100,000 ^{a)}		
	Both sexes	Men	Women	Both sexes	Men	Women
All sites	153.9	191.1	116.9	76.6	111.0	51.2
Lip, oral cavity, and pharynx	2.3	3.6	1.1	1.2	2.1	0.5
Esophagus	2.8	5.0	0.5	1.4	2.9	0.2
Stomach	15.7	20.2	11.2	7.7	11.8	4.6
Colon and rectum	17.0	19.5	14.5	8.1	11.3	5.6
Liver ^{b)}	20.9	31.2	10.7	10.9	18.3	4.5
Gallbladder ^{c)}	9.2	9.4	9.1	4.3	5.3	3.5
Pancreas	11.3	11.6	10.9	5.6	6.7	4.6
Larynx	0.7	1.4	0.1	0.3	0.8	0.0
Lung ^{d)}	35.1	51.9	18.4	16.7	29.4	7.4
Breast	4.9	0.1	9.7	2.9	0.0	5.5
Cervix uteri	1.7	-	3.4	0.9	-	1.7
Corpus uteri	0.6	-	1.2	0.3	-	0.7
Ovary	2.2	-	4.5	1.2	-	2.4
Prostate	3.6	7.1	-	1.5	4.0	-
Testis	0.0	0.1	-	0.0	0.0	-
Kidney	2.0	2.7	1.2	1.0	1.6	0.5
Bladder	2.8	4.3	1.3	1.2	2.5	0.5
Brain and CNS	2.6	2.9	2.3	1.7	2.0	1.4
Thyroid	0.7	0.4	1.0	0.3	0.2	0.4
Hodgkin lymphoma	0.1	0.2	0.0	0.1	0.1	0.0
Non-Hodgkin lymphoma	3.5	3.9	3.1	1.8	2.3	1.4
Multiple myeloma	1.9	2.0	1.8	0.9	1.1	0.8
Leukemia	3.6	4.1	3.1	2.1	2.7	1.7
Other and ill-defined	8.8	9.6	8.0	4.5	5.8	3.5

CNS, central nervous system. ^{a)}Age-adjusted using Segi's world standard population, ^{b)}Includes the liver and intrahepatic bile duct, ^{c)}Includes the gallbladder and other / unspecified parts of the biliary tract, ^{d)}Includes the lung and bronchus.

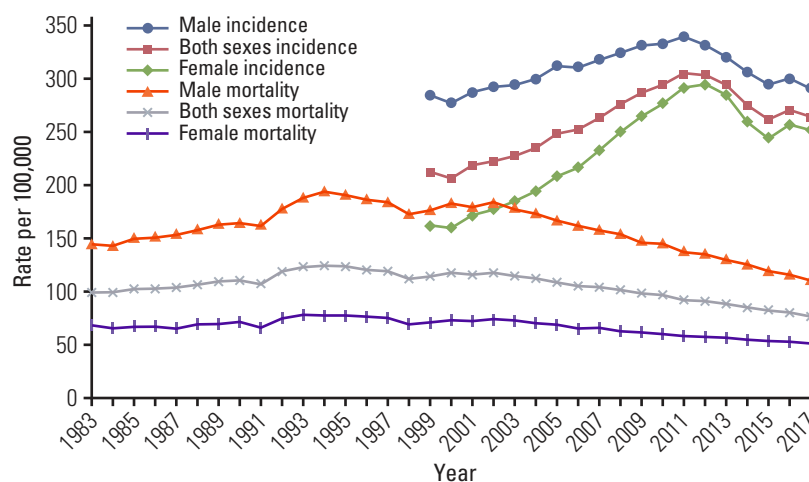


Fig. 3. Annual age-standardized cancer incidence and mortality rates by sex for all sites from 1983 to 2017 in Korea. Age standardization was based on Segi's world standard population.

