Cancer statistics, 2022

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Abstract: Each year, the American Cancer Society estimates the numbers of new cancer cases and deaths in the United States and compiles the most recent data on population-based cancer occurrence and outcomes. Incidence data (through 2018) were collected by the Surveillance, Epidemiology, and End Results program; the National Program of Cancer Registries; and the North American Association of Central Cancer Registries. Mortality data (through 2019) were collected by the National Center for Health Statistics. In 2022, 1,918,030 new cancer cases and 609,360 cancer deaths are projected to occur in the United States, including approximately 350 deaths per day from lung cancer, the leading cause of cancer death. Incidence during 2014 through 2018 continued a slow increase for female breast cancer (by 0.5% annually) and remained stable for prostate cancer, despite a 4% to 6% annual increase for advanced disease since 2011. Consequently, the proportion of prostate cancer diagnosed at a distant stage increased from 3.9% to 8.2% over the past decade. In contrast, lung cancer incidence continued to decline steeply for advanced disease while rates for localized-stage increased suddenly by 4.5% annually, contributing to gains both in the proportion of localized-stage diagnoses (from 17% in 2004 to 28% in 2018) and 3-year relative survival (from 21% to 31%). Mortality patterns reflect incidence trends, with declines accelerating for lung cancer, slowing for breast cancer, and stabilizing for prostate cancer. In summary, progress has stagnated for breast and prostate cancers but strengthened for lung cancer, coinciding with changes in medical practice related to cancer screening and/or treatment. More targeted cancer control interventions and investment in improved early detection and treatment would facilitate reductions in cancer mortality.

Keywords: cancer cases, cancer statistics, death rates, incidence, mortality

Introduction

Cancer is a major public health problem worldwide and the second leading cause of death in the United States. In 2020, the diagnosis and treatment of cancer was adversely affected by the coronavirus disease 2019 (COVID-19) pandemic. Reduced access to care because of health care setting closures and fear of COVID-19 exposure resulted in delays in diagnosis and treatment that may lead to a short-term drop in cancer incidence followed by an uptick in advanced-stage disease and, ultimately, increased mortality.[1] However, quantifying these and other secondary consequences of the pandemic at the population level will take several years because of the lag in dissemination of population-based surveillance data. For example, reported cancer incidence and mortality are only currently available through 2018 and 2019, respectively.

In this article, we provide the estimated numbers of new cancer cases and deaths in 2022 in the United States nationally and for each state, as well as a comprehensive overview of cancer occurrence based on the most currently available population-based data for cancer incidence and mortality. We also estimate the total number of cancer deaths averted through 2019 because of the continuous decline in cancer death rates since the early 1990s.

Materials and Methods

Data Sources

Population-based cancer incidence data in the United States have been collected by the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) program since 1973 and by the Centers for Disease Control and Prevention's (CDC's) National Program of Cancer Registries (NPCR) since 1995. The SEER program is the only source for historic population-based incidence and survival data (1975-2018), which is based on cases diagnosed in the 9 oldest SEER areas (Connecticut, Hawaii, Iowa, New Mexico, Utah, and the metropolitan areas of Atlanta, Detroit, San Francisco-Oakland, and Seattle-Puget Sound) and represents approximately 9% of the US population.[2] Contemporary survival statistics (2011-2017) were based on data from 18 SEER registries (SEER 9 plus the Alaska Native Tumor Registry and the California, Georgia, Kentucky, Louisiana, and New Jersey registries).[3,4] All 21 SEER registries (SEER 18 plus Idaho, Massachusetts, and New York)[5] were the source for contemporary incidence trends and the probability of developing cancer, which was obtained from the NCI's DevCan software, version 6.7.9.[6]

The North American Association of Central Cancer Registries (NAACCR) compiles and reports incidence data from 1995 forward for registries that participate in the SEER program and/or the NPCR. These data approach 100% coverage of the US population for the most recent years and were the source for the projected new cancer cases in 2022, contemporary cross-sectional incidence rates (2014-2018), and stage distribution (2014-2018).[7] Some of the incidence data presented herein were previously published in volumes 1 and 2 of *Cancer in North America: 2014-2018*.[8,9]

Mortality data from 1930 to 2019 were provided by the National Center for Health Statistics (NCHS).[10,11] Forty-seven states and the District of Columbia met data quality requirements for reporting to the national vital statistics system in 1930, and Texas, Alaska, and Hawaii began reporting in 1933, 1959, and 1960, respectively. The methods for abstraction and age adjustment of historic mortality data are described elsewhere.[11,12] Contemporary 5-year mortality rates for Puerto Rico were obtained from the NCI and CDC's joint State Cancer Profiles website (statecancerprofiles.cancer.gov).

All cancer cases were classified according to the *International Classification of Diseases for Oncology* except childhood and adolescent cancers, which were classified according to the *International Classification of Childhood Cancer*.[13,14] Colorectal cancer (CRC) incidence rates presented herein exclude tumors of the appendix (C18.1), which are distinct from CRC in histology, molecular profile, and clinical characteristics. Causes of death were classified according to the *International Classification of Diseases*.[15]

Statistical Analysis

All incidence and death rates were age-standardized to the 2000 US standard population and expressed per 100,000 persons, as calculated by NCI's SEER*Stat software, version 8.3.9.[16] The annual percent change (APC) in rates was quantified using NCI's Joinpoint Regression Program (version 4.9.0.1).[17] Trends were described as increasing or decreasing when the APC was statistically significant based on a 2-sided P value $< .05$ and otherwise stable. All statistics presented herein by race, including those for Asian/Pacific Islander people and American Indian/Alaska Native people, are exclusive of Hispanic ethnicity. Life tables by Hispanic ethnicity were published in 2018 and were used for relative survival comparisons between White and Black individuals.[18]

Whenever possible, cancer incidence rates were adjusted for delays in reporting, which occur because of a lag in case capture and data corrections. Delay adjustment provides the most accurate portrayal of contemporary cancer rates and thus is particularly important in trend analysis.[19] It has the largest effect on the most recent data years for cancers that are frequently diagnosed and/or treated in outpatient settings (eg, melanoma, leukemia, and prostate cancer). For example, the leukemia incidence rate for 2018 was 10.5% higher after adjusting for reporting delays (14.7 vs 13.3 per 100,000).[4]

Projected cancer cases and deaths in 2022

The most recent year for which incidence and mortality data are available lags 2 to 4 years behind the current year because of the time required for data collection, compilation, quality control, and dissemination. Therefore, we project the numbers of new cancer cases and deaths in the United States in 2022 to estimate the contemporary cancer burden. These estimates do not reflect the impact of COVID-19 because they are based on currently available incidence and mortality data through 2018 and 2019, respectively. In addition, basal cell and squamous cell skin cancers cannot be estimated because diagnoses are not recorded by most cancer registries.

The methodology for calculating contemporary cancer cases and deaths was updated in 2021 to take advantage of advances in statistical modeling and improved cancer registration coverage and is described in detail elsewhere.[20,21] Briefly, the first step in calculating the number of invasive cancer cases in 2022 was to estimate complete counts for every state from 2004 through 2018 using delay-adjusted, high-quality incidence data from 50 states and the District of Columbia (98% population coverage; data were unavailable for a few sporadic years for a limited number of states). A generalized linear mixed model[20] was used that accounted for state-level variations in sociodemographic and lifestyle factors, medical settings, and cancer screening behaviors.[22] Then, modeled state and national counts were projected forward to 2022 using a novel, data-driven joinpoint algorithm.[21]

New cases of ductal carcinoma in situ of the female breast and in situ melanoma of the skin diagnosed in 2022 were estimated by first approximating the number of cases occurring annually from 2009 through 2018 based on age-specific NAACCR incidence rates (data from 49 states with high-quality data available for all 10 years) and US Census Bureau population estimates obtained through SEER*Stat.[7,23] Counts were then adjusted for delays in reporting using SEER 21 delay factors for invasive disease (delay factors are unavailable for in situ cases)[5] and projected to 2022 based on the average APC generated by the joinpoint regression model.

The number of cancer deaths expected to occur in 2022 was estimated by applying the same data-driven joinpoint algorithm described previously for the case projection to reported cancer deaths from 2005 through 2019 at the state and national levels, as reported to the NCHS.[21]

Other statistics

The number of cancer deaths averted in men and women because of the reduction in cancer death rates since the early 1990s was estimated by summing the difference between the annual number of cancer deaths recorded and the number that would have been expected if cancer death rates had remained at their peak. The expected number of deaths was estimated by applying the 5-year age- and sex-specific cancer death rate in the peak year for age-standardized cancer death rates (1990 in men, 1991 in women) to the corresponding populations in subsequent years through 2019.

Selected Findings

Expected Number of New Cancer Cases

Table 1 presents the estimated numbers of new invasive cancer cases in the United States in 2022 by sex and cancer type. In total, there will be approximately 1,918,030 cancer cases diagnosed, the equivalent of about 5250 new cases each day. In addition, there will be about 51,400 new cases of ductal carcinoma in situ of the female breast diagnosed in women and 97,920 new cases of melanoma in situ of the skin. The estimated numbers of new cases for selected cancers by state are shown in Table 2.

The lifetime probability of being diagnosed with invasive cancer is slightly higher for men (40.2%) than for women (38.5%) (Table 3), reflecting life expectancy as well as cancer risk.[24] Reasons for higher cancer risk in men are not fully understood but probably largely reflect more exposure to cancer-causing environmental and biologic factors, such as smoking and height. Sex differences in endogenous hormones and immune function and response may also play a role.[25]

Figure 1 depicts the most common cancers diagnosed in men and women in 2022. Prostate, lung and bronchus (lung hereafter), and colorectal cancers (CRC) account for almost one-half (48%) of all incident cases in men, with prostate cancer alone accounting for 27% of diagnoses. For women, breast cancer, lung cancer, and CRC account for 51% of all new diagnoses, with breast cancer alone accounting for almost one-third.

Expected Number of Cancer Deaths

An estimated 609,360 people in the United States will die from cancer in 2022, corresponding to almost 1700 deaths per day (Table 1). The greatest number of deaths are from cancers of the lung, prostate, and colorectum in men and of the lung, breast, and colorectum in women (Fig. 1). Table 4 provides estimated number of deaths for these and other common cancers by state.

More than 350 people will die each day from lung cancer, which is more than breast, prostate, and pancreatic cancers combined and 2.5 times more than CRC, the second leading cause of cancer death. Approximately 105,840 of the 130,180 lung cancer deaths (81%) in 2022 will be caused by cigarette smoking directly, with an additional 3650 due to second-hand smoke.[26] The remaining balance of approximately 20,700 nonsmoking-related lung cancer deaths would rank as the eighth leading cause of cancer death among sexes combined if classified separately.

Trends in Cancer Incidence

Figure 2 illustrates long-term trends in overall cancer incidence rates, which reflect both patterns in behaviors associated with cancer risk and changes in medical practice, such as the use of cancer screening tests. For example, the spike in incidence for males during the early 1990s reflects a surge in the detection of asymptomatic prostate cancer as a result of widespread rapid uptake of prostate-specific antigen (PSA) testing among previously unscreened men.[27] Overall cancer incidence in men generally decreased from the early 1990s until around 2013, then stabilized through 2018; whereas in women, the rate was fairly stable through the mid-2010s but has ticked up slightly (0.2% per year) in recent data years.[28] Consequently, the sex gap is slowly narrowing, with the male-to-female incidence rate ratio declining from 1.39 (95% confidence interval [CI], 1.38-1.40) in 1995 to 1.14 (95% CI, 1.13-1.14) in 2018 (Fig. 2).

The incidence rate for prostate cancer dropped rapidly from 2007 to 2014 (Fig. 3) because of decreased detection of localized tumors through PSA testing, which declined following recommendations against routine screening for men aged 75 years and older in 2008 and all men in 2012 from the US Preventative Services Task Force (USPSTF).[29,30] Incidence was stable for local-stage disease from 2014 through 2018 but has increased by 4% per year for regional-stage since 2013 and by 6% per year for distant-stage disease since 2011.[31] Consequently, the proportion of distant-stage

TABLE 1. Estimated New Cancer Cases and Deaths by Sex, United States, 2022[a]

	ESTIMATED NEW CASES			ESTIMATED DEATHS		
	BOTH SEXES	MALE	FEMALE	BOTH SEXES	MALE	FEMALE
All sites	1,918,030	983,160	934,870	609,360	322,090	287,270
Oral cavity & pharynx	54,000	38,700	15,300	11,230	7,870	3,360
Tongue	17,860	12,880	4,980	2,790	1,830	960
Mouth	14,490	8,490	6,000	3,020	1,810	1,210
Pharynx	19,270	15,670	3,600	3,980	3,140	840
Other oral cavity	2,380	1,660	720	1,440	1,090	350
Digestive system	343,040	193,350	149,690	171,920	99,940	71,980
Esophagus	20,640	16,510	4,130	16,410	13,250	3,160
Stomach	26,380	15,900	10,480	11,090	6,690	4,400
Small intestine	11,790	6,290	5,500	1,960	1,110	850
Colon[b]	106,180	54,040	52,140	52,580	28,400	24,180
Rectum	44,850	26,650	18,200			
Anus, anal canal, & anorectum	9,440	3,150	6,290	1,670	740	930
Liver & intrahepatic bile duct	41,260	28,600	12,660	30,520	20,420	10,100
Gallbladder & other biliary	12,130	5,710	6,420	4,400	1,830	2,570
Pancreas	62,210	32,970	29,240	49,830	25,970	23,860
Other digestive organs	8,160	3,530	4,630	3,460	1,530	1,930
Respiratory system	254,850	131,450	123,400	135,360	72,770	62,590
Larynx	12,470	9,820	2,650	3,820	3,070	750
Lung & bronchus	236,740	117,910	118,830	130,180	68,820	61,360
Other respiratory organs	5,640	3,720	1,920	1,360	880	480
Bones & joints	3,910	2,160	1,750	2,100	1,180	920
Soft tissue (including heart)	13,190	7,590	5,600	5,130	2,740	2,390
Skin (excluding basal & squamous)	108,480	62,820	45,660	11,990	8,060	3,930
Melanoma of the skin	99,780	57,180	42,600	7,650	5,080	2,570
Other nonepithelial skin	8,700	5,640	3,060	4,340	2,980	1,360
Breast	290,560	2,710	287,850	43,780	530	43,250
Genital system	395,600	280,470	115,130	68,260	35,430	32,830
Uterine cervix	14,100		14,100	4,280		4,280
Uterine corpus	65,950		65,950	12,550		12,550
Ovary	19,880		19,880	12,810		12,810
Vulva	6,330		6,330	1,560		1,560
Vagina & other genital, female	8,870		8,870	1,630		1,630
Prostate	268,490	268,490		34,500	34,500	
Testis	9,910	9,910		460	460	
Penis & other genital, male	2,070	2,070		470	470	
Urinary system	164,190	114,490	49,700	31,990	21,680	10,310
Urinary bladder	81,180	61,700	19,480	17,100	12,120	4,980
Kidney & renal pelvis	79,000	50,290	28,710	13,920	8,960	4,960
Ureter & other urinary organs	4,010	2,500	1,510	970	600	370
Eye & orbit	3,360	1,790	1,570	410	220	190
Brain & other nervous system	25,050	14,170	10,880	18,280	10,710	7,570
Endocrine system	47,050	13,620	33,430	3,330	1,650	1,680
Thyroid	43,800	11,860	31,940	2,230	1,070	1,160
Other endocrine	3,250	1,760	1,490	1,100	580	520
Lymphoma	89,010	48,690	40,320	21,170	12,250	8,920
Hodgkin lymphoma	8,540	4,570	3,970	920	550	370
Non-Hodgkin lymphoma	80,470	44,120	36,350	20,250	11,700	8,550
Myeloma	34,470	19,100	15,370	12,640	7,090	5,550
Leukemia	60,650	35,810	24,840	24,000	14,020	9,980
Acute lymphocytic leukemia	6,660	3,740	2,920	1,560	880	680
Chronic lymphocytic leukemia	20,160	12,630	7,530	4,410	2,730	1,680
Acute myeloid leukemia	20,050	11,140	8,910	11,540	6,730	4,810
Chronic myeloid leukemia	8,860	5,120	3,740	1,220	670	550
Other leukemia[c]	4,920	3,180	1,740	5,270	3,010	2,260
Other & unspecified primary sites[c]	30,620	16,240	14,380	47,770	25,950	21,820

