Discussion | Reports of device-related complications have increased with the growing use of retrievable IVCFs,[3] resulting in a 2010 safety communication from the US Food and Drug Administration urging removal of these devices when their use is no longer indicated.[4] Prolonged IVCF dwell times have been associated with increased risks for device-related complications[5] and retrieval failure,[2] resulting in the perception that retrieval of IVCFs with prolonged dwell times should not be attempted.

Smaller studies have described high rates of technical success when retrieving IVCFs with prolonged dwell times,[6] now corroborated in our larger study. Retrievable IVCFs with prolonged dwell times can be removed with a high degree of technical success without increasing the rate of procedural adverse events. Adjunctive retrieval techniques positively affect retrieval rates and are often needed for retrieval of IVCFs with prolonged dwell times.

Study limitations include the evolution of adjunctive techniques during the study period. The use of these techniques was operator dependent and was not objectively assigned. In addition, this single-center experience may not translate broadly.

Retrievable IVCFs can be removed safely with a high rate of technical success, regardless of dwell time. These findings support the US Food and Drug Administration's goal of removing devices that are no longer necessary by eliminating a limit on dwell times. Weighed against the risks of prolonged dwell times of retrievable IVCFs, removal of these devices should always be attempted.

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1. Sarosiek S, Crowther M, Sloan JM. Indications, complications, and management of inferior vena cava filters: the experience in 952 patients at an academic hospital with a level I trauma center. *JAMA Intern Med*. 2013;173(7):513-517.

2. Marquess JS, Burke CT, Beecham AH, et al. Factors associated with failed retrieval of the Günther Tulip inferior vena cava filter. *J Vasc Interv Radiol*. 2008;19(9):1321-1327.

3. McLoney ED, Krishnasamy VP, Castle JC, Yang X, Guy G. Complications of Celect, Günther Tulip, and Greenfield inferior vena cava filters on CT follow-up: a single-institution experience. *J Vasc Interv Radiol*. 2013;24(11):1723-1729.

4. US Food and Drug Administration. Removing retrievable inferior vena cava filters: initial communication. http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm221676.htm. Accessed December 13, 2014.

5. Nicholson W, Nicholson WJ, Tolerico P, et al. Prevalence of fracture and fragment embolization of Bard retrievable vena cava filters and clinical implications including cardiac perforation and tamponade. *Arch Intern Med*. 2010;170(20):1827-1831.

6. Pellerin O, Barral FG, Lions C, Novelli L, Beregi JP, Sapoval M. Early and late retrieval of the ALN removable vena cava filter: results from a multicenter study. *Cardiovasc Intervent Radiol*. 2008;31(5):889-896.

Deaths Due to Cigarette Smoking for 12 Smoking-Related Cancers in the United States

The 2014 US Surgeon General's Report provided the estimated annual number of smoking-attributable deaths during 2005 to 2009 from cancer overall and lung cancer specifically but not separately for the 11 other cancers found to be caused by smoking.[1] Current estimates of smoking-attributable mortality for specific cancer sites are based on data from 2000 to 2004.[2] Updated estimates are needed because smoking patterns and the magnitude of the association between smoking and cancer death have changed in the past decade. From 2000 to 2012, smoking prevalence decreased from 23.2% to 18.1%.[3] In contrast to this favorable trend, recently published data revealed that the risk of cancer death among smokers can increase over time.[4] Therefore, we estimated the number and proportion of deaths in the United States in 2011 attributable to cigarette smoking for 12 cancers caused by smoking.

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Methods | For 12 cancers established as caused by smoking, we used the standard formula[5] to calculate the population-attributable fraction (PAF) within strata defined by sex and age group (35-54, 55-64, 65-74, and ≥75 years) using SAS statistical software, version 9.3 (SAS Institute Inc). The PAFs were calculated using smoking prevalence (current, former, or never) from the 2011 National Health Interview Survey[3] and age- and sex-specific relative risks (RRs) for former and current smoking from the Cancer Prevention Study II (CPS-II)[4] (for the 35- to 54-year age group, follow-up from 1982-1988) or the pooled contemporary cohort (PCC)[4] (for other age groups, follow-up from 2000-2011). The National Health Interview Survey provides smoking prevalence estimates based on in-person interviews of a nationally representative sample of US adults. The