Table 5. Trends in cancer incidence rates from 1999 to 2017 in Korea

Site/Type	Both sexes						Men						Women							
	1999		2017		Trend 2		1999		2017		Trend 1		1999		2017		Trend 1		Trend 2	
	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC
All sites	211.6	264.4	1999-2011	3.5 ^{b)}	2011-2017	-2.7 ^{a)}	285.4	291.3	1999-2011	1.6 ^{a)}	2011-2017	-2.7 ^{a)}	162.7	251.5	1999-2011	5.6 ^{a)}	2011-2017	-2.9 ^{a)}		
Lip, oral cavity, and pharynx	3.6	4.3	1999-2017	0.6 ^{b)}	-	-	6.1	6.3	1999-2017	-0.1	-	-	1.6	2.4	1999-2017	1.5 ^{a)}	-	-		
Esophagus	4.0	2.6	1999-2017	-2.3 ^{b)}	-	-	8.8	5.1	1999-2017	-2.8 ^{a)}	-	-	0.6	0.5	1999-2017	-1.3 ^{a)}	-	-		
Stomach	43.6	32.0	1999-2011	-0.2	2011-2017	-4.7 ^{a)}	66.1	46.4	1999-2011	-0.4 ^{a)}	2011-2017	-5.2 ^{a)}	26.7	19.6	1999-2011	-0.4	2011-2017	-4.2 ^{a)}		
Colon and rectum	20.5	29.7	1999-2010	5.9 ^{b)}	2010-2017	-4.2 ^{a)}	26.2	38.8	1999-2010	6.4 ^{a)}	2010-2017	-4.7 ^{a)}	16.5	21.8	1999-2010	4.7 ^{a)}	2010-2017	-3.7 ^{a)}		
Liver ^{b)}	27.8	16.5	1999-2010	-1.7 ^{a)}	2010-2017	-4.5 ^{a)}	46.6	26.8	1999-2009	-1.8 ^{a)}	2009-2017	-4.2 ^{a)}	12.2	7.2	1999-2010	-1.4 ^{a)}	2010-2017	-4.9 ^{a)}		
Gallbladder ^{c)}	6.5	6.6	1999-2004	1.4	2004-2017	-0.3	8.1	8.0	1999-2017	0.0	-	-	5.4	5.5	1999-2002	3.3	2002-2017	-0.5 ^{a)}		
Pancreas	5.6	7.1	1999-2017	1.4 ^{a)}	-	-	7.8	8.5	1999-2017	0.6 ^{a)}	-	-	4.0	5.8	1999-2017	2.3 ^{a)}	-	-		
Larynx	2.4	1.3	1999-2017	-3.6 ^{b)}	-	-	5.0	2.6	1999-2017	-3.8 ^{a)}	-	-	0.4	0.1	1999-2007	-9.2 ^{a)}	2007-2017	-3.5 ^{a)}		
Lung ^{d)}	28.4	27.1	1999-2010	0.2	2010-2017	-0.9 ^{a)}	51.3	42.1	1999-2005	0.0	2005-2017	-1.5 ^{a)}	12.5	15.5	1999-2011	1.9 ^{a)}	2011-2017	0.2		
Breast	11.0	28.0	1999-2002	10.2 ^{a)}	2002-2017	4.7 ^{a)}	0.2	0.2	1999-2017	-0.5	-	-	21.4	55.6	1999-2007	6.6 ^{a)}	2007-2017	4.4 ^{a)}		
Cervix uteri	8.6	4.4	1999-2007	-4.7 ^{a)}	2007-2017	-3.1 ^{a)}	-	-	-	-	-	-	16.4	8.7	1999-2007	-4.6 ^{a)}	2007-2017	-2.8 ^{a)}		
Corpus uteri	1.4	3.7	1999-2017	5.1 ^{a)}	-	-	-	-	-	-	-	-	2.8	7.3	1999-2017	5.3 ^{a)}	-	-		
Ovary	2.7	3.4	1999-2017	1.6 ^{b)}	-	-	-	-	-	-	-	-	5.1	6.8	1999-2017	1.9 ^{a)}	-	-		
Prostate	3.1	12.9	1999-2009	14.6 ^{b)}	2009-2017	1.5 ^{a)}	8.4	28.9	1999-2009	13.1 ^{a)}	2009-2017	0.8	-	-	-	-	-	-		
Testis	0.3	0.5	1999-2015	4.9 ^{b)}	2015-2017	-2.2	0.5	1.0	1999-2015	4.8 ^{b)}	2015-2017	-2.4	-	-	-	-	-	-		
Kidney	3.0	6.3	1999-2009	6.5 ^{b)}	2009-2017	1.9 ^{a)}	4.6	8.9	1999-2010	5.9 ^{a)}	2010-2017	1.1 ^{a)}	1.7	3.8	1999-2008	6.6 ^{a)}	2008-2017	2.4 ^{a)}		
Bladder	4.6	4.3	1999-2004	2.0 ^{b)}	2004-2017	-1.2 ^{a)}	9.0	8.0	1999-2004	1.9 ^{a)}	2004-2017	-1.5 ^{a)}	1.6	1.5	1999-2017	-1.0 ^{a)}	-	-		
Brain and CNS	2.8	2.9	1999-2017	0.2	-	-	3.2	3.1	1999-2017	0.2	-	-	2.6	2.7	1999-2017	0.2	-	-		
Thyroid	6.5	36.8	1999-2011	22.2 ^{a)}	2011-2017	-11.2 ^{a)}	2.1	17.0	1999-2011	24.8 ^{a)}	2011-2017	-6.7 ^{a)}	10.7	57.2	1999-2011	21.9 ^{a)}	2011-2017	-12.2 ^{a)}		
Hodgkin lymphoma	0.3	0.5	1999-2017	3.9 ^{b)}	-	-	0.4	0.6	1999-2017	3.0 ^{a)}	-	-	0.1	0.4	1999-2017	5.1 ^{a)}	-	-		
Non-Hodgkin lymphoma	4.3	6.0	1999-2017	2.3 ^{b)}	-	-	5.6	7.4	1999-2017	1.9 ^{a)}	-	-	3.3	4.8	1999-2017	2.6 ^{a)}	-	-		
Multiple myeloma	1.0	1.7	1999-2012	3.7 ^{a)}	2012-2017	1.0	1.2	2.0	1999-2012	3.5 ^{a)}	2012-2017	0.4	0.8	1.5	1999-2006	5.9 ^{a)}	2006-2017	2.3 ^{a)}		
Leukemia	4.7	5.2	1999-2017	0.9 ^{b)}	-	-	5.5	6.2	1999-2017	1.0 ^{a)}	-	-	3.9	4.3	1999-2017	0.7 ^{a)}	-	-		
Other and ill-defined	14.9	20.6	1999-2010	2.8 ^{a)}	2010-2017	1.4 ^{a)}	18.6	23.2	1999-2017	1.7 ^{a)}	-	-	12.3	18.5	1999-2010	3.4 ^{a)}	2010-2017	1.3 ^{a)}		

APC was calculated using age-standardized incidence data based on Segi's world standard population. APC, annual percentage change; CNS, central nervous system. ^{a)}Significantly different from zero ($p < 0.05$). ^{b)}Includes the liver and intrahepatic bile duct. ^{c)}Includes the gallbladder and other/unspecified parts of the biliary tract. ^{d)}Includes the lung and bronchus.

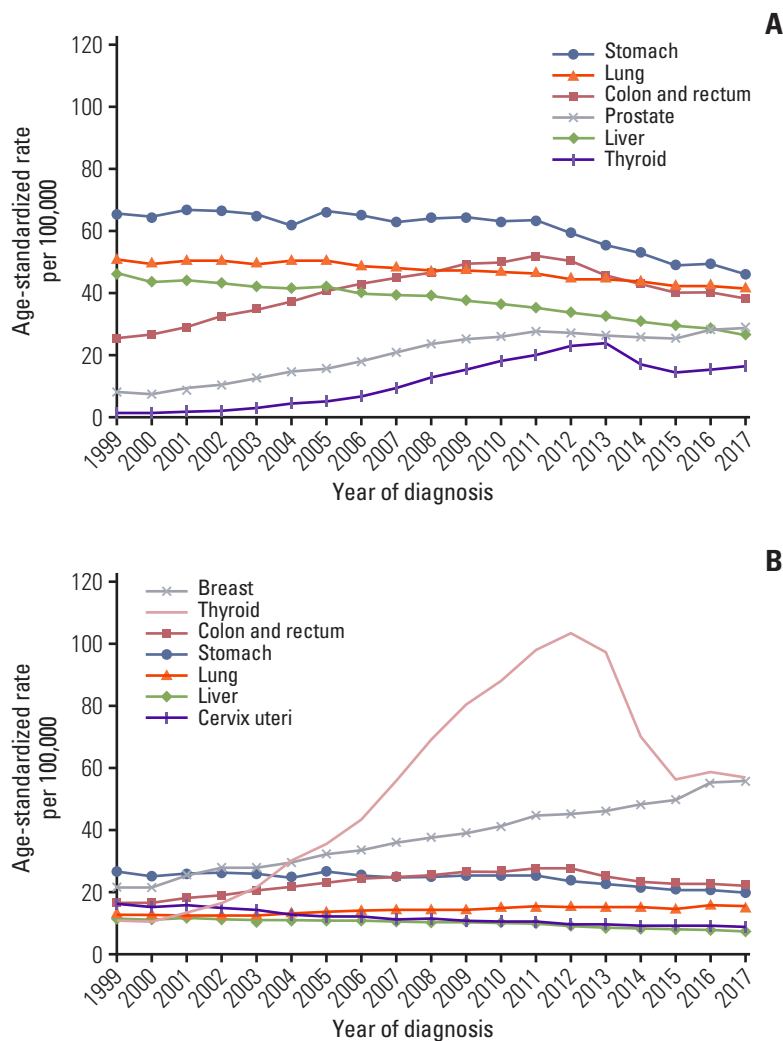


Fig. 4. Trends in age-standardized incidences of selected cancers by sex from 1999 to 2017 in Korea. (A) Men. (B) Women. Age standardization was based on Segi's world standard population.

cancer in men, whereas breast cancer and thyroid cancer were more commonly diagnosed in women. Collectively, the five most common cancers in men and women accounted for 65.0% and 65.5% of all cancer cases, respectively. Table 2 presents the CRs and ASRs of overall incidence and incidence of each cancer in 2017. The ASR of thyroid cancer, which occurs relatively frequently in younger age groups, was the highest. The overall lifetime probability of being diagnosed with any cancer was 37.0%, if one survives to reach the age that matches the life expectancy of the Korean population. That probability was higher in men (39.6%) than in women (33.8%) (data not shown).