Note: These are model-based estimates that should be interpreted with caution and not compared with those for previous years.
About 51,400 cases of ductal carcinoma in situ of the female breast and 97,920 cases of melanoma in situ will be diagnosed in 2022.
[a]Rounded to the nearest 10; cases exclude basal cell and squamous cell skin cancer and in situ carcinoma except urinary bladder.
[b]Deaths for colon and rectal cancers are combined because a large number of deaths from rectal cancer are misclassified as colon.
[c]More deaths than cases may reflect lack of specificity in recording underlying cause of death on death certificates and/or an undercount in the case estimate.
Source: Estimated new cases are based on 2004-2018 incidence data reported by the North American Association of Central Cancer Registries (NAACCR). Estimated deaths are based on 2005-2019 US mortality data, National Center for Health Statistics, Centers for Disease Control and Prevention.

TABLE 2. Estimated New Cases for Selected Cancers by State, 2022[a]

STATE	ALL CASES	FEMALE BREAST	UTERINE CERVIX	COLON & RECTUM	UTERINE CORPUS	LEUKEMIA	LUNG & BRONCHUS	MELANOMA OF THE SKIN	NON-HODGKIN LYMPHOMA	PROSTATE	URINARY BLADDER
Alabama	30,210	4,280	240	2,510	800	780	4,280	1,480	1,000	4,650	1,140
Alaska	3,250	530	[b]	320	100	90	380	100	120	460	160
Arizona	39,970	6,110	290	3,150	1,320	1,090	4,610	3,110	1,680	4,940	1,900
Arkansas	18,610	2,440	160	1,530	570	520	2,820	900	690	2,510	710
California	189,220	31,720	1,640	15,970	7,110	5,630	17,450	10,260	8,500	26,890	7,620
Colorado	28,480	4,730	190	2,140	940	870	2,550	1,850	1,140	4,030	1,220
Connecticut	22,810	3,550	120	1,550	830	680	2,760	1,050	950	3,310	1,110
Delaware	7,080	1,010	[b]	500	250	230	910	470	280	940	310
Dist. of Columbia	3,440	620	[b]	250	160	90	370	70	120	580	110
Florida	152,600	20,920	1,230	11,490	4,860	6,630	19,560	9,650	7,980	20,680	6,890
Georgia	58,970	9,170	490	4,970	1,730	1,860	7,700	3,640	2,140	9,150	2,100
Hawaii	7,730	1,430	60	700	370	210	890	530	330	940	300
Idaho	10,440	1,490	70	750	320	330	1,100	940	440	1,480	500
Illinois	75,350	11,340	530	6,260	2,730	2,190	9,440	3,860	3,060	10,520	3,110
Indiana	39,460	5,600	290	3,290	1,340	1,160	5,920	2,250	1,520	5,020	1,720
Iowa	19,960	2,770	110	1,570	690	750	2,530	1,250	880	2,690	870
Kansas	16,580	2,410	100	1,510	540	530	2,190	920	680	2,550	680
Kentucky	30,370	3,950	200	2,600	930	850	4,990	1,680	1,110	3,840	1,280
Louisiana	28,680	3,970	230	2,440	730	800	3,800	1,010	1,070	4,170	1,020
Maine	10,060	1,420	[b]	700	370	300	1,640	520	420	1,180	580
Maryland	34,960	5,640	240	2,540	1,400	970	4,150	1,670	1,350	5,380	1,310
Massachusetts	42,190	6,710	210	2,940	1,530	1,120	5,600	1,900	1,780	5,670	2,030
Michigan	62,500	8,900	370	4,680	2,270	1,850	8,720	3,180	2,670	9,240	2,880
Minnesota	35,130	4,950	160	2,420	1,190	1,390	3,980	1,860	1,550	4,290	1,530
Mississippi	18,250	2,510	150	1,680	490	450	2,810	730	580	2,970	600
Missouri	37,480	5,560	250	2,970	1,290	1,160	5,690	1,690	1,480	4,830	1,550
Montana	7,030	1,000	[b]	510	200	240	820	510	300	1,100	340
Nebraska	11,280	1,600	70	960	360	380	1,330	630	460	1,680	480
Nevada	16,390	2,570	160	1,430	510	510	2,030	770	700	2,230	800
New Hampshire	9,430	1,360	[b]	670	370	260	1,270	610	410	1,280	550
New Jersey	55,730	8,410	420	4,260	2,280	1,730	5,980	2,300	2,420	8,580	2,560
New Mexico	11,030	1,700	90	890	410	350	940	670	450	1,430	400
New York	118,830	17,800	870	8,950	4,730	4,010	14,050	3,960	5,240	17,960	5,450
North Carolina	65,320	10,220	440	4,760	2,130	2,120	8,760	3,760	2,450	9,550	2,670
North Dakota	4,300	590	[b]	340	120	170	510	230	180	600	200
Ohio	73,700	10,610	480	5,870	2,760	1,910	10,430	4,110	2,870	9,530	3,260
Oklahoma	23,700	3,280	210	1,900	660	710	3,390	1,180	870	2,900	870
Oregon	25,130	4,070	160	1,850	860	680	2,990	1,640	1,090	3,250	1,200
Pennsylvania	85,110	12,220	500	6,610	3,270	2,600	11,170	3,540	3,740	11,740	4,130
Rhode Island	7,030	1,020	[b]	490	260	240	980	320	300	1,030	360
South Carolina	33,440	5,170	240	2,570	1,080	1,030	4,560	1,970	1,260	5,110	1,310
South Dakota	5,370	750	[b]	430	160	180	660	320	220	810	230
Tennessee	42,200	6,040	330	3,420	1,280	1,230	6,200	1,940	1,630	5,800	1,690
Texas	139,320	21,040	1,500	11,780	4,140	4,750	14,790	5,020	5,590	17,850	4,470
Utah	13,190	1,960	80	900	480	420	780	1,610	550	2,130	480
Vermont	4,260	630	[b]	300	170	130	590	290	190	490	220
Virginia	46,670	7,600	310	3,610	1,590	1,320	5,900	2,240	1,880	7,150	1,830
Washington	42,620	7,020	280	3,120	1,310	1,320	4,880	2,510	1,890	5,670	1,930
West Virginia	12,690	1,630	80	1,080	490	400	2,050	660	520	1,550	640
Wisconsin	37,320	5,380	200	2,680	1,380	1,320	4,500	2,170	1,590	5,590	1,730
Wyoming	3,140	460	[b]	240	100	90	330	250	130	590	160
United States	1,918,030	287,850	14,100	151,030	65,950	60,650	236,740	99,780	80,470	268,490	81,180

Note: These are model-based estimates that should be interpreted with caution. State estimates may not add to the US total due to rounding and the exclusion of states with fewer than 50 cases.
[a]Rounded to the nearest 10; excludes basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder. Estimates for Puerto Rico are not available.
[b]The estimate is fewer than 50 cases.

TABLE 3. Probability (%) of Developing Invasive Cancer Within Selected Age Intervals by Sex, United States, 2016 to 2018[a]

		BIRTH TO 49	50 TO 59	60 TO 69	70 AND OLDER	BIRTH TO DEATH
All sites	Male	3.4 (1 in 29)	6.2 (1 in 16)	13.6 (1 in 7)	32.9 (1 in 3)	40.2 (1 in 2)
	Female	5.8 (1 in 17)	6.3 (1 in 16)	10.2 (1 in 10)	26.5 (1 in 4)	38.5 (1 in 3)
Breast	Female	2.1 (1 in 48)	2.4 (1 in 41)	3.5 (1 in 28)	7.0 (1 in 14)	12.9 (1 in 8)
Colorectum	Male	0.4 (1 in 249)	0.7 (1 in 143)	1.1 (1 in 94)	3.1 (1 in 32)	4.2 (1 in 24)
	Female	0.4 (1 in 265)	0.5 (1 in 192)	0.8 (1 in 130)	2.9 (1 in 35)	4.0 (1 in 25)
Kidney & renal pelvis	Male	0.2 (1 in 413)	0.4 (1 in 259)	0.7 (1 in 151)	1.4 (1 in 73)	2.2 (1 in 46)
	Female	0.2 (1 in 645)	0.2 (1 in 532)	0.3 (1 in 311)	0.8 (1 in 133)	1.3 (1 in 79)
Leukemia	Male	0.3 (1 in 386)	0.2 (1 in 531)	0.4 (1 in 254)	1.5 (1 in 68)	1.9 (1 in 54)
	Female	0.2 (1 in 498)	0.1 (1 in 823)	0.2 (1 in 421)	0.9 (1 in 110)	1.3 (1 in 77)
Lung & bronchus	Male	0.1 (1 in 812)	0.6 (1 in 169)	1.7 (1 in 59)	5.7 (1 in 17)	6.4 (1 in 16)
	Female	0.1 (1 in 690)	0.6 (1 in 175)	1.4 (1 in 71)	4.8 (1 in 21)	6.0 (1 in 17)
Melanoma of the skin[b]	Male	0.4 (1 in 233)	0.5 (1 in 198)	0.9 (1 in 109)	2.7 (1 in 37)	3.7 (1 in 27)
	Female	0.6 (1 in 157)	0.4 (1 in 241)	0.5 (1 in 184)	1.2 (1 in 84)	2.5 (1 in 40)
Non-Hodgkin lymphoma	Male	0.3 (1 in 377)	0.3 (1 in 343)	0.6 (1 in 178)	1.8 (1 in 54)	2.4 (1 in 42)
	Female	0.2 (1 in 515)	0.2 (1 in 453)	0.4 (1 in 245)	1.4 (1 in 73)	1.9 (1 in 52)
Prostate	Male	0.2 (1 in 456)	1.8 (1 in 54)	5.1 (1 in 19)	9.0 (1 in 11)	12.5 (1 in 8)
Thyroid	Male	0.2 (1 in 453)	0.1 (1 in 732)	0.2 (1 in 581)	0.2 (1 in 423)	0.7 (1 in 149)
	Female	0.9 (1 in 117)	0.4 (1 in 271)	0.3 (1 in 294)	0.4 (1 in 264)	1.8 (1 in 55)
Uterine cervix	Female	0.3 (1 in 359)	0.1 (1 in 839)	0.1 (1 in 944)	0.2 (1 in 594)	0.6 (1 in 159)
Uterine corpus	Female	0.3 (1 in 320)	0.6 (1 in 157)	1.1 (1 in 94)	1.5 (1 in 66)	3.1 (1 in 32)

[a]For people free of cancer at beginning of age interval. Excludes basal cell and squamous cell skin cancers and in situ cancers except urinary bladder.
[b]Probabilities are for non-Hispanic White people.

diagnoses has more than doubled, from a low of 3.9% in 2007 to 8.2% in 2018. Surprisingly, this shift is not influenced by improved staging, and may even be an underestimate, because the proportion of unstaged cancers, which are usually advanced, also increased from 4.3% to 8.1% during this time period.

Despite the USPSTF's upgraded recommendation in 2018 to informed decision making in men aged 55 to 69 years,[32-34] controversy remains about the underutilized potential of the PSA test for reducing prostate cancer mortality by detecting potentially fatal disease earlier.[35] The value of screening is especially salient for Black men, who have had a steeper drop in PSA testing than White men despite two-fold higher prostate cancer mortality.[36] Proponents of testing are bolstered by advances in mitigating over-detection and over-treatment through more stringent diagnostic criteria and active surveillance for low-risk disease.[37,38] In addition, promising new approaches to screening that include the use of molecular markers and magnetic resonance imaging-targeted biopsy have demonstrated success in the detection of clinically significant cancer with limited over-detection.[39]

Female breast cancer incidence rates have been slowly increasing by about 0.5% per year since the mid-2000s, attributed at least in part to continued declines in the fertility rate and increases in excess body weight.[40] These factors may also contribute to previous increases in uterine corpus cancer incidence,[41] although rates appear to have stabilized in recent years.

