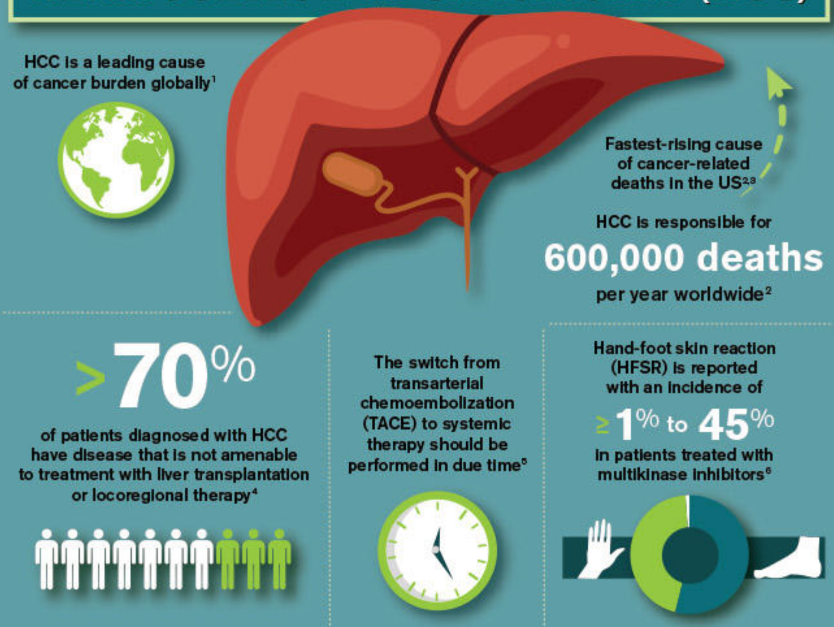
HEPATOCELLULAR CARCINOMA (HCC)



PLEASE JOIN US FOR A CME WEBCAST

featuring leading experts in Hepatic Oncology and Dermatology and live Q&A Sessions

Global Advances in the Medical Management of Hepatocellular Carcinoma

FACULTY PRESENTERS

PETER R. GALLE, MD, PhD
Chairman, First Department of Internal Medicine
University Medical Center
Mainz, German

NICOLE R. LEBOEUF, MD, MPH
Director, The Program in Skin Toxicities from Anticancer Therapies
Clinical Director, Center for Cutaneous Oncology
Dana-Farber/Brigham and Women's Cancer Center
Boston, Massachusetts, USA

WEBCAST & CASE STUDY: FRIDAY, SEPTEMBER 21

8:00 AM – 9:30 AM AKDT	9:00 AM – 10:30 AM PDT
10:00 AM – 11:30 AM MDT	11:00 AM – 12:30 PM CDT
12:00 PM – 1:30 PM EDT	1:00 PM – 2:30 PM BRT
5:00 PM – 6:30 PM BST	6:00 PM – 7:30 PM CEST
7:00 PM – 8:30 PM EEST	9:00 PM – 10:30 PM YEKT

Webcast & Case Study 1:

REGISTER ONLINE AT

https://webinars.on24.com/HCCWebcast/1

This activity has been approved for *AMA PRA Category 1 Credit*™. Supported by an unrestricted educational grant from Bayer Pharmaceuticals.

PROGRAM OVERVIEW

HCC is one of the most common malignancies in the world and is a complex tumor that is steadily rising in incidence globally.[1,3] The majority of patients diagnosed with HCC have advanced disease,[5] and these patients, represent the highest priority for improved outcomes and healthcare provider education. The proven efficacy of systemic therapies offers the hope of prolonged survival in these patients.[5] However, the timing of transition to systemic treatment is debated and the need to effectively manage side effects must be addressed in order to improve the long-term prognosis for patients with HCC.[1-3,5]

As a part of this webcast series, topical presentations will explore HCC as discussed by the experts. Throughout the series, case study presentations will highlight these issues.

INTENDED AUDIENCE

This activity is directed toward medical oncologists, hepatologists, gastroenterologists, and interventional radiologists who treat patients with hepatocellular carcinoma. Other healthcare providers are also invited to participate.