In terms of age-specific incidence rates, leukemia (0-14 years) and thyroid cancer (15-34 years) were the most common cancers in both sexes among the childhood and 'adoles-

cent and young adult' populations (Fig. 1). Brain and central nervous system (CNS) cancer and non-Hodgkin lymphoma were ranked next in the 0-14-year age group (both sexes), while breast cancer (women) and leukemia (men) were the next highest in terms of incidence in the 15-34-year age group. In the 35-64-year age group, men were most commonly diagnosed with stomach cancer and colorectal cancer, while breast cancer and thyroid cancer were most common in women. For those aged 65 years and above, lung cancer and stomach cancer were most common in men, while colorectal cancer and lung cancer were most common in women. The incidence rates of all major cancers increased with age; therefore, cases diagnosed at over 60 years accounted for the majority of incidences (Fig. 2). The only exceptions to this were the incidences of thyroid and breast cancer in women,

Table 6. Trends in cancer mortality rates from 1999 to 2017 in Korea

Site/Type	Both sexes						Men						Women												
	1999		2017		Trend 2		1999		2017		Trend 1		Trend 2		1999		2017		Trend 1		Trend 2				
	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC	Year	APC			
All sites	114.3	76.6	1999-2002	1.2	2002-2017	-2.8 ^{b)}	176.6	111.0	1999-2002	1.4	2002-2017	-3.2 ^{a)}	70.6	51.2	1999-2002	1.1	2002-2017	-2.3 ^{b)}	0.4	0.5	1999-2017	-2.5 ^{b)}	-	-	
Lip, oral cavity, and pharynx	1.1	1.2	1999-2017	-1.7 ^{a)}	-	-	2.0	2.1	1999-2017	-2.0 ^{b)}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Esophagus	3.1	1.4	1999-2017	-4.4 ^{b)}	-	-	6.8	2.9	1999-2017	-4.7 ^{a)}	-	-	0.5	0.2	1999-2010	-6.3 ^{b)}	2010-2017	-1.3	-	-	-	-	-	-	
Stomach	23.8	7.7	1999-2003	-3.1 ^{a)}	2003-2017	-6.8 ^{b)}	36.9	11.8	1999-2003	-2.4 ^{a)}	2003-2017	-7.1 ^{a)}	14.6	4.6	1999-2003	-4.4 ^{b)}	2003-2017	-6.6 ^{b)}	-	-	-	-	-	-	-
Colon and rectum	7.7	8.1	1999-2005	4.6 ^{b)}	2005-2017	-1.9 ^{b)}	10.5	11.3	1999-2007	3.3 ^{b)}	2007-2017	-2.3 ^{a)}	6.0	5.6	1999-2005	3.9 ^{a)}	2005-2017	-2.4 ^{b)}	-	-	-	-	-	-	
Liver ^{b)}	20.4	10.9	1999-2003	-0.1	2003-2017	-4.0 ^{b)}	35.3	18.3	1999-2008	-2.6 ^{a)}	2008-2017	-4.6 ^{a)}	8.3	4.5	1999-2002	3.4	2002-2017	-4.0 ^{b)}	-	-	-	-	-	-	
Gallbladder ^{c)}	5.2	4.3	1999-2001	6.3	2001-2017	-2.4 ^{b)}	6.8	5.3	1999-2017	-2.2 ^{b)}	-	-	4.1	3.5	1999-2001	8.4	2001-2017	-2.4 ^{b)}	-	-	-	-	-	-	
Pancreas	5.4	5.6	1999-2017	0.2 ^{a)}	-	-	7.6	6.7	1999-2015	-0.3 ^{a)}	2015-2017	-3.6	3.9	4.6	1999-2017	0.9 ^{a)}	-	-	-	-	-	-	-	-	
Larynx	1.6	0.3	1999-2017	-9.3 ^{b)}	-	-	3.4	0.8	1999-2017	-8.9 ^{b)}	-	-	0.4	0.0	1999-2010	-15.2 ^{a)}	2010-2017	-8.5 ^{b)}	-	-	-	-	-	-	
Lung ^{d)}	22.4	16.7	1999-2001	2.1	2001-2017	-2.2 ^{b)}	41.5	29.4	1999-2002	2.0	2002-2017	-2.6 ^{a)}	9.4	7.4	1999-2013	-1.0 ^{a)}	2013-2017	-4.5 ^{b)}	-	-	-	-	-	-	
Breast	2.2	2.9	1999-2003	3.3 ^{b)}	2003-2017	1.1 ^{a)}	0.1	0.0	1999-2017	-4.1 ^{a)}	-	-	4.2	5.5	1999-2004	3.1 ^{a)}	2004-2017	1.3 ^{b)}	-	-	-	-	-	-	
Cervix uteri	1.4	0.9	1999-2003	8.3 ^{b)}	2003-2017	-5.1 ^{a)}	-	-	-	-	-	-	2.6	1.7	1999-2003	7.7 ^{a)}	2003-2017	-4.8 ^{b)}	-	-	-	-	-	-	
Corpus uteri	0.1	0.3	1999-2002	52.8 ^{b)}	2002-2017	3.1 ^{a)}	-	-	-	-	-	-	0.1	0.7	1999-2003	35.3 ^{b)}	2003-2017	3.1 ^{a)}	-	-	-	-	-	-	
Ovary	0.9	1.2	1999-2001	10.3	2001-2017	0.3	-	-	-	-	-	-	1.7	2.4	1999-2001	9.6	2001-2017	0.7 ^{b)}	-	-	-	-	-	-	
Prostate	0.9	1.5	1999-2004	10.0 ^{b)}	2004-2017	-0.1	2.6	4.0	1999-2004	10.0 ^{b)}	2004-2017	-0.7	-	-	-	-	-	-	-	-	-	-	-	-	
Testis	0.0	0.0	1999-2017	-2.6 ^{b)}	-	-	0.1	0.0	1999-2017	-3.0 ^{b)}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Kidney	1.1	1.0	1999-2017	-0.2	-	-	1.8	1.6	1999-2017	-0.2	-	-	0.5	0.5	1999-2017	-0.6	-	-	-	-	-	-	-	-	
Bladder	1.3	1.2	1999-2001	9.9	2001-2017	-1.7 ^{a)}	2.6	2.5	1999-2017	-1.6 ^{a)}	-	-	0.5	0.5	1999-2001	10.5	2001-2017	-1.8 ^{b)}	-	-	-	-	-	-	
Brain and CNS	1.9	1.7	1999-2002	4.1	2002-2017	-1.9 ^{b)}	2.2	2.0	1999-2017	-1.5 ^{b)}	-	-	1.6	1.4	1999-2017	-1.4 ^{b)}	-	-	-	-	-	-	-	-	
Thyroid	0.4	0.3	1999-2003	7.5 ^{b)}	2003-2017	-4.5 ^{b)}	0.3	0.2	1999-2003	10.2	2003-2017	-4.5 ^{b)}	0.5	0.4	1999-2004	4.5	2004-2017	-4.9 ^{b)}	-	-	-	-	-	-	
Hodgkin lymphoma	0.0	0.1	1999-2004	22.8 ^{b)}	2004-2017	-1.6	0.0	0.1	1999-2004	18.8 ^{b)}	2004-2017	-1.8	0.0	0.0	1999-2014	5.7 ^{b)}	2014-2017	-32.2	-	-	-	-	-	-	
Non-Hodgkin lymphoma	2.1	1.8	1999-2017	-1.0 ^{b)}	-	-	3.0	2.3	1999-2017	-1.3 ^{b)}	-	-	1.4	1.4	1999-2017	-0.5	-	-	-	-	-	-	-	-	
Multiple myeloma	0.6	0.9	1999-2003	13.1 ^{a)}	2003-2017	0.7	0.8	1.1	1999-2003	11.5 ^{a)}	2003-2017	0.5	0.4	0.8	1999-2005	10.0 ^{b)}	2005-2017	0.2	-	-	-	-	-	-	
Leukemia	2.9	2.1	1999-2017	-1.8 ^{b)}	-	-	3.5	2.7	1999-2017	-1.7 ^{a)}	-	-	2.4	1.7	1999-2017	-1.9 ^{b)}	-	-	-	-	-	-	-	-	
Other and ill-defined	7.8	4.5	1999-2017	-2.9 ^{b)}	-	-	9.0	5.8	1999-2017	-2.7 ^{a)}	-	-	7.0	3.5	1999-2005	-7.1 ^{a)}	2005-2017	-2.0 ^{b)}	-	-	-	-	-	-	