After decades of increase, thyroid cancer incidence rates are now declining in both men and women at a combined pace of 2.5% per year from 2014 to 2018. Similar to prostate cancer, the decrease is because of recent changes in clinical practice designed to mitigate over-detection, including recommendations against thyroid cancer screening by the USPSTF and for more conservative biopsy criteria by professional societies.[42,43] These changes are supported by data from autopsy studies, which indicate that the occurrence of clinically relevant thyroid tumors has remained stable since 1970 and is generally similar in men and women, despite 3-fold higher overall incidence rates in women.[44,45]

Lung cancer incidence declined from 2009 to 2018 by almost 3% annually in men and 1% annually in women. Declines began later and have been slower in women than in men because women took up cigarette smoking in large numbers later and were slower to quit, including upturns in smoking prevalence in some birth cohorts.[46,47] As a result, the sex gap in lung cancer incidence has narrowed from more than 3-fold higher rates in men in the 1970s to just 24% higher in 2018,[2,7] with higher rates in women among some younger age groups.[48]

Estimated New Cases

Males			Females		
Prostate	268,490	27%	Breast	287,850	31%
Lung & bronchus	117,910	12%	Lung & bronchus	118,830	13%
Colon & rectum	80,690	8%	Colon & rectum	70,340	8%
Urinary bladder	61,700	6%	Uterine corpus	65,950	7%
Melanoma of the skin	57,180	6%	Melanoma of the skin	42,600	5%
Kidney & renal pelvis	50,290	5%	Non-Hodgkin lymphoma	36,350	4%
Non-Hodgkin lymphoma	44,120	4%	Thyroid	31,940	3%
Oral cavity & pharynx	38,700	4%	Pancreas	29,240	3%
Leukemia	35,810	4%	Kidney & renal pelvis	28,710	3%
Pancreas	32,970	3%	Leukemia	24,840	3%
All Sites	**983,160**	**100%**	**All Sites**	**934,870**	**100%**

Estimated Deaths

Males			Females		
Lung & bronchus	68,820	21%	Lung & bronchus	61,360	21%
Prostate	34,500	11%	Breast	43,250	15%
Colon & rectum	28,400	9%	Colon & rectum	24,180	8%
Pancreas	25,970	8%	Pancreas	23,860	8%
Liver & intrahepatic bile duct	20,420	6%	Ovary	12,810	4%
Leukemia	14,020	4%	Uterine corpus	12,550	4%
Esophagus	13,250	4%	Liver & intrahepatic bile duct	10,100	4%
Urinary bladder	12,120	4%	Leukemia	9,980	3%
Non-Hodgkin lymphoma	11,700	4%	Non-Hodgkin lymphoma	8,550	3%
Brain & other nervous system	10,710	3%	Brain & other nervous system	7,570	3%
All Sites	**322,090**	**100%**	**All Sites**	**287,270**	**100%**

FIGURE 1. Ten Leading Cancer Types for the Estimated New Cancer Cases and Deaths by Sex, United States, 2022. Estimates are rounded to the nearest 10 and exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder. Ranking is based on modeled projections and may differ from the most recent observed data.

Lung cancer incidence trends reflect temporal trends in smoking prevalence because cigarette smoking causes >80% of lung cancer cases in the United States.[26] Although this proportion is gradually attenuating as fewer people smoke,[49] still 72% of women and 81% of men aged 20 to 49 years recently diagnosed with lung cancer had smoked.[50] As a result, the CDC has recently redoubled efforts to boost cessation, including publication of a new Surgeon General's report in 2020.[51,52] Whether the incidence of lung cancer is changing among never-smokers is unknown because the smoking status of individuals diagnosed with cancer has only recently begun to be collected by a few cancer registries.

In contrast to lung cancer, CRC incidence patterns are similar by sex but differ by age, with rates from 2014 to 2018 declining by about 2% per year in people aged 50 years and older while increasing by 1.5% per year in adults younger than 50 years. Declines in screening-aged adults began in the mid-1980s and accelerated during the 2000s in the wake of widespread colonoscopy uptake. Reasons for rising incidence since the mid-1990s in younger adults in the United States and several other high-income countries[53] is unknown but likely relates to lifestyle exposures that began with generations born circa 1950.[54]

Non-Hodgkin lymphoma incidence has finally begun to decline after increasing since at least the mid-1970s. Similarly, melanoma and liver cancer incidence appear to have stabilized in recent years, especially in men, after decades of incline; rates in adults younger than 50 years, which typically foreshadow trends in older age groups, declined from 2014 to 2018 by 1% annually for melanoma and by 2% annually for liver cancer. In contrast, incidence continued to increase by about 1% annually for cancers of the oral cavity

TABLE 4. Estimated Deaths for Selected Cancers by State, 2022[a]

STATE	ALL SITES	BRAIN & OTHER NERVOUS SYSTEM	FEMALE BREAST	COLON & RECTUM	LEUKEMIA	LIVER & INTRAHEPATIC BILE DUCT	LUNG & BRONCHUS	NON-HODGKIN LYMPHOMA	OVARY	PANCREAS	PROSTATE
Alabama	10,520	320	730	910	340	510	2,650	270	210	830	480
Alaska	1,030	[b]	70	110	[b]	70	220	[b]	[b]	80	60
Arizona	13,200	410	910	1,210	540	710	2,280	410	310	1,120	820
Arkansas	6,460	190	390	560	210	310	1,770	190	120	450	430
California	60,970	2,070	4,690	5,470	2,340	3,680	9,660	2,150	1,390	5,080	4,130
Colorado	8,170	310	670	710	320	440	1,330	260	200	680	580
Connecticut	6,400	210	420	470	320	330	1,360	220	150	580	420
Delaware	2,200	50	160	160	100	120	530	80	50	190	100
Dist. of Columbia	1,010	[b]	100	90	[b]	80	150	[b]	[b]	100	70
Florida	47,540	1,360	3,150	4,110	1,980	2,330	10,440	1,560	1,010	3,820	2,720
Georgia	18,750	500	1,410	1,590	650	930	4,180	540	410	1,450	1,070
Hawaii	2,590	60	210	240	90	160	540	100	[b]	240	130
Idaho	3,240	130	250	270	140	120	590	120	80	270	200
Illinois	23,200	610	1,730	2,110	900	1,100	5,140	780	530	2,010	1,160
Indiana	13,570	380	880	1,160	520	640	3,470	450	190	1,070	770
Iowa	6,470	190	380	540	270	250	1,450	240	140	520	390
Kansas	5,660	180	380	480	250	270	1,350	220	110	420	280
Kentucky	9,740	290	640	880	390	390	2,730	320	170	740	320
Louisiana	9,630	240	690	880	330	570	2,310	290	170	740	470
Maine	3,440	110	190	230	120	130	860	120	60	260	170
Maryland	11,030	290	840	980	450	510	2,230	340	240	880	680
Massachusetts	12,520	440	760	990	510	620	2,760	410	290	1,110	700
Michigan	21,260	600	1,390	1,700	820	870	5,000	740	440	1,780	1,000
Minnesota	10,340	310	640	790	460	490	1,950	460	210	840	660
Mississippi	6,790	200	450	660	230	380	1,820	160	110	520	410
Missouri	13,050	350	820	1,070	500	590	3,200	410	250	990	680
Montana	2,160	70	150	170	80	110	370	70	[b]	170	140
Nebraska	3,550	120	250	320	170	100	670	110	70	290	170
Nevada	5,730	130	440	470	230	300	1,170	240	120	430	410
New Hampshire	2,880	90	180	210	110	120	710	90	70	320	160
New Jersey	15,710	510	1,210	1,380	660	790	2,930	440	350	1,390	750
New Mexico	3,830	120	290	330	130	300	560	120	100	290	240
New York	32,230	980	2,460	2,670	1,340	1,280	6,660	1,170	830	2,930	1,720
North Carolina	20,480	470	1,450	1,630	800	1,000	4,750	630	390	1,590	1,120
North Dakota	1,310	[b]	70	110	60	50	300	50	[b]	100	70
Ohio	25,120	720	1,700	2,110	990	1,040	5,900	830	380	2,090	1,370
Oklahoma	8,620	240	570	770	310	450	2,260	280	180	580	450
Oregon	8,460	260	580	650	330	470	1,670	300	170	700	520
Pennsylvania	27,260	820	1,900	2,310	1,110	1,210	5,990	940	590	2,330	1,470
Rhode Island	2,170	70	130	160	90	140	480	70	[b]	190	100
South Carolina	10,850	340	770	890	430	590	2,560	300	180	880	630
South Dakota	1,740	70	110	160	70	80	410	60	[b]	150	80
Tennessee	14,390	410	1,040	1,250	550	690	3,680	460	260	1,060	750
Texas	43,490	1,280	3,440	4,280	1,610	2,790	8,270	1,400	910	3,390	2,260
Utah	3,540	150	310	310	180	160	470	130	100	290	360
Vermont	1,460	50	80	120	50	80	330	50	[b]	120	80
Virginia	15,280	440	1,150	1,370	610	710	3,470	490	350	1,270	940
Washington	13,270	470	940	1,110	530	730	2,720	470	320	1,070	850
West Virginia	4,460	120	290	440	190	170	1,190	170	80	340	190
Wisconsin	11,570	370	720	900	500	510	2,500	460	240	980	740
Wyoming	1,000	[b]	70	80	[b]	60	210	[b]	[b]	90	60
United States	609,360	18,280	43,250	52,580	24,000	30,520	130,180	20,250	12,810	49,830	34,500

Note: These are model-based estimates that should be interpreted with caution. State estimates may not add to US total due to rounding and exclusion of states with fewer than 50 deaths.
[a]Rounded to the nearest 10. Estimates for Puerto Rico are not available.
[b]Estimate is fewer than 50 deaths.

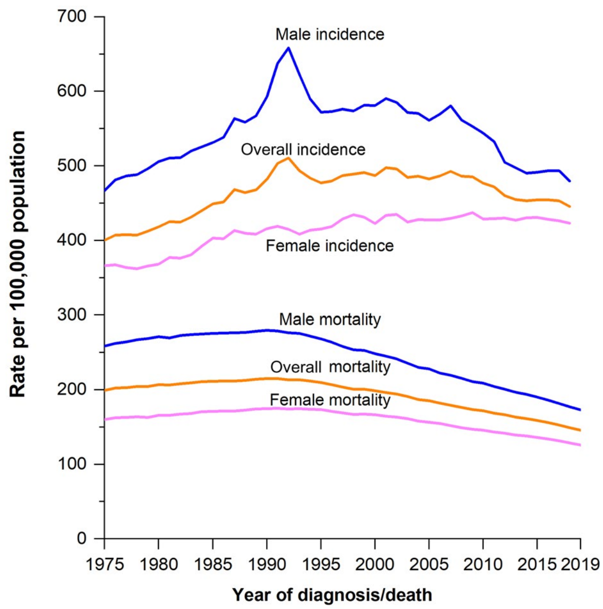

FIGURE 2. Trends in Cancer Incidence (1975-2018) and Mortality (1975-2019) Rates by Sex, United States. Rates are age adjusted to the 2000 US standard population. Incidence rates are also adjusted for delays in reporting.

and pharynx (driven by human papillomavirus [HPV]-associated oropharyngeal cancers in non-Hispanic White people) and for cancers of the kidney and pancreas.

Cancer Stage at Diagnosis and Survival

The 5-year relative survival rate for all cancers combined increased between the mid-1970s and 2011 through 2017 from 49% to 68% overall, from 50% to 68% in White individuals, and from 39% to 63% in Black individuals.[3,4] Figure 4 shows 5-year relative survival rates for selected cancer types by stage and race. For all stages combined, survival is highest for prostate cancer (98%), melanoma of the skin (93%), and female breast cancer (90%) and lowest for cancers of the pancreas (11%), liver and esophagus (20%), and lung (22%).

Survival rates are lower for Black individuals than for White individuals for every cancer type in Figure 4 except pancreas and kidney, for which they are similar. However, Black patients have lower kidney cancer survival for every histologic subtype of the disease and only have similar overall survival because of a higher proportion of papillary and chromophobe renal cell carcinoma, both of which have a

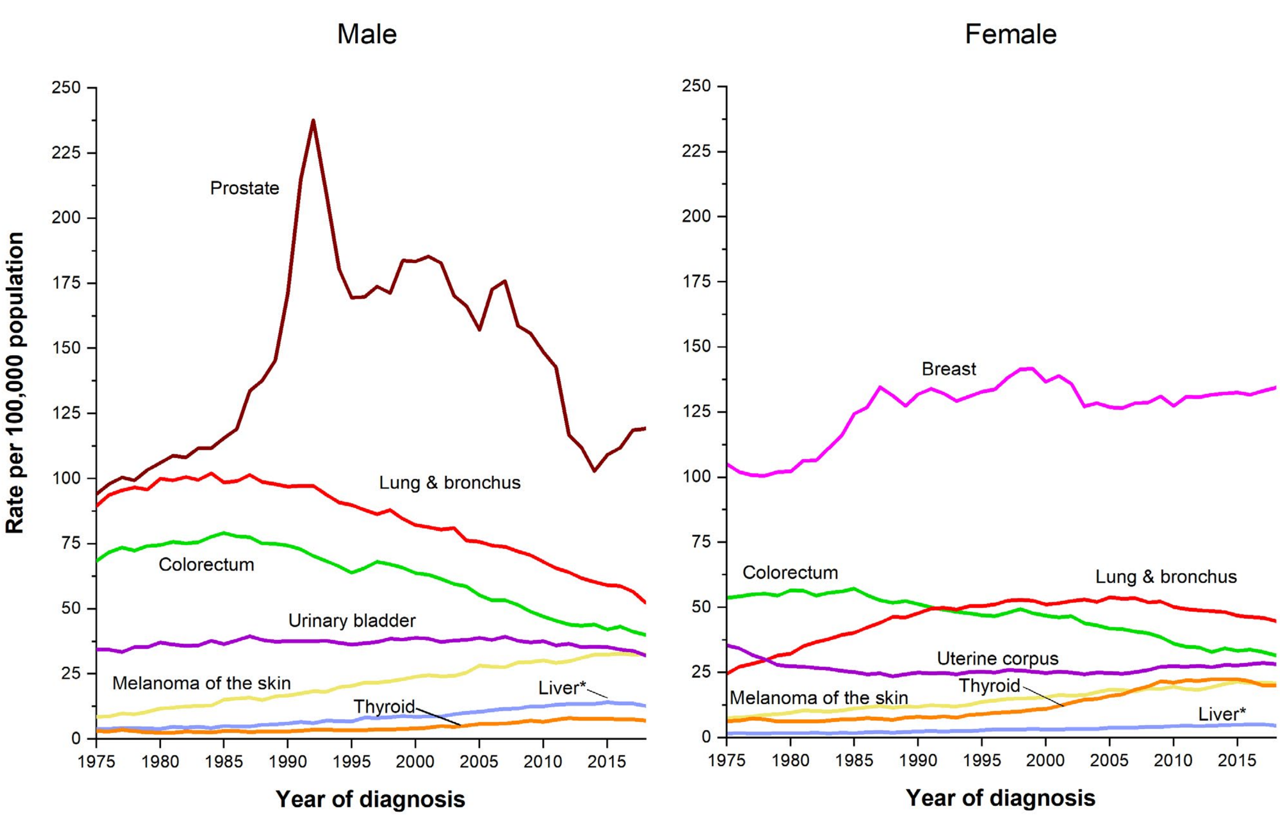

FIGURE 3. Trends in Incidence Rates for Selected Cancers by Sex, United States, 1975 to 2018. Rates are age adjusted to the 2000 US standard population and adjusted for delays in reporting. *Liver includes the intrahepatic bile duct.