EDUCATIONAL OBJECTIVES FOR THE WEBCAST

- Understand management strategies for intermediate and advanced disease in patients including transition from local-regional to systemic therapies
- Gain awareness of recent, global, evidence-based literature and clinical trials on systemic therapies and sequencing for HCC
- Understand management of treatment-related adverse events with focus on HFSR
- Provide learners the knowledge to help with the development and implementation of local institutional clinical pathways to optimize management of HCC

CONTINUING EDUCATION CREDIT

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the University of Massachusetts Medical School Office of Continuing Medical Education (UMMS-OCME) and Strategically Speaking, Inc. The UMMS-OCME is accredited by the ACCME to provide continuing medical education for physicians.

The University of Massachusetts Medical School designates this live activity for a maximum of ***1.5 AMA PRA Category 1 Credits*™**. Physicians should claim on the credit commensurate with the extent of their participation in the activity.

DISCLOSURE POLICY

It is the policy of the University of Massachusetts Medical School to ensure fair balance, independence, objectivity, and scientific rigor in all activities. All faculty participating in CME activities sponsored by the University of Massachusetts Medical School are required to present evidence-based data, identify and reference any mention of off-label product use, and disclose all relevant financial relationships with those supporting the activity or others whose products or services are discussed. Faculty disclosures will be provided as part of the educational activity.

FEE INFORMATION AND DISCLOSURE

There is no fee for this educational activity, which is supported by an unrestricted educational grant from Bayer Pharmaceuticals.

REFERENCES: 1. Mokdad AA et al. *Chin Clin Oncol.* 2017;6(2):21. **2.** Rich NE et al. *J Oncol Pract.* 2017;13(6):356-364. **3.** El-Serag HB. *N Engl J Med.* 2011;365:1118-1127. **4.** National Cancer Institute. Hepatocellular Carcinoma Clinical Trials Planning Meeting December 2008 Executive Summary. May 13, 2009. https://www.cancer.gov/about-nci/organization/ccct/steering-committees/nctn/gastrointestinal/hcc-sots-2008-exec-summary-05-13-09.pdf. Accessed July 8, 2018. **5.** Galle PR et al. *J Hepatol.* 2017;67:173-183. **6.** ESMO Oncology PRO. Skin Changes - Hand-Foot Skin Reaction. August 22, 2014. https://oncologypro.esmo.org/Oncology-in-Practice/Palliative-and-Supportive-care/Multikinase-Inhibitor-Related-Skin-Toxicity/Healthcare-Professionals/Symptoms-and-Grading/Skin-Changes/Hand-Foot-Skin-Reaction. Accessed July 8, 2018.

QUESTIONS?

If you have questions regarding this event, please contact:
Strategically Speaking, Inc., 11 Main St., Suite 201, Cold Spring, NY 10516, (845) 265-2238
info@strategicallyspeaking.org

Cancer Statistics, 2018

Rebecca L. Siegel, MPH[1]*; Kimberly D. Miller, MPH[2]; Ahmedin Jemal, DVM, PhD [3]

[1]Strategic Director, Surveillance Information Services, Surveillance and Health Services Research, American Cancer Society, Atlanta, GA; [2]Epidemiologist, Surveillance and Health Services Research, American Cancer Society, Atlanta, GA; [3]Vice President, Surveillance and Health Services Research, American Cancer Society, Atlanta, GA.

Corresponding author: Rebecca L. Siegel, MPH, Surveillance Information Services, Surveillance and Health Services Research, American Cancer Society, 250 Williams St, NW, Atlanta, GA 30303-1002; Rebecca.siegel@cancer.org

DISCLOSURES: The authors report no conflicts of interest.