APC was calculated using age-standardized incidence data based on Segi's world standard population. APC, annual percentage change; CNS, central nervous system. ^{a)}Significantly different from zero ($p < 0.05$). ^{b)}Includes the liver and intrahepatic bile duct, ^{c)}Includes the gallbladder and other/unspecified parts of the biliary tract, ^{d)}Includes the lung and bronchus.

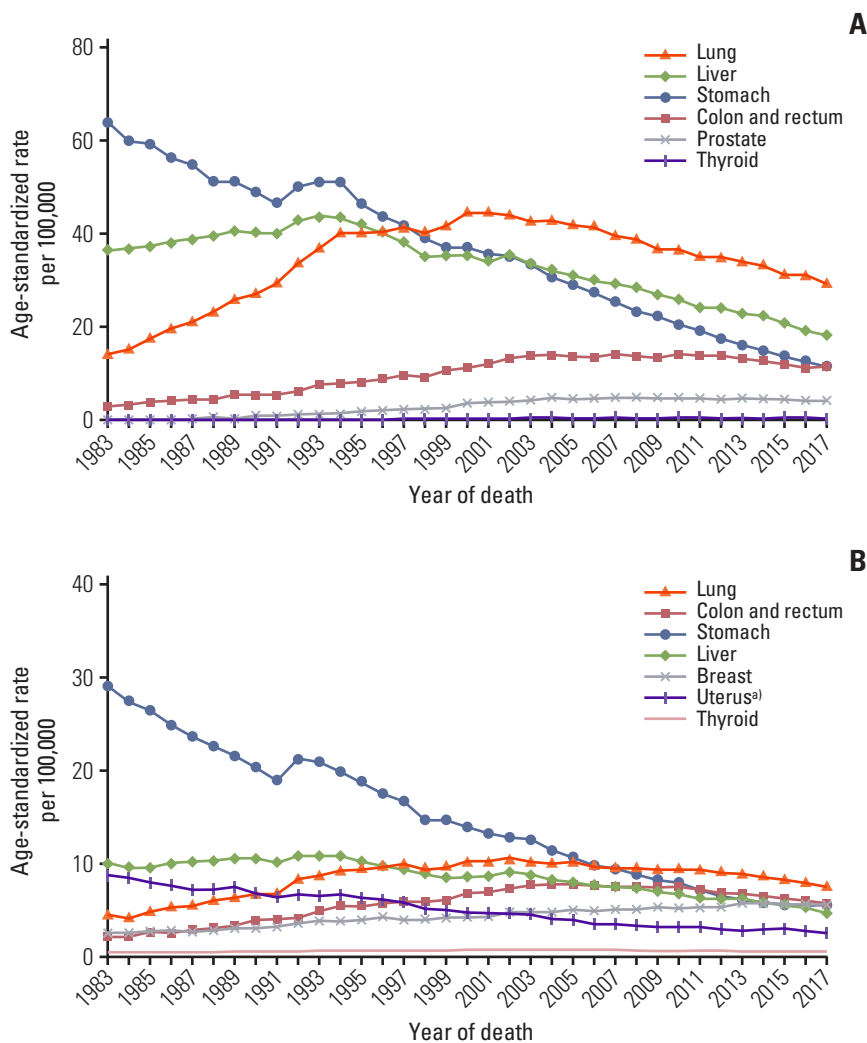


Fig. 5. Trends in age-standardized mortalities of selected cancers by sex from 1983 to 2017 in Korea. (A) Men. (B) Women. Age standardization was based on Segi's world standard population. ^{a)}Cancers of cervix uteri, corpus uteri, and unspecified parts of the uterus were combined (C53-C55), due to their unclear classifications in the past.

which were the highest in women in their 40s and 50s.

2. Mortality

A total of 78,863 people (62.0% men and 38.0% women) died of cancer in 2017, accounting for 27.6% of all deaths occurring in Korea (Tables 1 and 3). The overall CR for cancer deaths was 153.9 per 100,000, and the cancer mortality rate was higher in men than in women (Table 4). The top five cancers in terms of mortality rates were lung, liver, colorectal, stomach, and pancreatic cancers. Lung cancer was the leading cause of death in both sexes, followed by liver cancer and stomach cancer in men, and colorectal cancer and stomach cancer in women. When stratified based on age at time of

death, the most common causes of cancer mortality were as follows: leukemia at ages 10 and 20 years, stomach cancer at 30 years, liver cancer at 40 and 50 years, and lung cancer at 60 years or more (data not shown).