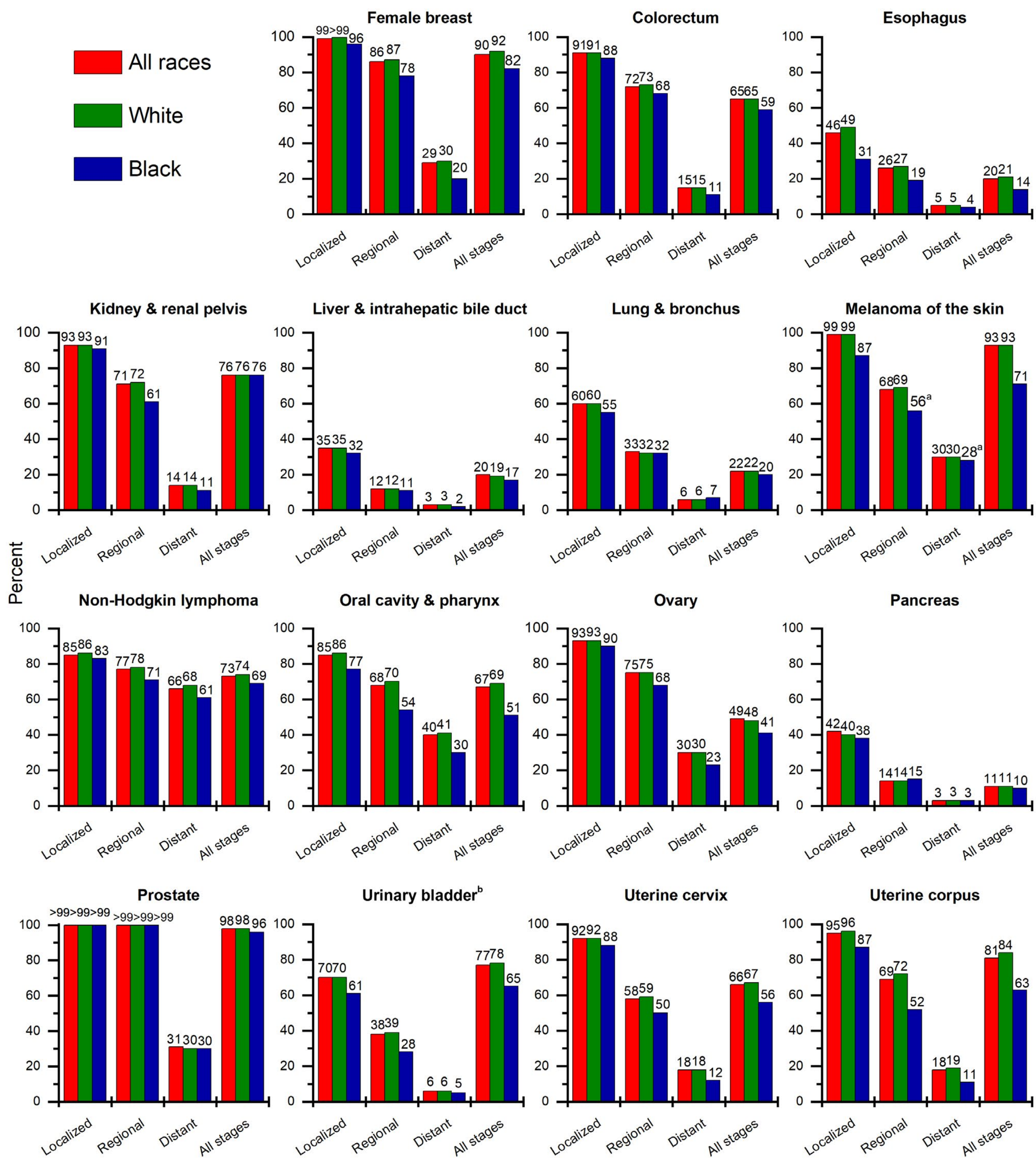

FIGURE 4. Five-Year Relative Survival for Selected Cancers by Race and Stage at Diagnosis, United States, 2011 to 2017. White and Black race categories are exclusive of Hispanic ethnicity. [a]The standard error of the survival rate is between 5 and 10 percentage points. [b]The survival rate for carcinoma in situ of the urinary bladder is 96% in all races, 96% in White patients, and 93% in Black patients.

better prognosis than clear cell renal cell carcinoma, which is more common among White patients.[55] The largest Black-White survival differences in absolute terms are for melanoma (22%) and cancers of the uterine corpus (21%), oral cavity and pharynx (18%), and urinary bladder (13%). Although these disparities partly reflect later stage diagnosis (Fig. 5), Black individuals also have lower stage-specific survival for most cancer types (Fig. 4). Compared with White people, the risk of death after adjusting for sex, age, and stage at diagnosis is 33% higher in Black people and 51% higher in American Indian/Alaska Native people.[56]

Cancer survival has improved since the mid-1970s for the most common cancers except uterine cervix and uterine corpus,[56] largely reflecting a lack of major

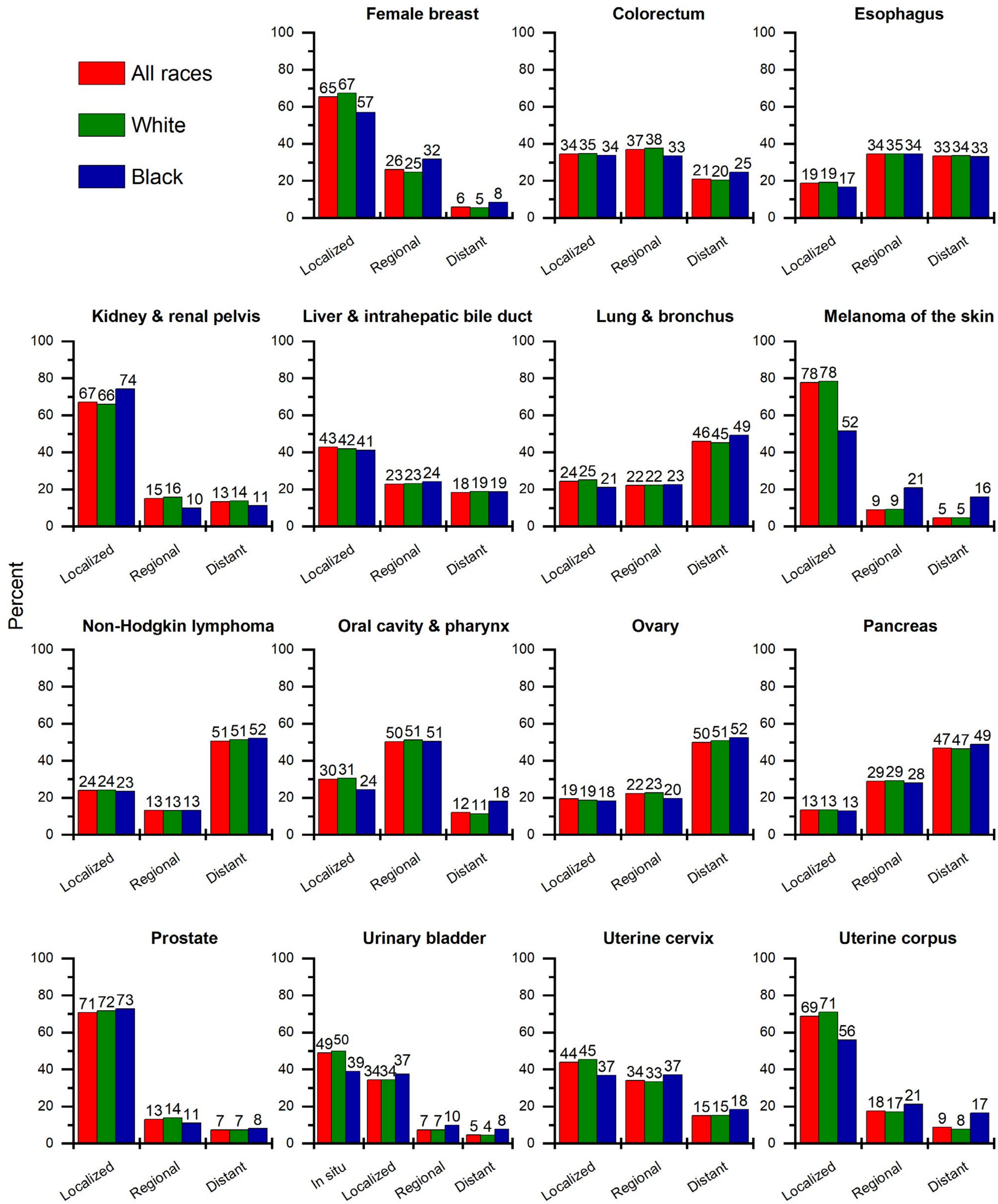

FIGURE 5. Stage Distribution for Selected Cancers by Race, United States, 2014 to 2018. White and Black race categories are exclusive of Hispanic ethnicity. Stage categories do not sum to 100% because sufficient information is not available to stage all cases.

treatment advances.[57,58] For cervical cancer, it may also reflect an increased proportion of adenocarcinoma, which has lower survival and is less easily detected by cytology screening than cervical intraepithelial neoplasia and invasive squamous cell carcinoma.[59] Screening also influences the interpretation of temporal improvements in breast and prostate cancer survival because of lead-time bias and the detection of indolent cancers.[60]

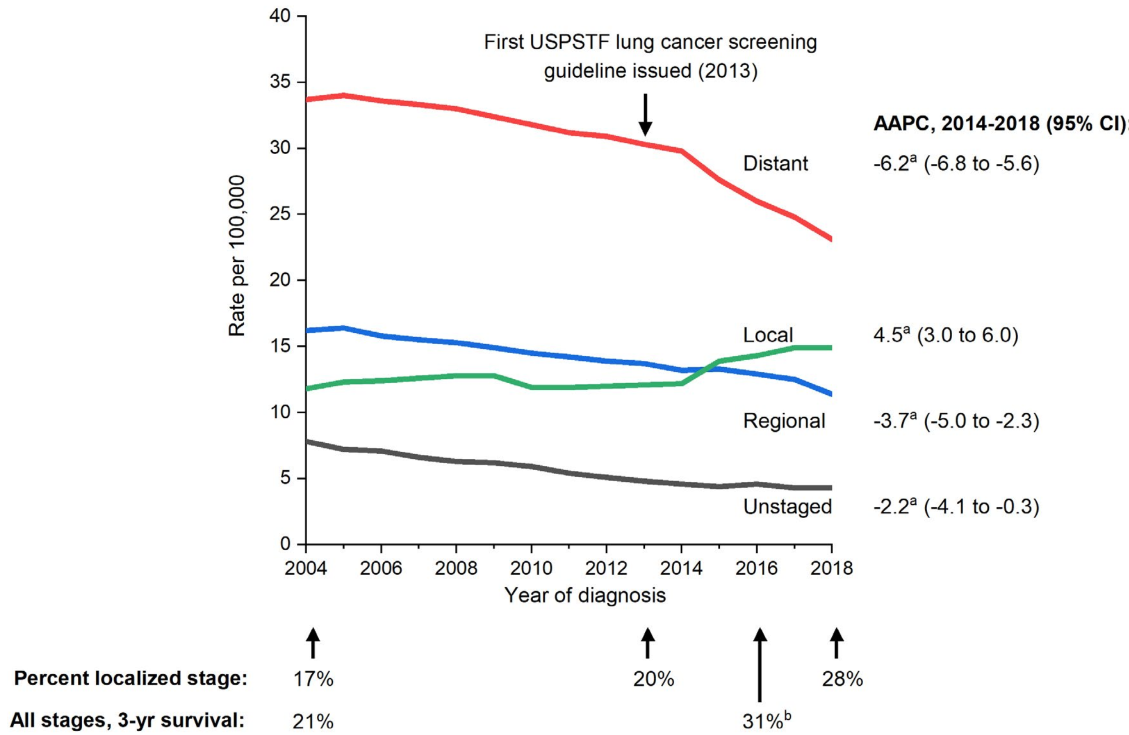

FIGURE 6. Trends in Lung Cancer Incidence Rates by Stage at Diagnosis, United States, 2004 to 2018. AAPC indicates average annual percent change; USPSTF, US Preventive Services Task Force. Incidence rates are age adjusted to the 2000 US standard population. Three-year relative survival is presented for patients followed through 2018. [a]The AAPC is significantly different from zero ($P < .05$). [b]Patients were diagnosed from 2015 to 2017.

Survival gains have been especially rapid for hematopoietic and lymphoid malignancies because of improvements in treatment protocols, including the development of targeted therapies. For example, the 5-year relative survival rate for chronic myeloid leukemia increased from 22% in the mid-1970s to 71% for those diagnosed during 2011 through 2017, with most patients treated with tyrosine-kinase inhibitors experiencing near-normal life expectancy.[61] More recently, immunotherapy—most notably combined anti-CTLA4 and anti–PD-1 checkpoint inhibition—has been a game-changer in the treatment of metastatic melanoma,[62,63] boosting 5-year relative survival for distant-stage disease from 15% in 2004 to 30% for patients diagnosed during 2011 through 2017.

After decades of stagnant survival, the outlook is also more promising for lung cancer at all stages of disease. Overall, the percentage of people living at least 3 years after diagnosis rose from 19% in 2001 to 21% in 2004 and 31% in 2015 through 2017, and median survival increased from 8 to 13 months.[3] Survival gains are largely confined to non-small cell lung cancer and reflect advances in diagnostic and surgical procedures, such as pathologic staging and video-assisted thoracoscopic surgery,[64,65] as well as medical therapies targeted against the most common driver mutations,[66] such as epidermal growth factor receptor (EGFR) and anaplastic lymphoma kinase (ALK) tyrosine kinase inhibitors. Immunotherapy (ie, programmed cell death protein-1/programmed death ligand-1 inhibitors)[67] was approved by the US Food and Drug Administration in 2015 for second-line treatment and may also be a factor in more recent years.[68]

Improved lung cancer outcomes may also reflect increased access to care through the Patient Protection and Affordable Care Act (ACA), as one study has reported an independent association between Medicaid expansion and stage at diagnosis and survival.[69] Nationally, the proportion of disease diagnosed at a localized stage increased from 17% during the mid-2000s to 20% in 2013 and 28% in 2018.[7] The more abrupt stage shift from 2013 to 2018 coincides with an increase in the incidence of localized-stage disease of 4.5% per year alongside even steeper declines for advanced-stage diagnoses after the USPSTF first recommended lung cancer screening in 2013 (Fig. 6). Earlier diagnosis has a large impact on lung cancer outcomes, with 5-year relative survival increasing from 6% for distant-stage disease to 33% for regional stage and 60% for localized-stage disease (Fig. 4).