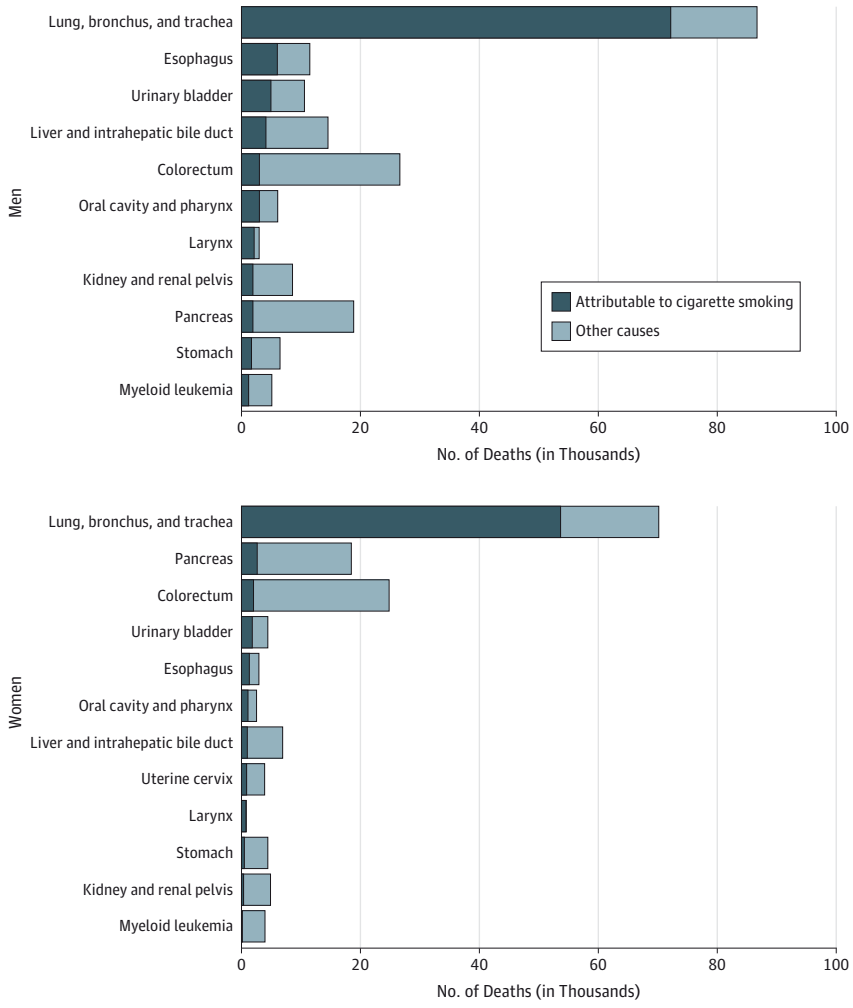
Table. Number and Proportion of Cancer Deaths in Adults 35 Years and Older Attributable to Cigarette Smoking in the United States in 2011[a]

Cancer Site	Men		Women		Total	
	Total Deaths, No.	Smoking-Attributable Deaths, No. (%) [95% CI]	Total Deaths, No.	Smoking-Attributable Deaths, No. (%) [95% CI]	Total Deaths, No.	Smoking-Attributable Deaths, No. (%) [95% CI]
Colorectum	26 608	2976 (11.2) [6.8 to 16.2]	24 815	1992 (8.0) [5.0 to 11.5]	**51 423**	**4969** (9.7) [6.9 to 12.8]
Esophagus	11 483	6011 (52.3) [45.2 to 59.1]	2921	1296 (44.4) [35.8 to 52.3]	**14 404**	**7307** (50.7) [44.8 to 56.5]
Kidney and renal pelvis	8550	1904 (22.3) [15.2 to 30.3]	4870	350 (7.2) [1.2 to 14.9]	**13 420**	**2253** (16.8) [11.9 to 22.8]
Larynx	2946	2125 (72.1) [62.2 to 80.5]	782	730 (93.4) [82.6 to 98.2]	**3728**	**2856** (76.6) [68.7 to 83.5]
Liver and intrahepatic bile duct	14 525	4085 (28.1) [18.2 to 39.6]	6916	975 (14.1) [6.0 to 23.4]	**21 441**	**5060** (23.6) [16.6 to 32.3]
Lung, bronchus, and trachea	86 690	72 164 (83.2) [81.9 to 84.6]	70 165	53 635 (76.4) [75.1 to 77.8]	**156 855**	**125 799** (80.2) [79.2 to 81.1]
Myeloid leukemia	5098	1181 (23.2) [15.4 to 32.1]	3949	136 (3.4) [−3.5 to 12.7]	**9047**	**1317** (14.6) [9.5 to 21.4]
Oral cavity and pharynx	6073	2955 (48.7) [37.0 to 59.6]	2503	1077 (43.0) [33.5 to 53.4]	**8576**	**4032** (47.0) [38.6 to 55.5]
Pancreas	18 841	1870 (9.9) [4.3 to 16.2]	18 448	2626 (14.2) [10.9 to 17.9]	**37 289**	**4495** (12.1) [8.7 to 15.8]
Stomach	6474	1656 (25.6) [17.0 to 35.2]	4419	476 (10.8) [3.5 to 20.1]	**10 893**	**2131** (19.6) [13.8 to 26.8]
Urinary bladder	10 585	4920 (46.5) [40.2 to 52.8]	4412	1804 (40.9) [33.4 to 47.9]	**14 997**	**6724** (44.8) [40.1 to 49.8]
Uterine cervix	NA	NA	3889	862 (22.2) [9.1 to 40.7]	**3889**	**862** (22.2) [9.1 to 40.7]
Total	**197 873**	**101 848**(51.5) [47.9 to 55.4]	**148 089**	**65 958**(44.5) [41.9 to 47.7]	**345 962**	**167 805** (48.5) [46.2 to 51.2]

Abbreviation: NA, not applicable.