3. Trends in cancer incidence and mortality

Fig. 3 illustrates the trends in cancer incidence rates from 1999 to 2017 and mortality rates from 1983 to 2017. The overall cancer incidence rates increased by approximately 3.5% per year until 2011, and thereafter declined by approximately 2.7% per year (Table 5). These trends were observed in both men and women, although the slopes of change were much more pronounced in women. Breast, prostate, kidney, and

Table 7. Trends in the 5-year relative survival rates (%) by year of diagnosis from 1993 to 2017 in Korea

Site/Type	Both sexes										Men										Women																								
	1993-1995		2001-2005		2006-2010		2011-2015		2013-2017		Change ^{b)}	1993-1995		2001-2005		2006-2010		2011-2015		2013-2017		Change ^{b)}	1993-1995		2001-2005		2006-2010		2011-2015		2013-2017		Change ^{b)}												
	1993	1995	2001	2005	2006	2010	2011	2015	2013	2017		1993	1995	2001	2005	2006	2010	2011	2015	2013	2017		1993	1995	2001	2005	2006	2010	2011	2015	2013	2017													
All sites	42.9	45.1	54.1	54.1	65.5	70.7	70.4	70.4	27.5	33.2	36.3	45.6	56.8	63.1	63.5	30.3	55.1	56.4	64.3	74.4	78.4	77.5	22.4	41.2	43.3	50.8	59.0	64.2	65.0	23.8	32.7	35.8	44.7	54.6	60.3	61.0	28.3	52.6	53.5	59.1	65.0	69.3	70.1	17.5	
All sites excluding thyroid	42.1	47.4	54.5	54.5	61.0	65.3	66.7	66.7	24.6	36.6	41.7	49.6	56.9	61.7	63.7	27.1	59.3	64.5	68.1	72.0	74.4	74.1	14.8	14.0	15.7	21.5	29.9	36.4	38.0	24.0	13.1	14.8	20.7	29.3	36.1	37.5	24.4	25.0	25.9	29.8	37.1	39.7	42.2	17.2	
Lip, oral cavity, and pharynx	43.9	47.3	58.0	58.0	68.4	75.9	76.5	76.5	32.6	43.9	47.6	58.7	69.1	76.8	77.5	33.6	43.7	46.8	56.6	67.0	74.0	74.6	30.9	56.2	58.8	66.9	73.9	76.2	75.0	18.8	56.6	59.8	68.8	75.8	77.9	76.6	20.0	55.7	57.7	64.4	71.1	73.7	72.6	16.9	
Esophagus	11.7	14.1	20.5	20.5	28.2	34.3	35.6	35.6	23.9	10.8	13.8	20.4	28.2	34.8	36.4	25.6	15.0	15.1	20.9	28.3	32.7	33.2	18.2	18.7	20.7	23.1	26.9	28.8	28.9	10.2	18.0	21.1	23.5	27.8	29.5	29.7	11.7	19.3	20.3	22.7	26.0	28.1	28.0	8.7	
Stomach	10.6	8.7	8.4	8.5	10.8	12.2	1.6	10.0	8.3	8.4	8.3	8.4	8.3	10.2	11.8	1.8	11.5	9.2	8.4	8.8	11.4	12.5	1.0	61.6	63.3	66.5	73.2	75.0	77.0	15.4	62.1	63.7	67.1	73.5	75.4	77.4	15.3	56.3	58.9	58.6	68.0	69.2	69.6	13.3	
Colon and rectum	12.5	13.6	16.5	20.2	27.5	30.2	17.7	11.6	12.4	15.3	18.0	23.2	25.2	13.6	15.8	17.5	20.1	26.0	37.2	41.5	25.7	79.2	83.6	88.7	91.2	92.7	93.2	14.0	77.1	84.3	87.5	89.9	89.4	94.7	17.6	79.2	83.6	88.7	91.2	92.7	93.2	14.0			
Liver ^{b)}	78.3	80.3	81.5	80.7	80.2	80.2	1.9	-	-	-	-	-	-	-	-	-	78.3	80.3	81.5	80.7	80.2	1.9	82.9	82.0	84.8	86.5	87.8	88.2	5.3	-	-	-	-	-	-	-	60.1	59.4	61.7	61.2	64.3	64.9	4.8		
Gallbladder ^{c)}	59.1	69.2	81.0	91.9	94.1	94.1	35.0	59.1	69.2	81.0	91.9	94.1	94.1	94.1	94.1	35.0	59.1	69.2	81.0	91.9	94.1	94.1	-	59.1	69.2	81.0	91.9	94.1	94.1	35.0	59.1	69.2	81.0	91.9	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	-
Pancreas	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8			
Larynx	64.3	67.0	73.6	78.6	82.4	83.1	18.8	63.5	65.3	73.0	78.4	82.1	83.1	19.6	65.9	70.3	74.9	78.9	83.2	82.9	17.0	70.7	73.6	76.0	77.2	76.4	76.8	6.1	71.6	75.1	77.8	79.2	78.3	78.8	7.2	67.1	67.3	69.1	69.1	68.6	68.9	1.8			
Lung ^{d)}	40.4	39.9	41.0	42.9	41.3	40.8	0.4	39.1	38.7	40.3	41.3	39.7	39.2	0.1	42.1	41.4	41.8	44.6	43.0	42.5	0.4	40.4	39.9	41.0	42.9	41.3	40.8	0.4	39.1	38.7	40.3	41.3	39.7	39.2	0.1	42.1	41.4	41.8	44.6	43.0	42.5	0.4			