National lung cancer screening prevalence has only increased from 3% of eligible individuals in 2010[70] to 5% in 2018, but is as high as 10% to 15% in Kentucky—which has the highest lung cancer incidence—and some northeastern states.[71] The evidence in support of annual screening with

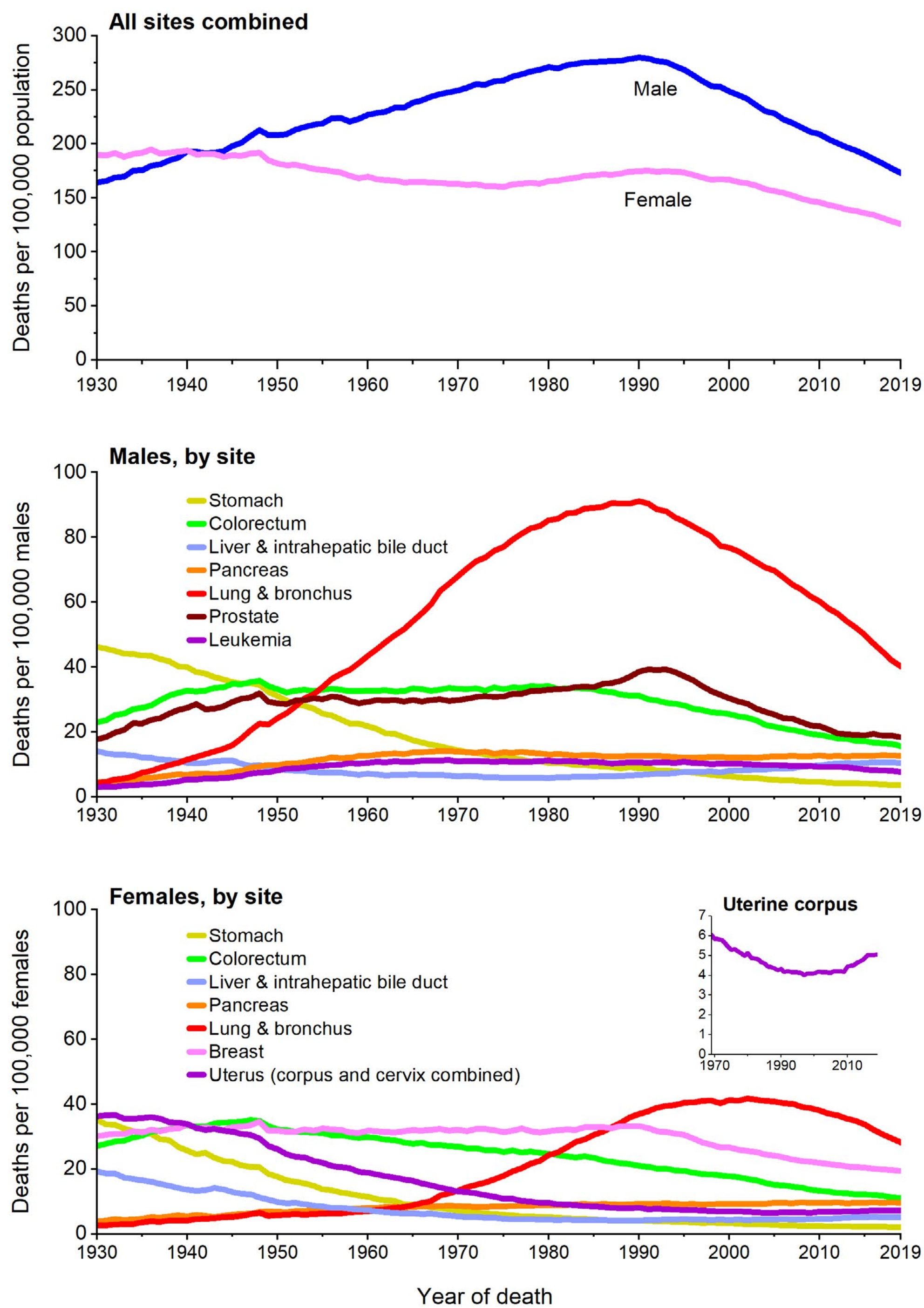

FIGURE 7. Trends in Cancer Mortality Rates by Sex Overall and for Selected Cancers, United States, 1930 to 2019. Rates are age adjusted to the 2000 US standard population. Because of improvements in International Classification of Diseases coding over time, numerator data for cancers of the lung and bronchus, colon and rectum, liver, and uterus differ from the contemporary time period. For example, rates for lung and bronchus include pleura, trachea, mediastinum, and other respiratory organs.

low-dose computed tomography for high-risk individuals has strengthened in recent years, including a reported 39% reduction in lung cancer mortality compared with no intervention among current or former smokers with a >20 pack-year smoking history.[72] As a result, the USPSTF issued an updated recommendation in March 2021 that expanded eligibility among people who currently smoke or have quit within 15 years from adults aged 55 to 80 years with a 30 pack-year smoking history to those aged 50 to 80 years with a 20 pack-year history.[73]

Trends in Cancer Mortality

Mortality rates are a better indicator of progress against cancer than incidence or survival because they are less affected

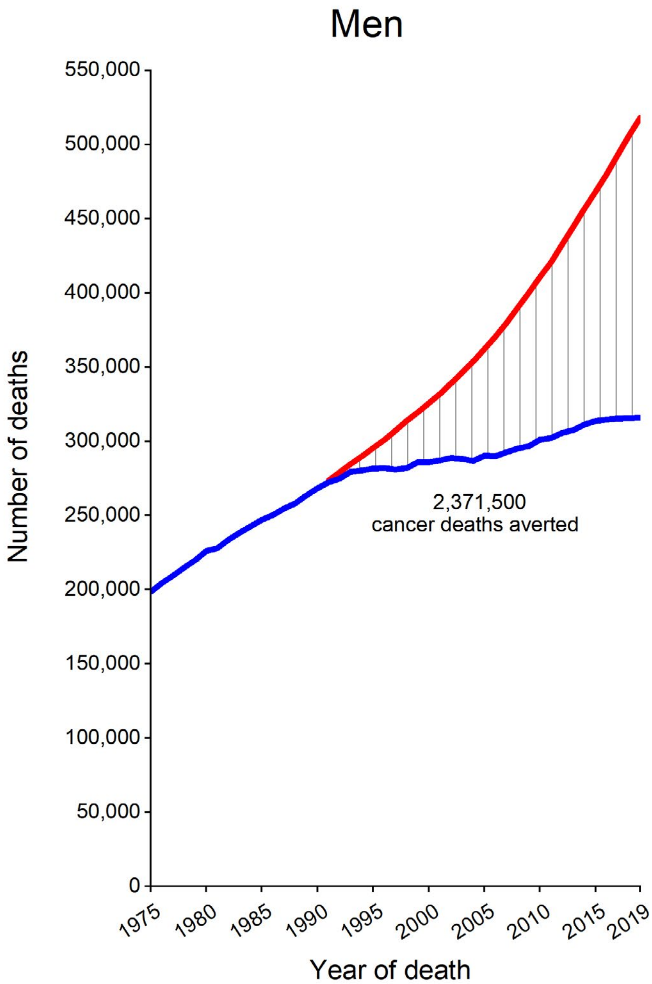

FIGURE 8. Total Number of Cancer Deaths Averted During 1991 to 2019 in Men and 1992 to 2019 in Women, United States. The blue line represents the actual number of cancer deaths recorded in each year; the red line represents the number of cancer deaths that would have been expected if cancer death rates had remained at their peak.

by biases from changes in detection practice.[74] The cancer death rate rose during most of the 20th century (Fig. 7), largely because of a rapid increase in lung cancer deaths among men as a consequence of the tobacco epidemic. However, reductions in smoking as well as improvements in early detection and treatment for some cancers have resulted in a continuous decline in the cancer death rate since its peak in 1991 at 215.1 per 100,000 people. The overall drop of 32% as of 2019 (146.0 per 100,000) translates to an estimated 3,495,700 fewer cancer deaths (2,371,500 in men and 1,124,200 in women) than if mortality had remained at peak rates (Fig. 8). The number of averted deaths in men is twice that in women because the male death rate peaked higher and declined faster (Fig. 7).

The pace of decline in cancer mortality has slowly accelerated from about 1% per year during the late 1990s to 1.5% per year during the 2000s and 2% per year from 2015 through 2019 (Table 5). Overall mortality trends are largely driven by lung cancer, for which declines steepened in recent years because of earlier detection and treatment advances that have extended survival, as mentioned in the previous section. For example, the decrease in lung cancer mortality accelerated from 3.1% per year during 2010 through 2014 to 5.4% per year during 2015 through 2019 in men and from 1.8% to 4.3% in women (Table 5). Overall, the lung cancer death rate has dropped by 56% from 1990 to 2019 in men and by 32% from 2002 to 2019 in women.

Long-term reductions in mortality for CRC—the second-most common cause of cancer death in men and women combined—also contribute to overall progress, with rates dropping by 55% among males since 1978 and by 60% among females since 1969. (CRC death rates were declining in women before 1969, but earlier data are not exclusive of deaths from small intestine cancer.) The CRC mortality rate decreased during the most recent decade (2010-2019) by about 2% per year. However, similar to incidence, this trend masks increasing mortality among young adults; the CRC death rate rose from 2005 through 2019 by 1.2% per year in individuals younger than 50 years and by 0.6% per year in those aged 50 to 54 years.

TABLE 5. Trends in Mortality Rates for Selected Cancers by Sex, United States, 1975 to 2019

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		TREND 6		AAPC		
	YEARS	APC	YEARS	APC	Years	APC	YEARS	APC	YEARS	APC	YEARS	APC	2010-2014	2015-2019	2010-2019
All sites															
Overall	1975-1984	0.5[a]	1984-1991	0.3[a]	1991-1994	−0.6	1994-2002	−1.1[a]	2002-2016	−1.5[a]	2016-2019	−2.3[a]	−1.5[a]	−2.1[a]	−1.8[a]
Male	1975-1979	1.0[a]	1979-1990	0.3[a]	1990-1993	−0.5	1993-2001	−1.5[a]	2001-2015	−1.8[a]	2015-2019	−2.3[a]	−1.8[a]	−2.3[a]	−2.0[a]
Female	1975-1990	0.6[a]	1990-1995	−0.2	1995-1998	−1.2[a]	1998-2001	−0.4	2001-2016	−1.4[a]	2016-2019	−2.0[a]	−1.4[a]	−1.9[a]	−1.6[a]
Female breast	1975-1990	0.4[a]	1990-1995	−1.8[a]	1995-1998	−3.3[a]	1998-2013	−1.9[a]	2013-2019	−1.1[a]			−1.7[a]	−1.1[a]	−1.3[a]
Colorectum															
Overall	1975-1978	0.2	1978-1985	−0.8[a]	1985-2002	−1.8[a]	2002-2005	−3.8[a]	2005-2012	−2.5[a]	2012-2019	−1.9[a]	−2.2[a]	−1.9[a]	−2.0[a]
Male	1975-1979	0.6	1979-1987	−0.6[a]	1987-2002	−1.9[a]	2002-2005	−4.0[a]	2005-2012	−2.6[a]	2012-2019	−2.0[a]	−2.3[a]	−2.0[a]	−2.1[a]
Female	1975-1984	−1.0[a]	1984-2001	−1.8[a]	2001-2010	−3.0[a]	2010-2019	−2.0[a]					−2.0[a]	−2.0[a]	−2.0[a]
Liver & intrahepatic bile duct															
Overall	1975-1980	0.2	1980-1987	2.0[a]	1987-1995	3.8[a]	1995-2007	1.9[a]	2007-2013	3.3[a]	2013-2019	0.3	2.5[a]	0.3	1.3[a]
Male	1975-1985	1.5[a]	1985-1995	3.7[a]	1995-2006	2.0[a]	2006-2013	3.1[a]	2013-2019	0.0			2.3[a]	0.0	1.1[a]
Female	1975-1984	0.2	1984-1995	3.1[a]	1995-2008	1.2[a]	2008-2014	3.1[a]	2014-2019	0.5			3.1[a]	0.5	1.6[a]
Lung & bronchus															
Overall	1975-1980	3.0[a]	1980-1990	1.8[a]	1990-1995	−0.2	1995-2005	−0.9[a]	2005-2014	−2.4[a]	2014-2019	−4.9[a]	−2.4[a]	−4.9[a]	−3.8[a]
Male	1975-1978	2.4[a]	1978-1984	1.2[a]	1984-1991	0.3[a]	1991-2005	−1.9[a]	2005-2014	−3.1[a]	2014-2019	−5.4[a]	−3.1[a]	−5.4[a]	−4.4[a]
Female	1975-1982	6.0[a]	1982-1990	4.2[a]	1990-1995	1.8[a]	1995-2005	0.2[a]	2005-2014	−1.8[a]	2014-2019	−4.3[a]	−1.8[a]	−4.3[a]	−3.2[a]
Melanoma of skin															
Overall	1975-1988	1.6[a]	1988-2013	0.0	2013-2017	−6.2[a]	2017-2019	−1.6					−1.6[a]	−3.9[a]	−3.2[a]
Male	1975-1989	2.3[a]	1989-2013	0.3[a]	2013-2017	−6.7[a]	2017-2019	−1.9					−1.5[a]	−4.4[a]	−3.4[a]
Female	1975-1988	0.8[a]	1988-2012	−0.5[a]	2012-2019	−4.0[a]							−2.3[a]	−4.0[a]	−3.3[a]
Oral cavity and pharynx															
Overall	1975-1979	−0.5	1979-1993	−1.7[a]	1993-2000	−2.7[a]	2000-2009	−1.3[a]	2009-2019	0.4[a]			0.4[a]	0.4[a]	0.4[a]
Male	1975-1980	−0.9	1980-2006	−2.2[a]	2006-2019	0.4[a]							0.4[a]	0.4[a]	0.4[a]
Female	1975-1989	−0.9[a]	1989-2009	−2.2[a]	2009-2019	0.2							0.2	0.2	0.2
Tongue, tonsil, oropharynx	1975-1983	−1.0[a]	1983-1999	−1.8[a]	1999-2009	−0.1	2009-2019	1.8[a]					1.8[a]	1.8[a]	1.8[a]
Other oral cavity	1975-1992	−1.6[a]	1992-2006	−2.9[a]	2006-2019	−0.8[a]							−0.8[a]	−0.8[a]	−0.8[a]
Pancreas															
Overall	1975-2002	−0.1[a]	2002-2005	1.0	2005-2019	0.2[a]							0.2[a]	0.2[a]	0.2[a]
Male	1975-1986	−0.8[a]	1986-2000	−0.2[a]	2000-2019	0.3[a]							0.3[a]	0.3[a]	0.3[a]
Female	1975-1984	0.8[a]	1984-2003	0.1	2003-2006	1.0	2006-2019	0.1					0.1	0.1	0.1
Prostate	1975-1987	0.9[a]	1987-1991	3.0[a]	1991-1994	−0.5	1994-1999	−4.1[a]	1999-2013	−3.4[a]	2013-2019	−0.6[a]	−2.7[a]	−0.6[a]	−1.5[a]
Uterine corpus	1975-1989	−1.6[a]	1989-1997	−0.7[a]	1997-2009	0.4[a]	2009-2016	2.3[a]	2016-2019	0.5			2.3[a]	1.0[a]	1.7[a]

Note: Trends were analyzed using the Joinpoint Regression Program, version 4.9.0.1, allowing up to 5 joinpoints.
Abbreviations: AAPC, average annual percent change; APC, annual percent change based on mortality rates adjusted to the 2000 US standard population.
[a]The APC or AAPC is significantly different from zero ($P < .05$).