[a] Calculations are based on relative risks by smoking status and age group, adjusted for alcohol consumption, generated from analyses of the Cancer Prevention Study II (CPS-II) and updated analyses of the pooled contemporary cohort (which includes the CPS-II, the Nurses' Health Study, the Health Professionals Follow-up Study, the Women's Health Initiative, and the National Institutes of Health-AARP Diet and Health Study) as described by Thun et al.[4]

Figure. Number of Cancer Deaths Attributable to Cigarette Smoking in 2011 in Adults 35 Years and Older by Cancer Type



CPS-II and the 5 studies that compose the PCC are large US cohort studies that ascertained smoking from self-administered questionnaires and are described in detail elsewhere.[4] The RRs were adjusted for age, race, educational level, and alcohol use; the RRs from the PCC were additionally adjusted for cohort. The RRs from CPS-II appear in the 2014 US Surgeon General's Report,[1] and the RRs from the PCC appear in the article by Carter et al.[6] For each cancer site, smoking-attributable deaths in each age and sex group were calculated by multiplying age- and sex-specific PAFs by age- and sex-specific death counts in 2011 derived from the National Vital Statistics System. Smoking-attributable deaths were then summed across age and sex groups to determine the total number of smoking-attributable deaths, which was divided by the total number of deaths to calculate the overall PAF. These statistical methods and data sources match those used in smoking-attributable mortality calculations in the 2014 US Surgeon General's Report but use slightly updated data.[1]

Results | Of the 345 962 deaths among adults 35 years and older in 2011 from the 12 cancer sites examined, we estimate 167 805 (48.5%; 95% CI, 46.2%-51.2%) were caused by cigarette smoking. The largest proportions of smoking-attributable deaths were for cancers of the lung, bronchus, and trachea (125 799 [80.2%]; 95% CI, 79.2%-81.1%) and larynx (2856 [76.6%]; 95% CI, 68.7%-83.5%) (**Table** and **Figure**). Approximately half of the deaths from cancers of the oral cavity, esophagus, and urinary bladder were due to smoking.

Discussion | Cigarette smoking continues to cause numerous deaths from multiple cancers despite half a century of decreasing prevalence. The smoking downturn is likely reflected in the generally lower proportions of deaths caused by smoking in 2011 than in 2000 to 2004 for the 10 overlapping cancer sites. Earlier estimates excluded colorectal and liver cancers (10 029 smoking-attributable deaths in 2011) because they were not yet established smoking-related sites.

One limitation of our study is the cohort populations, which are less racially diverse and more educated than the US population. In addition, tobacco exposures other than cigarettes were not included in our analysis. These exposures include secondhand smoke, which is estimated to cause an additional 5% of lung cancer deaths,[1] and the use of cigars, pipes, and smokeless tobacco, which undoubtedly account for a considerable proportion of deaths from cancers of the oropharynx, larynx, and esophagus. Although differences in exposures (eg, diet and exercise) between smokers and nonsmokers may have potentially confounded our results, these differences have minimal effect on smoking-attributable risk.[1]

Continued progress in reducing cancer mortality, as well as deaths from many other serious diseases, will require more comprehensive tobacco control, including targeted cessation support.

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1. US Department of Health and Human Services. *The Health Consequences of Smoking–50 Years of Progress: A Report of the Surgeon General.* Atlanta, GA: US Dept of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014.

2. Centers for Disease Control and Prevention (CDC). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000-2004. *MMWR Morb Mortal Wkly Rep*. 2008;57(45):1226-1228.

3. National Center for Health Statistics. National Health Interview Survey, 2000-2012 [public-use data file, released 2001-2013]. Hyattsville, MD: National Center for Health Statistics; 2001-2013.

4. Thun MJ, Carter BD, Feskanich D, et al. 50-year trends in smoking-related mortality in the United States. *N Engl J Med*. 2013;368(4):351-364.

5. Walter SD. The estimation and interpretation of attributable risk in health research. *Biometrics*. 1976;32(4):829-849.

6. Carter BD, Abnet CC, Feskanich D, et al. Smoking and mortality--beyond established causes. *N Engl J Med*. 2015;372(7):631-640.