Breast	94.5	95.0	98.4	100.0	100.2	100.1	5.6	87.9	89.6	96.0	100.2	100.6	100.4	12.5	95.7	96.0	98.7	99.9	100.1	100.0	4.3	70.1	71.9	76.7	81.0	82.2	83.7	13.6	69.2	69.3	74.7	80.8	81.7	81.3	12.1	71.5	77.3	80.7	81.5	83.1	87.8	16.3			
Cervix uteri	48.3	51.1	56.0	59.4	62.8	63.2	14.9	46.9	49.6	55.0	59.2	62.7	63.9	17.0	50.6	53.3	57.5	59.7	62.9	62.2	11.6	48.3	51.1	56.0	59.4	62.8	63.2	14.9	46.9	49.6	55.0	59.2	62.7	63.9	17.0	50.6	53.3	57.5	59.7	62.9	62.2	11.6			
Corpus uteri	60.1	59.4	61.7	61.2	64.3	64.9	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60.1	59.4	61.7	61.2	64.3	64.9	4.8	-	-	-	-	-	-	-	-	-	-	-	-			
Ovary	59.1	69.2	81.0	91.9	94.1	94.1	35.0	59.1	69.2	81.0	91.9	94.1	94.1	35.0	59.1	69.2	81.0	91.9	94.1	94.1	-	59.1	69.2	81.0	91.9	94.1	94.1	35.0	59.1	69.2	81.0	91.9	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	-	
Prostate	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8	87.4	90.4	90.7	93.1	95.1	95.2	7.8			
Testis	64.3	67.0	73.6	78.6	82.4	83.1	18.8	63.5	65.3	73.0	78.4	82.1	83.1	19.6	65.9	70.3	74.9	78.9	83.2	82.9	17.0	70.7	73.6	76.0	77.2	76.4	76.8	6.1	71.6	75.1	77.8	79.2	78.3	78.8	7.2	67.1	67.3	69.1	69.1	68.6	68.9	1.8			
Kidney	70.7	73.6	76.0	77.2	76.4	76.8	6.1	71.6	75.1	77.8	79.2	78.3	78.8	7.2	67.1	67.3	69.1	69.1	68.6	68.9	1.8	40.4	39.9	41.0	42.9	41.3	40.8	0.4	39.1	38.7	40.3	41.3	39.7	39.2	0.1	42.1	41.4	41.8	44.6	43.0	42.5	0.4			
Bladder	94.5	95.0	98.4	100.0	100.2	100.1	5.6	87.9	89.6	96.0	100.2	100.6	100.4	12.5	95.7	96.0	98.7	99.9	100.1	100.0	4.3	70.1	71.9	76.7	81.0	82.2	83.7	13.6	69.2	69.3	74.7	80.8	81.7	81.3	12.1	71.5	77.3	80.7	81.5	83.1	87.8	16.3			
Brain and CNS	70.1	71.9	76.7	81.0	82.2	83.7	13.6	69.2	69.3	74.7	80.8	81.7	81.3	12.1	71.5	77.3	80.7	81.5	83.1	87.8	16.3	48.3	51.1	56.0	59.4	62.8	63.2	14.9	46.9	49.6	55.0	59.2	62.7	63.9	17.0	50.6	53.3	57.5	59.7	62.9	62.2	11.6			
Thyroid	48.3	51.1	56.0	59.4	62.8	63.2	14.9	46.9	49.6	55.0	59.2	62.7	63.9	17.0	50.6	53.3	57.5	59.7	62.9	62.2	11.6	23.5	21.0	29.7	35.0	41.2	43.3	19.8	23.0	19.1	29.8	35.2	40.8	43.6	20.6	24.1	23.3	29.5	34.7	41.7	43.1	19.0			
Hodgkin lymphoma	27.5	34.3	42.0	47.7	51.9	53.0	25.5	27.3	33.3	41.8	46.9	52.2	53.6	26.3	27.8	35.5	42.2	48.7	51.5	52.3	24.5	27.5	34.3	42.0	47.7	51.9	53.0	25.5	27.3	33.3	41.8	46.9	52.2	53.6	26.3	27.8	35.5	42.2	48.7	51.5	52.3	24.5			
Non-Hodgkin lymphoma	44.5	48.3	57.8	67.6	72.6	74.0	29.5	39.6	44.7	54.0	63.8	69.3	70.9	31.3	50.1	52.6	61.9	71.5	76.0	77.0	26.9	44.5	48.3	57.8	67.6	72.6	74.0	29.5	39.6	44.7	54.0	63.8	69.3	70.9	31.3	50.1	52.6	61.9	71.5	76.0	77.0	26.9			
Multiple myeloma	23.5	21.0	29.7	35.0	41.2	43.3	19.8	23.0	19.1	29.8	35.2	40.8	43.6	20.6	24.1	23.3	29.5	34.7	41.7	43.1	19.0	27.5	34.3	42.0	47.7	51.9	53.0	25.5	27.3	33.3	41.8	46.9	52.2	53.6	26.3	27.8	35.5	42.2	48.7	51.5	52.3	24.5			
Leukemia	44.5	48.3	57.8	67.6	72.6	74.0	29.5	39.6	44.7	54.0	63.8	69.3	70.9	31.3	50.1	52.6	61.9	71.5	76.0	77.0	26.9	44.5	48.3	57.8	67.6	72.6	74.0	29.5	39.6	44.7	54.0	63.8	69.3	70.9	31.3	50.1	52.6	61.9	71.5	76.0	77.0	26.9			
Other and ill-defined	44.5	48.3	57.8	67.6	72.6	74.0	29.5	39.6	44.7	54.0	63.8	69.3	70.9	31.3	50.1	52.6	61.9	71.5	76.0	77.0	26.9	44.5	48.3	57.8	67.6	72.6	74.0	29.5	39.6	44.7	54.0	63.8	69.3	70.9	31.3	50.1	52.6	61.9	71.5	76.0	77.0	26.9			