Female breast cancer mortality peaked in 1989 and has since decreased by 42% because of both earlier diagnosis, through increased awareness as well as mammography screening, and improvements in treatment. Declines in breast cancer mortality have slowed in recent years, from 2% to 3% annually during the 1990s and 2000s to 1% annually from 2013 to 2019, perhaps reflecting the slight but steady increase in incidence and stagnant mammography uptake in recent years. Similarly, the slowing decline in prostate cancer mortality likely reflects the recent uptick in advanced-stage diagnoses associated with reductions in PSA testing since 2008.[75,76] The widespread uptake of PSA testing during the 1990s and early 2000s, as well as advances in treatment, are thought to have contributed to the 53% decline in prostate cancer mortality since 1993.[77,78]

The third leading cause of death in men and women combined is pancreatic cancer, for which mortality has increased slowly in men, from 12.1 (per 100,000) in 2000 to 12.7 per in 2019, but remained relatively stable in women at 9.3 to 9.6 per 100,000. Liver cancer had the fastest increasing mortality for decades, but rates have stabilized during the most recent 5 years in both men and women (Table 5). Similarly, uterine corpus cancer death rates had risen since the mid-1990s but may be leveling off in recent years. The mortality rate for cancers of the oral cavity and pharynx increased by 0.4% per year from 2010 to 2019 overall, but trends differ by subsite, mirroring incidence; sites associated with HPV-infection (cancers of the tongue, tonsil, and oropharynx) rose by about 2% per year in men and 1% per year in women, whereas those more strongly associated with smoking (eg, lip and gums) declined by 0.8% per year (Table 5).

TABLE 6. Leading Causes of Death in the United States in 2019 Versus 2018

		2019			2018		ABSOLUTE CHANGE IN NO. OF DEATHS
		NO.	RATE	PERCENT	NO.	RATE	
All causes		2,854,838	715.4		2,839,205	724.6	15,633
1	Heart diseases	659,041	161.6	23%	655,381	163.8	3,660
2	Cancer	599,601	146.0	21%	599,274	149.2	327
3	Accidents (unintentional injuries)	173,040	49.2	6%	167,127	48.0	5,913
4	Chronic lower respiratory diseases	156,979	38.2	5%	159,486	39.8	−2,507
5	Cerebrovascular disease	150,005	37.0	5%	147,810	37.2	2,195
6	Alzheimer disease	121,499	29.9	4%	122,019	30.6	−520
7	Diabetes mellitus	87,647	21.6	3%	84,946	21.4	2,701
8	Nephritis, nephrotic syndrome, & nephrosis	51,565	12.7	2%	51,386	12.9	179
9	Influenza and pneumonia	49,783	12.3	2%	59,120	14.9	−9,337
10	Intentional self-harm (suicide)	47,511	13.9	2%	48,344	14.2	−833

Includes unknown age. Rates for 2018 may differ from those published previously due to updated population denominators.
Rates are per 100,000 and age adjusted to the 2000 US standard population.
Source: National Center for Health Statistics, Centers for Disease Control and Prevention.

TABLE 7. Trends in Mortality Rates for the Five Leading Causes of Death, United States, 1975 to 2019

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		TREND 6		AAPC		
	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	2010-2014	2015-2019	2010-2019
All causes	1975-1979	−1.6[a]	1979-2002	−0.8[a]	2002-2010	−1.8[a]	2010-2019	−0.2[a]					−0.2[a]	−0.2[a]	−0.2[a]
Heart diseases	1975-1986	−1.4[a]	1986-1991	−3.4[a]	1991-1995	−1.5[a]	1995-2002	−2.7[a]	2002-2010	−4.1[a]	2010-2019	−0.8[a]	−0.8[a]	−0.8[a]	−0.8[a]
Cancer	1975-1984	0.5[a]	1984-1991	0.3[a]	1991-1994	−0.6	1994-2002	−1.1[a]	2002-2016	−1.5[a]	2016-2019	−2.3[a]	−1.5[a]	−2.1[a]	−1.8[a]
Accidents (unintentional injuries)	1975-1992	−2.1[a]	1992-2000	0.0	2000-2006	1.9[a]	2006-2013	−0.5	2013-2017	6.5[a]	2017-2019	−0.7	1.2[a]	2.9	2.5[a]
Chronic lower respiratory diseases	1975-1986	3.7[a]	1986-2000	1.7[a]	2000-2019	−0.5[a]							−0.5[a]	−0.5[a]	−0.5[a]
Cerebrovascular disease	1975-1982	−5.3[a]	1982-1991	−3.2[a]	1991-2001	−0.6[a]	2001-2007	−5.5[a]	2007-2012	−3.1[a]	2012-2019	0.4	−1.4[a]	0.4	−0.4

Note: Trends analyzed by the Joinpoint Regression Program, version 4.9.0.1, allowing up to 5 joinpoints.
Abbreviations: AAPC, average annual percent change; APC, annual percent change based on mortality rates age adjusted to the 2000 US standard population.
[a]The APC or AAPC is significantly different from zero ($P < .05$).

Recorded Number of Deaths in 2019

In total, 2,854,838 deaths were recorded in the United States in 2019 (Table 6). In contrast to the accelerated declines in cancer mortality, decreases in all-cause mortality have slowed from 1% to 2% per year during 1975 through 2010 to 0.2% per year during 2010 through 2019. This deceleration reflects slowing declines in mortality for heart and chronic lower respiratory diseases, plateaued rates for cerebrovascular diseases, and a steep increase for accidents, although this trend may be leveling off (Table 7). All-cause mortality rates are stable over the past decade when cancer is excluded.

Cancer accounts for 21% of all deaths in both men and women and is the second leading cause of death after heart diseases. However, it is the leading cause of death among women aged 40 to 79 years and men aged 60 to 79 years (Table 8). Table 9 presents the number of deaths in 2019 for the 5 leading cancer types by age and sex. Brain and other nervous system tumors lead in cancer deaths among men younger than 40 years and women younger than 20 years, whereas breast cancer leads among women aged 20 to 59 years. Lung cancer is the leading cause of cancer death in men aged 40 years and older and in women aged 60 years and older.

Despite being one of the most preventable cancers, cervical cancer is persistently the second leading cause of cancer death in women aged 20 to 39 years (Table 9). In total, 4152 women

TABLE 8. Ten Leading Causes of Death in the United States by Age and Sex, 2019

	ALL AGES		AGES 1 to 19		AGES 20 TO 39		AGES 40 TO 59		AGES 60 TO 79		AGES ≥80	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes	All Causes
	1,473,823	1,381,015	12,588	6,843	80,979	36,350	224,097	139,097	627,613	473,923	516,769	715,511
1	Heart diseases 357,761	Heart diseases 301,280	Accidents (unintentional injuries) 4,063	Accidents (unintentional injuries) 2,115	Accidents (unintentional injuries) 33,392	Accidents (unintentional injuries) 12,348	Heart diseases 49,951	Cancer 43,278	Cancer 178,161	Cancer 146,171	Heart diseases 147,643	Heart diseases 188,183
2	Cancer 315,876	Cancer 283,725	Intentional self-harm (suicide) 2,038	Cancer 733	Intentional self-harm (suicide) 12,723	Cancer 4,570	Cancer 43,257	Heart diseases 21,218	Heart diseases 154,337	Heart diseases 88,829	Cancer 89,576	Cancer 88,947
3	Accidents (unintentional injuries) 112,720	Cerebrovascular diseases 85,658	Assault (homicide) 2,014	Intentional self-harm (suicide) 718	Assault (homicide) 8,553	Intentional self-harm (suicide) 3,034	Accidents (unintentional injuries) 34,179	Accidents (unintentional injuries) 13,710	Chronic lower respiratory diseases 39,075	Chronic lower respiratory diseases 38,058	Cerebrovascular disease 30,699	Alzheimer disease 70,762
4	Chronic lower respiratory diseases 73,724	Alzheimer disease 83,516	Cancer 916	Assault (homicide) 493	Heart diseases 5,324	Heart diseases 2,651	Intentional self-harm (suicide) 12,068	Chronic liver disease & cirrhosis 5,985	Cerebrovascular disease disease 26,151	Cerebrovascular disease 23,472	Alzheimer disease 29,397	Cerebrovascular disease 56,624
5	Cerebrovascular diseases 64,347	Chronic lower respiratory diseases 83,255	Congenital anomalies 533	Congenital anomalies 452	Cancer 3,925	Assault (homicide) 1,598	Chronic liver disease & cirrhosis 11,210	Chronic lower respiratory diseases 5,617	Diabetes mellitus 26,049	Diabetes mellitus 17,698	Chronic lower respiratory diseases 29,039	Chronic lower respiratory diseases 39,146
6	Diabetes mellitus 49,512	Accidents (unintentional injuries) 60,320	Heart diseases 327	Heart diseases 272	Chronic liver disease & cirrhosis 1,619	Chronic liver disease & cirrhosis 974	Diabetes mellitus 9,080	Diabetes mellitus 5,110	Accidents (unintentional injuries) 24,591	Accidents (unintentional injuries) 12,698	Accidents (unintentional injuries) 15,732	Accidents (unintentional injuries) 18,932
7	Alzheimer disease 37,983	Diabetes mellitus 38,135	Chronic lower respiratory diseases 162	Influenza & pneumonia 161	Diabetes mellitus 1,197	Pregnancy, childbirth, & puerperium 929	Cerebrovascular disease 6,615	Cerebrovascular disease 4,807	Chronic liver disease & cirrhosis 13,286	Alzheimer disease 12,498	Parkinson 13,289	Influenza & pneumonia 14,597
8	Intentional self-harm (suicide) 37,256	Influenza & pneumonia 25,139	Influenza & pneumonia 155	Cerebrovascular disease 85	Cerebrovascular disease 713	Diabetes mellitus 732	Chronic lower respiratory diseases 5,042	Intentional self-harm (suicide) 4,087	Nephritis, nephrotic syndrome, & nephrosis 11,744	Nephritis, nephrotic syndrome, & nephrosis 9,665	Diabetes mellitus 13,146	Diabetes mellitus 14,545
9	Chronic liver disease & cirrhosis 28,105	Nephritis, nephrotic syndrome, & nephrosis 24,896	Cerebrovascular disease 110	Chronic lower respiratory diseases 85	HIV disease 629	Cerebrovascular disease 622	Assault (homicide) 3,441	Septicemia 2,304	Influenza & pneumonia 9,623	Septicemia 8,310	Nephritis, nephrotic syndrome, & nephrosis 11,548	Nephritis, nephrotic syndrome, & nephrosis 12,870
10	Nephritis, nephrotic syndrome, & nephrosis 26,669	Hypertension & hypertensive renal disease[a] 19,911	In situ/benign neoplasms 76	Septicemia 82	Influenza & pneumonia 531	Influenza & pneumonia 442	Nephritis, nephrotic syndrome, & nephrosis 2,988	Influenza & pneumonia 2,078	Septicemia 8,966	Influenza & pneumonia 7,794	Influenza & pneumonia 11,503	Hypertension & hypertensive renal disease[a] 12,844

Abbreviation: HIV, human immunodeficiency virus.
Note: Deaths within each age group do not sum to all ages combined due to the inclusion of unknown ages. In accordance with the National Center for Health Statistics' cause-of-death ranking, "Symptoms, signs, and abnormal clinical or laboratory findings" and categories that begin with "Other" and "All other" were not ranked.
[a]Includes primary and secondary hypertension.

TABLE 9. Five Leading Causes of Cancer Death in the United States by Age and Sex, 2019

ALL AGES	<20	20 TO 39	40 TO 59	60 TO 79	≥80
MALE					
All sites 315,876	All sites 948	All sites 3,925	All sites 43,257	All sites 178,161	All sites 89,576
Lung & bronchus 74,860	Brain & ONS 274	Brain & ONS 535	Lung & bronchus 8,838	Lung & bronchus 47,592	Lung & bronchus 18,238
Prostate 31,638	Leukemia 212	Leukemia 492	Colorectum 5,893	Prostate 14,651	Prostate 15,656
Colorectum 27,674	Bones & joints 124	Colorectum 484	Pancreas 3,698	Pancreas 14,629	Colorectum 7,052
Pancreas 23,732	Soft tissue (including heart) 85	Non-Hodgkin lymphoma 218	Liver[a] 3,092	Colorectum 14,239	Urinary bladder 5,675
Liver[a] 18,692	Non-Hodgkin lymphoma 39	Soft tissue (including heart) 218	Brain & ONS 2,392	Liver[a] 12,365	Pancreas 5,272
FEMALE					
All sites 283,725	All sites 756	All sites 4,570	All sites 43,278	All sites 1,46,171	All sites 88,947
Lung & bronchus 64,743	Brain & ONS 239	Breast 1,200	Breast 9,727	Lung & bronchus 38,393	Lung & bronchus 18,543
Breast 42,281	Leukemia 193	Uterine cervix 423	Lung & bronchus 7,641	Breast 19,874	Breast 11,478
Colorectum 24,222	Bones & joints 67	Colorectum 379	Colorectum 4,088	Pancreas 12,286	Colorectum 9,276
Pancreas 22,154	Soft tissue (including heart) 52	Brain & ONS 354	Pancreas 2,613	Colorectum 10,478	Pancreas 7,182
Ovary 13,445	Kidney & renal pelvis 27	Leukemia 318	Ovary 2,448	Ovary 7,482	Leukemia 4,109

Abbreviation: ONS, other nervous system.
Note: Ranking order excludes category titles that begin with the word "other."
[a]Includes intrahepatic bile duct.

died from cervical cancer in 2019, one-half of whom were in their 50s or younger. Moreover, diagnoses among young women is driving rising incidence for advanced disease and cervical adenocarcinoma,[79] for which cytology is less effective at prevention and early detection compared with squamous cell carcinoma.[80,81] Women of low socioeconomic status are about 2 times more likely than affluent women both to be infected with oncogenic HPV subtypes not included in vaccines (18.3% vs 8.9%)[82] and to die from cervical cancer.[83,84] Due to this excess burden, near-elimination of cervical cancer is estimated to occur 14 years later among women living in high-poverty versus low-poverty counties, despite comparable HPV vaccination uptake.[84] Thus, improved cervical cancer control requires more targeted efforts to increase the prevalence of both HPV vaccination and screening with primary HPV testing or HPV/cytology cotesting as recommended in recently updated guidelines by the American Cancer Society.[85,86] Notably, HPV vaccination in the United States lags far behind that in other high-income countries, with 2019 up-to-date prevalence among female adolescents at 57%[87] compared with 67% in Canada,[88] >80% in Australia (ncci.canceraustralia.gov.au/), and >90% in the United Kingdom-Scotland.[89]