doi: 10.3322/caac.21442. Available online at cacancerjournal.com

Abstract: Each year, the American Cancer Society estimates the numbers of new cancer cases and deaths that will occur in the United States and compiles the most recent data on cancer incidence, mortality, and survival. Incidence data, available through 2014, 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, available through 2015, were collected by the National Center for Health Statistics. In 2018, 1,735,350 new cancer cases and 609,640 cancer deaths are projected to occur in the United States. Over the past decade of data, the cancer incidence rate (2005-2014) was stable in women and declined by approximately 2% annually in men, while the cancer death rate (2006-2015) declined by about 1.5% annually in both men and women. The combined cancer death rate dropped continuously from 1991 to 2015 by a total of 26%, translating to approximately 2,378,600 fewer cancer deaths than would have been expected if death rates had remained at their peak. Of the 10 leading causes of death, only cancer declined from 2014 to 2015. In 2015, the cancer death rate was 14% higher in non-Hispanic blacks (NHBs) than non-Hispanic whites (NHWs) overall (death rate ratio [DRR], 1.14; 95% confidence interval [95% CI], 1.13-1.15), but the racial disparity was much larger for individuals aged <65 years (DRR, 1.31; 95% CI, 1.29-1.32) compared with those aged ≥65 years (DRR, 1.07; 95% CI, 1.06-1.09) and varied substantially by state. For example, the cancer death rate was lower in NHBs than NHWs in Massachusetts for all ages and in New York for individuals aged ≥65 years, whereas for those aged <65 years, it was 3 times higher in NHBs in the District of Columbia (DRR, 2.89; 95% CI, 2.16-3.91) and about 50% higher in Wisconsin (DRR, 1.78; 95% CI, 1.56-2.02), Kansas (DRR, 1.51; 95% CI, 1.25-1.81), Louisiana (DRR, 1.49; 95% CI, 1.38-1.60), Illinois (DRR, 1.48; 95% CI, 1.39-1.57), and California (DRR, 1.45; 95% CI, 1.38-1.54). Larger racial inequalities in young and middle-aged adults probably partly reflect less access to high-quality health care. **CA Cancer J Clin 2018;68:7-30.** © **2018 American Cancer Society.**

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

Introduction

Cancer is a major public health problem worldwide and is the second leading cause of death in the United States. In this article, we provide the estimated numbers of new cancer cases and deaths in 2018 in the United States nationally and for each state, as well as a comprehensive overview of cancer occurrence based on the most current population-based data for cancer incidence through 2014 and for mortality through 2015. We also estimate the total number of deaths averted as a result of the continual decline in cancer death rates since the early 1990s and quantify the black-white disparity in cancer mortality by state and age based on the actual number of reported cancer deaths in 2015.

Materials and Methods

Incidence and Mortality Data

Mortality data from 1930 to 2015 were provided by the National Center for Health Statistics (NCHS).[1-3] Forty-seven states and the District of Columbia (DC) met data quality requirements for reporting to the national vital statistics system in 1930. Texas, Alaska, and Hawaii began reporting mortality data in 1933, 1959, and