CNS, central nervous system. ^{a)}Absolute percentage change in 5-year relative survival from 1993 to 2017, ^{b)}Includes the liver and intrahepatic bile duct, ^{c)}Includes the gallbladder and other/unspecified parts of the biliary tract, ^{d)}Includes the lung and bronchus.

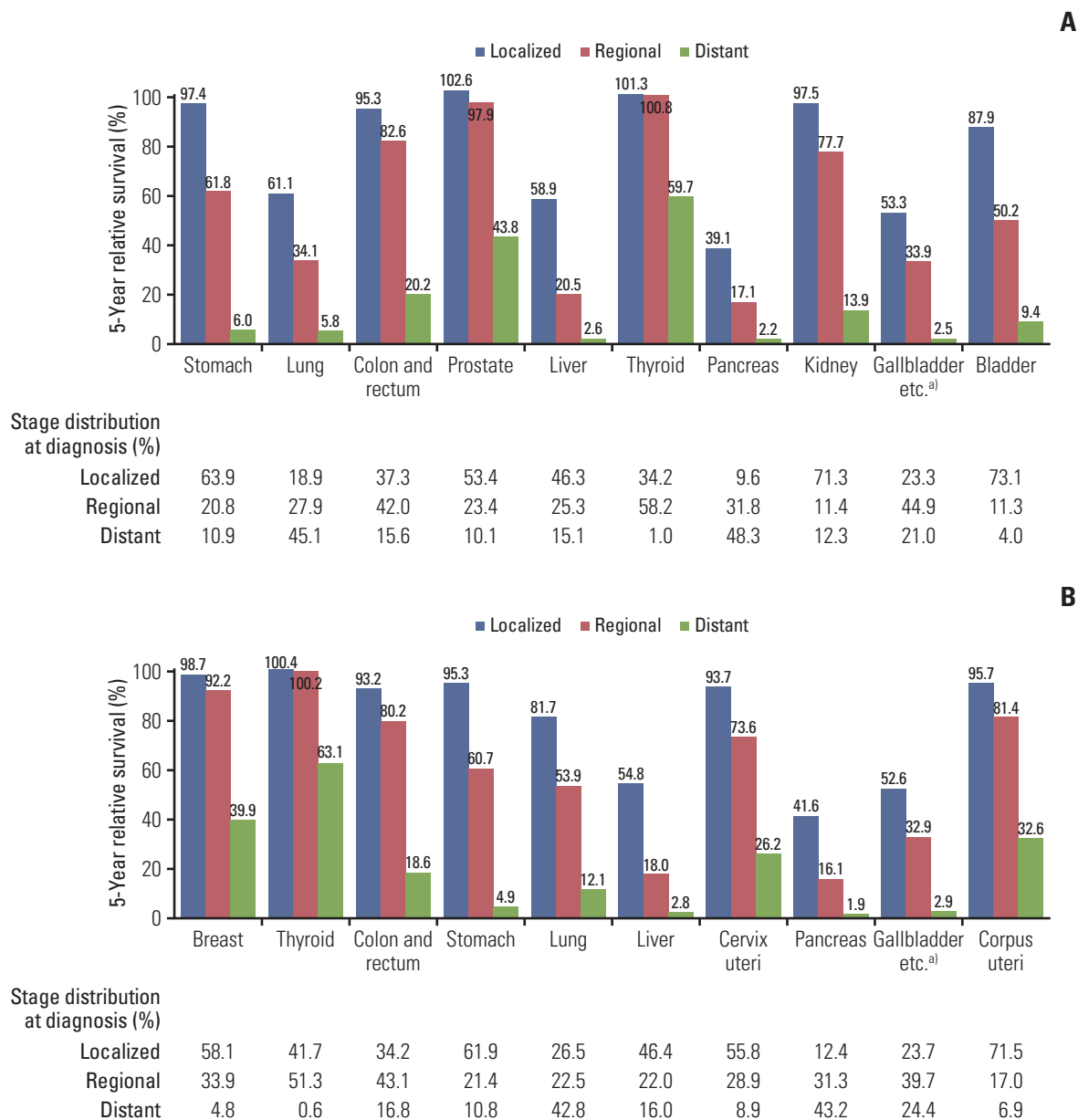


Fig. 6. Five-year relative survival rates by stage at diagnosis and stage distribution of selected cancers by sex in Korea, 2013-2017. (A) Men. (B) Women. Staging according to the Surveillance, Epidemiology, and End Results (SEER) stage categories. For each cancer type, stage categories do not total 100% because sufficient information was not available to stage all cases. ^{a)}Includes the gallbladder and other/unspecified parts of the biliary tract.

pancreatic cancer incidences have been continuously increasing since 1999; showing a steady increase for pancreatic cancer throughout the entire period, while the rest of those cancers revealed initially displaying rapid increases and then moderate increases after 2002 or 2009. The incidences of colorectal cancer, thyroid cancer, and bladder cancer demonstrated increasing trends that have recently reversed

significantly, with decreases starting in 2010, 2011, and 2004, respectively. The rapid increase and decrease in the incidence of thyroid cancer ASRs were similar to overall trend of cancer incidence (i.e., the timing and pattern of changes), appears that the former has a major influence on the latter. In contrast, stomach, liver, and cervical cancers have displayed steady decreases in incidence since 1999 (Fig. 4).

Table 8. Crude and age-standardized rates of cancer prevalence by sex on January 1, 2018 in Korea

Site/Type	Crude prevalence rate per 100,000 ^{a)}			Age-standardized prevalence rate per 100,000 ^{b)}		
	Both sexes	Men	Women	Both sexes	Men	Women
All sites	3,645.1	3,205.4	4,083.5	2,126.0	1,952.5	2,384.7
Lip, oral cavity, and pharynx	49.7	66.5	32.9	29.5	41.2	19.2
Esophagus	20.3	36.4	4.2	10.7	21.1	2.0
Stomach	564.6	748.3	381.4	301.5	437.6	188.9
Colon and rectum	490.1	583.8	396.6	258.8	343.0	190.6
Liver ^{c)}	132.9	199.7	66.3	75.5	120.3	34.8
Gallbladder ^{d)}	43.7	44.9	42.5	22.1	25.9	19.1
Pancreas	23.0	24.1	21.8	12.8	14.5	11.4
Larynx	21.5	40.4	2.6	11.2	23.4	1.2
Lung ^{e)}	164.4	202.6	126.4	87.0	118.0	63.2
Breast	424.0	3.1	843.5	255.9	1.9	503.7
Cervix uteri	107.2	-	214.1	63.6	-	124.3
Corpus uteri	50.0	-	99.8	30.2	-	59.4
Ovary	41.0	-	81.9	26.9	-	53.5
Prostate	168.7	337.9	-	80.2	189.3	-
Testis	6.7	13.5	-	6.0	11.8	-
Kidney	83.0	111.9	54.2	49.1	69.6	30.7
Bladder	69.5	113.5	25.6	34.8	65.7	11.1
Brain and CNS	22.9	23.5	22.3	19.1	20.1	18.0
Thyroid	790.6	277.7	1,302.0	510.0	183.0	834.8
Hodgkin lymphoma	5.9	7.3	4.4	4.8	5.8	3.8
Non-Hodgkin lymphoma	63.5	72.2	54.7	43.1	51.7	35.0
Multiple myeloma	12.4	13.1	11.8	6.8	7.7	6.0
Leukemia	43.4	48.4	38.4	39.4	44.1	34.6
Other and ill-defined	246.4	236.8	256.0	147.2	156.9	139.4

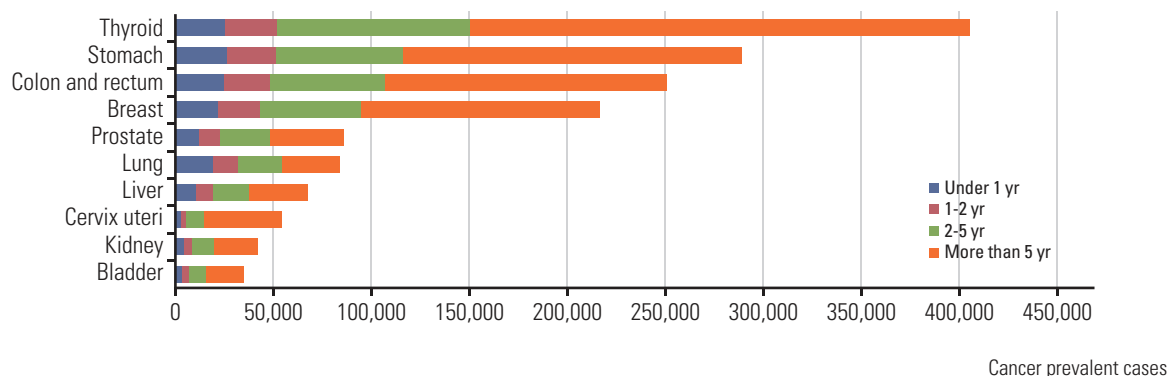
CNS, central nervous system. ^{a)}Crude prevalence rate: number of prevalent cases divided by the corresponding person-years of observation. Prevalent cases were defined as patients who were diagnosed between January 1, 1999 and December 31, 2017, and who were alive on January 1, 2018. Multiple primary cancer cases were counted multiple times, ^{b)}Age-adjusted using Segi's world standard population, ^{c)}Includes the liver and intrahepatic bile duct, ^{d)}Includes the gallbladder and other/ unspecified parts of the biliary tract, ^{e)}Includes the lung and bronchus.