Cancer Disparities by Race/Ethnicity

Cancer occurrence and outcomes vary considerably between racial and ethnic groups, largely because of longstanding inequalities in wealth that lead to differences in risk factor exposures and barriers to equitable cancer prevention, early detection, and treatment.[90,91] Ultimately, disproportionate wealth stems from longstanding persistent structural racism, including residential, educational, judicial, and occupational segregationist and discriminatory policies, that has altered the balance of prosperity, security, and other social determinants of health.[92] The social determinants of health are defined by the World Health Organization as the conditions in which an individual is born, grows, lives, works, and ages[93] because they are consistently and strongly associated with life-expectancy and disease mortality.[94,95] A prime example is the disproportionate impact of the COVID-19 pandemic on people of color in the United States.[96]

One example of a form of structural racism that has been shown to be associated with poor health is redlining. Redlining is a previously legal form of lending discrimination whereby credit-worthy applicants who lived in predominantly Black neighborhoods were denied loans

TABLE 10. Incidence and Mortality Rates for Selected Cancers by Race and Ethnicity, United States, 2014-2019

	ALL RACES COMBINED	WHITE	BLACK	ASIAN/PACIFIC ISLANDER	AMERICAN INDIAN/ ALASKA NATIVE[a]	HISPANIC/LATINO
Incidence rates, 2014-2018						
All sites	449.0	466.0	455.0	294.5	452.6	348.3
Male	487.9	501.3	529.2	295.3	477.3	370.2
Female	423.0	442.8	405.3	297.9	438.5	339.2
Breast (female)	126.9	132.5	127.1	98.8	110.5	96.3
Colon & rectum[b]	36.5	36.1	42.6	29.0	49.2	32.8
Male	42.1	41.5	50.4	34.4	55.8	39.2
Female	31.6	31.3	37.1	24.6	43.9	27.6
Kidney & renal pelvis	17.1	17.3	18.9	8.1	29.6	17.0
Male	23.2	23.5	26.1	11.3	39.0	22.3
Female	11.8	11.8	13.5	5.5	21.9	12.7
Liver & intrahepatic bile duct	8.6	7.2	10.9	12.4	18.1	13.8
Male	13.1	10.9	17.8	19.1	26.4	20.3
Female	4.7	3.9	5.5	7.1	11.1	8.1
Lung & bronchus	57.3	61.6	59.5	34.3	62.3	29.2
Male	65.8	69.0	77.4	42.5	68.5	36.1
Female	50.8	56.0	47.2	28.0	57.7	24.2
Prostate	106.4	99.9	172.6	55.0	79.8	85.3
Stomach	6.5	5.3	9.8	9.7	9.9	9.5
Male	8.7	7.4	13.3	12.6	12.8	12.0
Female	4.6	3.5	7.4	7.4	7.6	7.7
Uterine cervix	7.7	7.2	8.8	6.1	10.8	9.6
Mortality rates, 2015-2019						
All sites	152.4	157.2	178.6	96.4	161.4	109.7
Male	181.4	186.2	221.4	113.2	193.2	132.2
Female	131.1	135.4	152.1	84.2	138.1	93.9
Breast (female)	19.9	19.9	28.0	11.7	17.8	13.7
Colon & rectum	13.4	13.4	18.1	9.3	17.4	10.8
Male	16.0	15.8	22.7	11.1	21.3	13.7
Female	11.3	11.3	14.8	7.9	14.4	8.5
Kidney & renal pelvis	3.6	3.7	3.5	1.6	6.3	3.4
Male	5.2	5.4	5.3	2.4	9.4	4.9
Female	2.2	2.3	2.2	1.0	3.8	2.2
Liver & intrahepatic bile duct	6.6	5.9	8.5	8.6	12.2	9.3
Male	9.7	8.5	13.3	12.9	17.1	13.2
Female	4.1	3.6	4.8	5.3	8.3	6.0
Lung & bronchus	36.7	39.9	39.2	20.6	35.9	16.2
Male	44.5	47.0	54.0	26.9	42.3	22.1
Female	30.7	34.2	29.2	15.9	31.0	11.8
Prostate	18.9	17.8	37.9	8.6	21.0	15.6
Stomach	2.9	2.2	5.1	4.9	5.4	4.8
Male	3.9	3.0	7.5	6.2	7.2	6.1
Female	2.1	1.5	3.5	3.9	3.9	3.9
Uterine cervix	2.2	2.0	3.4	1.7	3.1	2.5

Rates are per 100,000 population and age adjusted to the 2000 US standard population and exclude data from Puerto Rico.
All race groups are exclusive of Hispanic origin.
[a]Data based on Purchased/Referred Care Delivery Area (PRCDA) counties and are not comparable to previous years due to the exclusion of Hispanic ethnicity. Mortality rates for American Indians and Alaska Natives are underestimated because Indian Health Service-linked data are not publicly available.
[b]Colorectal cancer incidence rates exclude appendix.

for home ownership or improvement. This normalized practice of disinvestment prevented people of color from integrating into suburban White neighborhoods and advancing economically. Although these policies have formally ended, affected neighborhoods remain impoverished and residents experience residual effects, including poorer mental and physical health,[97] later stage cancer diagnosis, lower likelihood of appropriate treatment, and worse outcomes,[98-100] including 2-fold higher breast cancer mortality rates.[101]

Overall cancer incidence is highest among White people in part because of high rates of female breast cancer, some part of which may be overdiagnosis (Table 10). However, sex-specific incidence is highest in Black men, among whom rates during 2014 through 2018 were 79% higher than those in Asian/Pacific Islander men, who have the lowest rates, and 6% higher than White men, who rank second. Among women, the highest incidence during 2014 through 2018 was in those who were White, 9% higher than in Black women, who rank second. However, Black women have the highest cancer mortality rates—12% higher than White women. Even more striking, Black women have 4% lower breast cancer incidence than White women but 41% higher breast cancer mortality. Disparities are also larger for mortality than for incidence among men, with the death rate in Black men double that in Asian/Pacific Islander men and 19% higher than that in White men. Although still large, the Black-White disparity in overall cancer mortality among men and women combined has declined from a peak of 33% in 1993 (279.0 vs 210.5 per 100,000, respectively) to 14% in 2019 (171.3 vs 150.9 per 100,000, respectively). This progress is largely due to more rapid declines in deaths from smoking-related cancers among Black men because of the steep drop in smoking initiation among Black teens from the late 1970s to the early 1990s.[102]

Geographic Variation in Cancer Occurrence

Tables 11 and 12 show cancer incidence and mortality rates for selected cancers by state. Geographic variation reflects differences in the prevalence of cancer risk factors, such as smoking and obesity, as well as prevention and early detection practices, such as screening. The largest geographic variation is for the most preventable cancers,[26] such as lung cancer, cervical cancer, and melanoma of the skin.[103] For example, lung cancer incidence and mortality rates in Kentucky, where smoking prevalence was historically highest, are 3 to 5 times higher than those in Utah and Puerto Rico, where smoking was lowest. Even in 2019, 1 in 4 residents of Kentucky and West Virginia were current smokers compared to 1 in 10 in Utah, California, District of Columbia, Massachusetts, Connecticut, Washington, New York, Maryland, and Hawaii.[104] Similarly, cervical cancer incidence rates range from 4 (per 100,000 women) in Vermont and 5 in New Hampshire to almost 10 in Arkansas and Kentucky and 13 in Puerto Rico (Table 11).

Ironically, advances in cancer control, such as the availability of screening tests and improved treatment, typically exacerbate disparities. Thus state differences for cervical and other HPV-associated cancers will likely widen in the wake of unequal uptake of the HPV vaccine. In 2020, up-to-date HPV vaccination among boys and girls aged 13 to 17 years ranged from 32% in Mississippi and 43% in West Virginia to 73% in Massachusetts, 74% in Hawaii, and 83% in Rhode Island.[105] State/territory differences in initiatives to improve health, such as Medicaid expansion, may also contribute to future geographic disparities.[106,107]

Cancer in Children and Adolescents

Cancer is the second most common cause of death among children aged 1 to 14 years in the United States, surpassed only by accidents, and is the fourth most common cause of death among adolescents (aged 15-19 years). In 2022, approximately 10,470 children (birth to 14 years) and 5,480 adolescents (aged 15-19 years) will be diagnosed with cancer and 1050 and 550, respectively, will die from the disease. Leukemia is the most common childhood cancer, accounting for 28% of cases, followed by brain and other nervous system tumors (26%), nearly one-third of which are benign or borderline malignant (Table 13). Cancer types and their distribution differ in adolescents; for example, brain and other nervous system tumors, more than one-half of which are benign or borderline malignant, are most common (21%), followed closely by lymphoma (19%). In addition, there are almost twice as many cases of Hodgkin lymphoma as non-Hodgkin lymphoma among adolescents whereas among children the reverse is true. Thyroid carcinoma and melanoma of the skin account for 12% and 3% of cancers, respectfully, in adolescents, but only 2% and 1%, respectively, in children.

The overall cancer incidence rate in children and adolescents has been increasing slightly (by 0.8 per year in both children and adolescents) since 1975, although trends vary by cancer type. In contrast, death rates per 100,000 declined from 1970 through 2019 continuously from 6.3 to 1.8 in children and from 7.2 to 2.8 in adolescents, for overall reductions of 71% and 61%, respectively. Much of this progress reflects the dramatic declines in mortality for leukemia of 84% in children and 75% in adolescents. Remission rates of 90% to 100% have been achieved for childhood acute lymphocytic leukemia over the past 4 decades, primarily through the optimization of established chemotherapeutic agents as opposed to the development of new therapies.[108] Progress among adolescents has lagged somewhat behind that in children for reasons that are complex but include differences in tumor biology, clinical trial enrollment, treatment protocols, and tolerance and compliance with treatment.[109] Mortality reductions from 1970 to 2019 are also lower in adolescents for other common cancers, including non-Hodgkin lymphoma (91% in children and 67% in adolescents) and brain and other nervous system tumors (41% and 23%, respectively). The 5-year relative survival rate for all cancers combined improved from 58% during the mid-1970s to 85% during 2011 through 2017 in children and from 68% to 86% in adolescents.[2,110] However, survival varies substantially by cancer type and age at diagnosis (Table 13).

TABLE 11. Incidence Rates for Selected Cancers by State, United States, 2014 to 2018

	ALL SITES		BREAST	COLON & RECTUM[a]		LUNG & BRONCHUS		NON-HODGKIN LYMPHOMA		PROSTATE	UTERINE CERVIX
STATE	MALE	FEMALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Alabama	515.2	404.1	121.4	47.8	35.7	81.9	49.6	19.5	12.9	121.9	9.4
Alaska	440.7	403.8	121.9	43.9	37.5	62.6	48.5	20.1	13.5	88.4	7.9
Arizona	410.3	368.5	114.2	35.8	26.7	49.2	41.6	18.5	12.7	79.6	6.5
Arkansas	543.5	430.9	119.5	49.5	36.0	93.7	62.9	22.1	14.8	117.1	9.5
California	428.4	387.4	121.8	38.6	29.3	44.9	36.9	22.1	15.1	92.3	7.3
Colorado	415.5	387.3	129.0	34.6	27.3	43.1	38.5	20.5	14.1	92.3	6.3
Connecticut	499.5	443.7	140.2	37.9	29.1	62.8	54.2	25.3	17.2	114.4	5.8
Delaware	524.9	447.2	133.7	41.2	31.2	71.4	59.7	23.7	16.1	122.9	8.3
Dist. of Columbia	456.1	410.2	140.4	40.4	32.6	49.0	42.1	18.7	11.8	130.3	8.2
Florida	499.9	431.0	120.4	40.3	30.2	65.2	50.1	27.6	19.7	95.2	9.1
Georgia	531.4	424.1	128.4	46.4	33.4	76.2	50.0	22.3	14.8	126.6	8.0
Hawaii	439.8	402.1	139.6	44.5	33.2	54.5	35.5	19.1	13.1	95.6	7.0
Idaho	478.2	420.3	128.8	37.5	29.7	54.2	45.1	23.6	15.7	108.5	7.1
Illinois	503.6	444.5	133.7	47.1	34.7	71.8	56.7	23.4	16.4	111.5	7.7
Indiana	499.0	431.5	124.5	46.4	34.7	82.2	60.5	22.2	15.5	96.5	8.3
Iowa	527.1	455.5	132.6	46.2	36.4	72.9	54.8	26.0	17.3	112.1	8.0
Kansas	495.5	433.5	131.6	43.5	33.0	63.0	50.0	23.5	15.8	111.0	8.3
Kentucky	568.4	484.5	127.6	53.7	38.7	104.6	76.9	23.7	16.5	105.1	9.8
Louisiana	556.8	427.3	127.4	51.0	37.1	80.6	52.2	23.1	15.6	134.7	9.4
Maine	504.9	458.0	127.2	37.8	30.2	77.5	66.7	25.5	16.7	92.6	5.6
Maryland	493.1	426.1	132.2	39.5	30.9	60.9	50.9	21.4	15.2	128.1	6.7
Massachusetts	486.3	440.6	136.9	38.0	28.7	64.5	58.1	23.6	15.7	107.7	5.5
Michigan	487.2	422.6	123.1	40.1	31.6	70.5	57.1	23.7	16.2	107.3	6.9
Minnesota	506.1	445.5	134.2	40.3	31.1	60.3	51.7	26.4	17.1	110.5	5.4
Mississippi	549.8	418.9	120.9	54.6	39.8	95.6	57.6	20.6	14.0	131.5	9.5
Missouri	486.8	430.0	130.2	44.4	33.1	81.7	62.3	22.4	15.2	93.0	8.1
Montana	496.7	435.9	135.4	42.0	29.6	52.0	50.9	22.2	15.0	124.2	7.0
Nebraska	508.7	440.3	130.5	45.9	36.6	63.4	50.3	23.8	17.0	123.3	7.6
Nevada[b]	395.5	374.1	110.4	40.2	30.0	53.9	51.6	17.4	12.3	85.1	8.9
New Hampshire	509.4	460.1	143.1	39.7	29.0	65.7	60.8	24.5	17.2	109.2	5.1
New Jersey	531.8	459.2	137.2	44.4	33.4	59.5	51.2	26.5	18.4	134.5	7.9
New Mexico	390.3	363.2	111.0	36.5	28.4	42.4	33.0	17.1	13.2	82.7	8.5
New York	528.0	454.8	133.9	42.4	31.5	64.8	53.2	26.0	18.1	126.5	7.7
North Carolina	521.1	433.3	136.5	40.6	30.7	80.2	55.9	21.5	14.6	119.3	7.1
North Dakota	490.1	428.2	129.4	45.6	34.3	64.5	53.2	21.9	15.6	118.2	6.0
Ohio	505.2	443.7	129.6	45.3	34.7	78.7	58.7	23.4	15.8	107.2	7.9
Oklahoma	488.8	424.3	124.2	46.3	33.9	78.4	57.4	20.6	15.6	95.7	9.5
Oregon	450.3	419.0	128.0	36.4	29.0	56.0	50.2	22.4	15.5	93.3	7.0
Pennsylvania	515.6	459.0	132.2	44.4	33.3	71.5	56.2	24.8	17.8	104.3	7.3
Rhode Island	503.9	456.8	139.8	36.9	27.5	75.3	64.6	24.0	16.1	105.1	7.3
South Carolina	502.6	411.0	129.9	42.0	30.8	77.6	51.4	20.4	13.7	113.0	7.8
South Dakota	500.9	430.3	124.8	46.4	33.9	64.4	53.0	23.2	16.3	118.3	6.9
Tennessee	523.1	425.0	123.1	45.1	33.5	89.5	62.2	21.9	14.5	113.9	8.5
Texas	454.4	381.2	114.2	44.0	30.2	59.4	41.8	21.0	14.2	97.6	9.3
Utah	444.5	376.2	115.5	30.5	24.8	30.4	22.5	22.6	14.5	115.0	5.4
Vermont	477.0	447.0	132.4	35.9	30.6	66.0	55.9	22.9	15.7	92.1	4.0
Virginia	439.2	393.6	126.4	37.9	29.7	63.2	48.4	20.5	13.9	98.0	6.1
Washington	469.3	426.5	133.5	37.3	29.5	56.9	49.6	23.6	16.0	98.1	6.7
West Virginia	513.7	464.1	118.7	50.5	38.9	91.3	69.3	22.6	16.5	94.3	9.7
Wisconsin	509.5	440.5	132.9	39.1	30.3	65.7	53.6	25.7	17.4	112.6	6.6
Wyoming	429.4	382.0	114.3	33.8	28.5	44.0	40.6	20.2	13.3	111.4	7.4
Puerto Rico[c]	410.0	334.3	95.2	48.8	33.6	22.6	11.5	17.8	12.4	144.3	12.9
United States	**487.9**	**423.0**	**126.9**	**42.1**	**31.6**	**65.8**	**50.8**	**23.1**	**15.9**	**106.4**	**7.7**