The ASRs for the mortality of all cancers increased until 2002, then continuously decreased thereafter (Table 6, Fig. 3). More rapid changes were observed in decreasing phase compared to the preceding increasing phase, and the slopes of change were much more pronounced in men than in women. Continuous decreasing trends were evident throughout the observed period for mortality associated with stomach, liver, and uterine cancer, whereas the mortality rates associated with colorectal cancer and lung cancer (men) began to decline in the early or mid-2000s, after an initial increasing trend. Prostate cancer and breast cancer (women) displayed steadily increasing mortality trends; however, attenuation of the increasing trend in prostate cancer has been observed in recent years (Fig. 5).

4. Survival rates

The 5-year relative survival rates for all patients diagnosed with cancer in the recent 5 years, from 2013 to 2017 were 63.5% in men and 77.5% in women, for a combined overall survival rate of 70.4% (Table 7). The temporal trends in survival rates demonstrated remarkable improvement in both sexes, from 42.9% in 1993-1995 to 70.4% in 2013-2017. Such findings were maintained even after excluding thyroid cancer, which has excellent prognosis and a 5-year relative survival rate of 100.1%.

After thyroid cancer, survival was the highest for prostate and testicular cancers in men (94.1% and 95.2%, respectively) and for breast cancer in women (93.2%); the survival was



Time since diagnosis	Thyroid	Stomach	Colon and rectum	Breast	Prostate	Lung	Liver	Cervix uteri	Kidney	Bladder	All cancers
Under 1 yr	26,026	26,971	25,621	22,125	12,491	19,905	11,260	3,303	4,938	4,027	204,451
1-2 yr	26,111	24,917	23,165	21,236	11,075	12,807	8,427	3,187	4,446	3,544	176,867
2-5 yr	97,944	64,680	58,903	51,603	25,102	22,178	17,874	8,656	10,724	8,355	446,428
More than 5 yr	254,951	172,655	143,374	122,239	37,767	29,352	30,516	39,768	22,405	19,659	1,039,659
Total	405,032	289,223	251,063	217,203	86,435	84,242	68,077	54,914	42,513	35,585	1,867,405

Fig. 7. Prevalent cases of common cancers by time since cancer diagnosis. Prevalent cases were defined as the number of cancer patients alive on January 1, 2018 among all cancer patients diagnosed between 1999 and 2017.

lowest for cancers of the pancreas (12.2%), gallbladder plus other and unspecified parts of the biliary tract (28.9%), lung (30.2%), and liver (35.6%). Stomach cancer (both sexes), prostate cancer (men), and lung cancer (women) were associated with outstanding improvements in survival rate over the time period studied. In contrast, advances have been slow for pancreatic cancer, as well as cancers of the brain and CNS.

Fig. 6 shows the 5-year relative survival rates (2013-2017) based on SEER summary stage and stage distribution at diagnosis of the top 10 most common cancers for each sex in 2017. In men, 63.9%, 71.3%, and 73.1% of the stomach, kidney, and bladder cancers, respectively, were diagnosed at the localized stage, with 5-year survival rates of 97.4%, 97.5%, and 87.9%, respectively. However, these rates decreased to 6.0% (10.9% of cases), 13.9% (12.3% of cases), and 9.4% (4.0% of cases), respectively, for cases diagnosed at the distant metastatic stage. In women, 58.1%, 61.9%, and 71.5% of the breast, stomach, and uterine corpus cancers, respectively, were diagnosed at the localized stage, with 5-year survival rates of 98.7%, 95.3%, and 95.7%, respectively. These rates decreased to 39.9% (4.8% of cases), 4.9% (10.8% of cases), and 32.6% (6.9% of cases), respectively, for cases diagnosed at the distant metastatic stage. In both sexes, relatively large proportions (> 40%) of lung and pancreatic cancers were diagnosed at the distant metastatic stage, resulting in poor prognosis.

5. Prevalence rates

A total of 1,867,405 cancer cases were identified as of January 1, 2018 (Table 1), suggesting that 1 in 28 people, i.e., 3.6% of the Korean population (3.2% of men and 4.1% of women) has a history of being diagnosed with cancer. Of these, 826,103 (44.2% of all prevalent cases) were aged ≥ 65 years, indicating that 1 in 9 people in that age group (15.2% of men and 9.1% of women) will have experienced cancer (data not shown).

Table 8 presents the CRs and ASRs of prevalence for all cancers combined and for specific cancers. In the total population, thyroid cancer had the highest prevalence (CR, 790.6 per 100,000, derived from 277.7 per 100,000 for men and 1,302.0 per 100,000 for women), followed by stomach cancer (CR, 564.6 per 100,000) and colorectal cancer (CR, 490.1 per 100,000). Prostate cancer and breast cancer (women) also revealed high prevalence rates (CR, 337.9 and 843.5 per 100,000, respectively).

Fig. 7 depicts the number of prevalent cases for common cancers, categorized according to time since cancer diagnosis. In total, 1,039,659 (55.7% of all prevalent cases) had survived > 5 years after cancer diagnosis, including high proportion of patients diagnosed with thyroid, stomach, colorectal, breast, and cervical cancers. Another 446,428 (23.9% of all prevalent cases) were alive 2-5 years after their cancer diagnosis, leaving 381,318 (20.4% of all prevalent cases) who had

been diagnosed for < 2 years and who may still be undergoing active cancer treatment.

Conclusion

In summary, the numbers of newly diagnosed cancer cases and cancer-related deaths in 2017 were 232,255 and 78,863, respectively. Although overall cancer incidence and mortality have declined since 2011 and 2002, respectively, some cancers, such as breast and prostate cancer, demonstrate increasing trends with respect to both incidence and mortality. The 5-year relative survival rates have continuously improved, reaching 70.4% for all patients diagnosed with cancer between 2013 and 2017. Accordingly, cancer prevalence continues to increase, reaching approximately 1.87 million by the end of 2017. Although overall cancer incidence and mortality rates are on decreasing trend in Korea, improved survival is rapidly increasing cancer prevalence. These results suggest that comprehensive cancer control strategies and efforts should continue, based on the changes of cancer statistics.

Conflicts of Interest

Conflict of interest relevant to this article was not reported.

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