Rates are per 100,000, age adjusted to the 2000 US standard population.
[a]Colorectal cancer incidence rates exclude appendix, with the exception of Nevada.
[b]Data for this state are not included in US combined rates because either the registry did not consent or incidence data did not meet inclusion standards for all years during 2014 through 2018 according to the North American Association of Central Cancer Registries (NAACCR). Rates for this state are based on data published in NAACCR's *Cancer in North America*, Volume II.
[c]Data for Puerto Rico are not included in US combined rates for comparability to previously published US rates. Puerto Rico incidence data for 2017 reflect diagnoses that occurred January through June only.

TABLE 12. Mortality Rates for Selected Cancers by State, United States, 2015-2019

	ALL SITES		BREAST	COLON & RECTUM		LUNG & BRONCHUS		NON-HODGKIN LYMPHOMA		PANCREAS		PROSTATE
STATE	MALE	FEMALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
Alabama	212.1	139.2	21.4	18.6	12.4	62.6	33.9	6.6	3.6	13.7	10.2	20.6
Alaska	172.0	131.3	17.8	15.7	13.8	38.9	30.7	6.9	4.9	11.6	8.8	19.1
Arizona	159.0	116.1	18.3	15.0	9.9	34.3	25.8	5.8	3.4	12.0	8.8	17.2
Arkansas	212.3	145.2	19.5	18.5	12.9	64.4	39.8	6.9	3.8	12.9	9.4	18.8
California	161.5	120.4	19.1	14.3	10.6	31.6	22.9	6.5	3.9	11.8	9.1	19.8
Colorado	154.6	114.7	18.8	13.1	10.0	28.2	23.1	6.0	3.4	10.8	8.3	21.2
Connecticut	164.6	120.3	17.3	12.6	8.8	36.2	28.1	6.8	3.8	12.4	9.7	18.0
Delaware	192.7	138.1	21.3	15.6	11.1	49.3	34.8	7.3	4.0	14.4	10.4	17.0
Dist. of Columbia	177.6	141.4	25.4	17.0	12.4	35.7	23.2	5.0	3.5	15.1	12.4	26.5
Florida	170.8	123.4	18.7	15.1	10.6	43.0	29.8	6.3	3.8	12.2	9.0	16.3
Georgia	192.1	131.5	21.1	17.7	11.9	51.0	30.0	6.5	3.8	12.7	9.5	21.5
Hawaii	152.8	108.6	16.7	13.6	9.9	35.9	22.2	6.0	3.6	12.1	9.7	14.6
Idaho	174.7	129.4	21.1	14.9	11.0	34.4	27.0	6.7	4.8	12.7	9.2	22.0
Illinois	187.8	138.1	20.9	17.3	12.2	47.2	33.1	7.1	4.1	13.4	9.8	19.7
Indiana	205.5	143.8	20.4	17.7	12.6	57.2	38.6	7.7	4.5	13.7	10.0	19.4
Iowa	190.0	133.8	18.4	16.2	11.9	48.8	33.2	7.9	4.3	12.9	9.9	20.2
Kansas	186.7	137.4	20.2	16.7	12.0	47.1	34.3	7.2	4.5	13.0	9.6	18.4
Kentucky	226.6	157.5	21.2	19.5	13.8	71.3	47.0	7.9	4.5	13.1	10.3	18.7
Louisiana	211.2	143.9	22.4	19.6	13.1	59.0	35.3	7.5	4.1	14.3	11.1	20.0
Maine	198.8	144.9	18.2	14.9	11.4	53.0	39.8	7.8	4.4	12.9	10.4	19.3
Maryland	178.9	132.6	21.0	15.8	11.6	41.5	30.6	6.7	3.6	13.1	10.0	20.3
Massachusetts	176.3	126.8	16.8	13.4	9.6	40.7	31.9	6.6	4.1	13.2	10.1	18.2
Michigan	191.7	141.7	20.4	15.9	11.5	50.0	36.4	7.8	4.6	14.0	10.8	18.4
Minnesota	173.9	127.3	17.7	14.1	10.1	38.1	29.7	7.9	4.2	12.5	9.8	19.9
Mississippi	232.2	148.9	22.9	21.9	14.4	70.1	37.3	6.8	3.7	15.4	10.7	24.7
Missouri	199.8	141.7	20.4	17.4	11.7	56.3	38.8	7.0	4.1	13.6	9.5	17.8
Montana	171.8	129.1	19.3	15.4	10.3	35.1	31.3	6.4	3.7	11.7	9.5	22.2
Nebraska	179.3	133.1	19.8	17.1	12.2	42.6	31.3	7.3	3.8	13.3	9.7	17.8
Nevada	174.6	136.4	22.0	17.8	12.9	39.8	34.3	6.5	3.8	12.0	9.2	19.0
New Hampshire	181.8	133.6	18.1	14.7	10.3	43.3	36.2	6.5	4.2	12.3	9.4	19.4
New Jersey	167.3	129.1	20.6	16.0	11.3	37.1	28.1	6.7	3.9	12.8	10.0	16.9
New Mexico	162.4	118.8	20.2	15.8	10.3	30.0	21.6	5.8	3.6	11.5	8.1	19.1
New York	164.7	124.9	18.9	14.4	10.5	38.0	27.5	6.7	3.8	12.5	9.7	17.2
North Carolina	192.6	133.3	20.5	15.5	11.0	53.5	33.3	6.8	3.7	12.7	9.5	19.7
North Dakota	172.5	124.0	18.1	17.1	9.7	41.3	28.2	6.6	3.9	12.5	9.0	18.0
Ohio	203.2	145.1	21.6	17.7	12.5	55.8	36.8	7.6	4.4	13.9	10.8	19.4
Oklahoma	214.3	150.5	22.5	20.0	13.7	60.6	39.4	7.9	4.6	12.9	9.5	20.4
Oregon	177.6	135.5	19.6	14.4	11.1	38.6	31.8	7.1	4.4	13.4	10.1	20.7
Pennsylvania	191.7	138.1	20.8	16.8	12.0	47.9	32.7	7.5	4.4	14.1	10.4	18.5
Rhode Island	188.7	134.5	17.6	13.9	10.6	46.9	35.3	6.6	3.9	14.9	9.9	18.2
South Carolina	198.2	134.3	21.2	16.9	11.1	53.2	31.5	6.2	4.0	13.3	10.0	21.0
South Dakota	184.9	132.3	18.8	17.5	12.6	44.5	33.7	7.6	4.0	12.4	10.2	19.1
Tennessee	212.5	145.4	21.8	18.1	12.5	62.7	38.6	7.6	4.5	12.8	9.6	19.6
Texas	176.4	124.2	19.9	17.2	11.1	40.7	26.0	6.6	3.9	11.8	9.0	17.7
Utah	142.8	105.1	19.8	12.2	9.8	21.0	14.3	6.7	3.6	10.9	7.9	21.1
Vermont	187.9	137.2	17.6	15.9	13.2	43.7	33.8	7.3	4.4	12.4	9.9	19.7
Virginia	183.2	130.1	20.9	16.1	11.2	46.4	29.9	6.7	3.9	12.9	9.5	19.7
Washington	174.1	130.9	19.5	14.3	10.3	38.2	30.5	7.1	4.2	12.3	9.4	20.2
West Virginia	213.8	154.3	21.7	20.0	14.4	64.1	41.7	7.9	4.5	12.3	9.8	16.8
Wisconsin	184.6	133.0	18.5	14.8	10.5	43.4	32.0	7.6	4.3	13.5	9.9	20.8
Wyoming	160.2	121.8	18.9	13.5	11.0	33.7	27.8	6.0	4.3	12.8	8.3	17.2
Puerto Rico[a]	134.4	87.7	17.3	17.8	11.0	15.4	7.4	4.5	2.6	8.0	5.4	22.0
United States	**181.4**	**131.1**	**19.9**	**16.0**	**11.3**	**44.5**	**30.7**	**6.9**	**4.0**	**12.7**	**9.6**	**18.9**

Rates are per 100,000 and age adjusted to the 2000 US standard population.
[a]Rates for Puerto Rico are not included in US combined rates.

TABLE 13. Case Distribution (2014-2018) and 5-Year Relative Survival (2011-2017) by Age and International Classification of Childhood Cancer Type, Ages Birth to 19 Years, United States

	BIRTH TO 14		15 TO 19	
	% OF CASES	5-YEAR SURVIVAL, %	% OF CASES	5-YEAR SURVIVAL, %
All ICCC groups combined		85		86
Leukemias, myeloproliferative & myelodysplastic diseases	28	87	13	75
Lymphoid leukemia	21	92	7	76
Acute myeloid leukemia	4	68	3	67
Lymphomas & reticuloendothelial neoplasms	12	95	19	94
Hodgkin lymphoma	3	99	11	97
Non-Hodgkin lymphoma (including Burkitt)	6	91	7	89
Central nervous system neoplasms	26	74	21	76
Benign/borderline malignant tumors[a]	8	97	13	98
Neuroblastoma & other peripheral nervous cell tumors	6	82	<1	66[b]
Retinoblastoma	2	96	<1	[c]
Nephroblastoma & other nonepithelial renal tumors	4	93	<1	[c]
Hepatic tumors	2	80	<1	56[b]
Hepatoblastoma	1	82	<1	[c]
Malignant bone tumors	4	73	5	68
Osteosarcoma	2	68	3	68
Ewing tumor & related bone sarcomas	1	76	2	59
Rhabdomyosarcoma	3	70	1	50[b]
Germ cell & gonadal tumors	3	90	10	93
Thyroid carcinoma	2	>99	12	>99
Malignant melanoma	1	96	3	95

Abbreviations:ICCC, International Classification of Childhood Cancer.
Survival rates are adjusted for normal life expectancy and are based on follow-up of patients through 2018.
[a]Benign and borderline brain tumors were excluded from survival calculations for overall central nervous system tumors and all cancers combined but were included in the denominator for case distribution.
[b]The standard error of the survival rate is between 5 and 10 percentage points.
[c]Statistic could not be calculated due to <25 cases during 2011 through 2017.

Limitations

The estimated numbers of new cancer cases and deaths in 2022 are model-based 3-year or 4-year (incidence) ahead projections that should not be used to track trends over time for several reasons. First, new methodologies are adopted regularly, most recently as of the 2021 estimates, to take advantage of improved modeling techniques and cancer surveillance coverage. Second, although the models are robust, they can only account for trends through the most recent data year (currently, 2018 for incidence and 2019 for mortality) and thus do not reflect reduced access to cancer care because of the COVID-19 pandemic. Similarly, the models cannot anticipate abrupt fluctuations for cancers affected by changes in detection practice, such as those that occur for prostate cancer because of changes in PSA testing. Third, the model can be over-sensitive to sudden or large changes in observed data. The most informative metrics for tracking cancer trends are age-standardized or age-specific cancer incidence rates from SEER, NPCR, and/or NAACCR and cancer death rates from the NCHS.

Errors in reporting race/ethnicity in medical records and on death certificates may result in underestimates of cancer incidence and mortality in persons who are not White, particularly Native American populations. It is also important to note that cancer data in the United States are primarily reported for broad, heterogeneous racial and ethnic groups, masking important differences in the cancer burden within these populations. For example, lung cancer incidence is equivalent in Native Hawaiian and White men but about 50% lower in Asian/Pacific Islander men overall.[111]

Conclusion

The risk of death from cancer has decreased continuously since 1991, resulting in an overall drop of 32% and approximately 3.5 million cancer deaths averted as of 2019. This success is largely because of reductions in smoking that resulted in downstream declines in lung and other smoking-related cancers. Adjuvant chemotherapies for colon and breast cancer and combination therapies for many cancers also contributed. Progress against cancer has accelerated in the past decade because of advances in early detection, surgical techniques, and targeted therapies, despite slowing momentum for other leading causes of death. Some recent treatment breakthroughs are particularly notable because they are for historically difficult-to-treat cancers, such as metastatic melanoma and lung cancer. Also promising is a plateau in liver cancer occurrence, which is one of the most fatal cancers and was the fastest increasing malignancy just a few years ago. However, rising incidence for breast and advanced stage prostate cancers, both of which are amenable to early detection, is concerning. Even more alarming is the persistent racial, socioeconomic, and geographic disparities for highly preventable cancers that may be exacerbated by uneven access to interventions such as HPV vaccination and expanded health care. Increased investment in the broad application of existing cancer control interventions and basic and clinical research to further knowledge and advance treatment options would undoubtedly accelerate progress against cancer and mitigate racial and socioeconomic inequalities. ■

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