TABLE 1. Estimated New Cancer Cases and Deaths by Sex, United States, 2018*

	ESTIMATED NEW CASES			ESTIMATED DEATHS		
	BOTH SEXES	MALE	FEMALE	BOTH SEXES	MALE	FEMALE
All sites	**1,735,350**	**856,370**	**878,980**	**609,640**	**323,630**	**286,010**
Oral cavity & pharynx	**51,540**	**37,160**	**14,380**	**10,030**	**7,280**	**2,750**
Tongue	17,110	12,490	4,620	2,510	1,750	760
Mouth	13,580	7,980	5,600	2,650	1,770	880
Pharynx	17,590	14,250	3,340	3,230	2,480	750
Other oral cavity	3,260	2,440	820	1,640	1,280	360
Digestive system	**319,160**	**181,960**	**137,200**	**160,820**	**94,230**	**66,590**
Esophagus	17,290	13,480	3,810	15,850	12,850	3,000
Stomach	26,240	16,520	9,720	10,800	6,510	4,290
Small intestine	10,470	5,430	5,040	1,450	810	640
Colon†	97,220	49,690	47,530	50,630	27,390	23,240
Rectum	43,030	25,920	17,110			
Anus, anal canal, & anorectum	8,580	2,960	5,620	1,160	480	680
Liver & intrahepatic bile duct	42,220	30,610	11,610	30,200	20,540	9,660
Gallbladder & other biliary	12,190	5,450	6,740	3,790	1,530	2,260
Pancreas	55,440	29,200	26,240	44,330	23,020	21,310
Other digestive organs	6,480	2,700	3,780	2,610	1,100	1,510
Respiratory system	**253,290**	**136,400**	**116,890**	**158,770**	**87,200**	**71,570**
Larynx	13,150	10,490	2,660	3,710	2,970	740
Lung & bronchus	234,030	121,680	112,350	154,050	83,550	70,500
Other respiratory organs	6,110	4,230	1,880	1,010	680	330
Bones & joints	**3,450**	**1,940**	**1,510**	**1,590**	**930**	**660**
Soft tissue (including heart)	**13,040**	**7,370**	**5,670**	**5,150**	**2,770**	**2,380**
Skin (excluding basal & squamous)	**99,550**	**60,350**	**39,200**	**13,460**	**9,070**	**4,390**
Melanoma	91,270	55,150	36,120	9,320	5,990	3,330
Other nonepithelial skin	8,280	5,200	3,080	4,140	3,080	1,060
Breast	**268,670**	**2,550**	**266,120**	**41,400**	**480**	**40,920**
Genital system	**286,390**	**176,320**	**110,070**	**62,330**	**30,210**	**32,120**
Uterine cervix	13,240		13,240	4,170		4,170
Uterine corpus	63,230		63,230	11,350		11,350
Ovary	22,240		22,240	14,070		14,070
Vulva	6,190		6,190	1,200		1,200
Vagina & other genital, female	5,170		5,170	1,330		1,330
Prostate	164,690	164,690		29,430	29,430	
Testis	9,310	9,310		400	400	
Penis & other genital, male	2,320	2,320		380	380	
Urinary system	**150,350**	**107,600**	**42,750**	**33,170**	**23,110**	**10,060**
Urinary bladder	81,190	62,380	18,810	17,240	12,520	4,720
Kidney & renal pelvis	65,340	42,680	22,660	14,970	10,010	4,960
Ureter & other urinary organs	3,820	2,540	1,280	960	580	380
Eye & orbit	**3,540**	**2,130**	**1,410**	**350**	**190**	**160**
Brain & other nervous system	**23,880**	**13,720**	**10,160**	**16,830**	**9,490**	**7,340**
Endocrine system	**56,430**	**14,350**	**42,080**	**3,080**	**1,490**	**1,590**
Thyroid	53,990	13,090	40,900	2,060	960	1,100
Other endocrine	2,440	1,260	1,180	1,020	530	490
Lymphoma	**83,180**	**46,570**	**36,610**	**20,960**	**12,130**	**8,830**
Hodgkin lymphoma	8,500	4,840	3,660	1,050	620	430
Non-Hodgkin lymphoma	74,680	41,730	32,950	19,910	11,510	8,400
Myeloma	**30,770**	**16,400**	**14,370**	**12,770**	**6,830**	**5,940**
Leukemia	**60,300**	**35,030**	**25,270**	**24,370**	**14,270**	**10,100**
Acute lymphocytic leukemia	5,960	3,290	2,670	1,470	830	640
Chronic lymphocytic leukemia	20,940	12,990	7,950	4,510	2,790	1,720
Acute myeloid leukemia	19,520	10,380	9,140	10,670	6,180	4,490
Chronic myeloid leukemia	8,430	4,980	3,450	1,090	620	470
Other leukemia‡	5,450	3,390	2,060	6,630	3,850	2,780
Other & unspecified primary sites‡	**31,810**	**16,520**	**15,290**	**44,560**	**23,950**	**20,610**

*Rounded to the nearest 10; cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

About 63,960 cases of carcinoma in situ of the female breast and 87,290 cases of melanoma in situ will be newly diagnosed in 2018.

†Deaths for colon and rectum cancers are combined because a large number of deaths from rectal cancer are misclassified as colon.

‡More deaths than cases may reflect a lack of specificity in recording the underlying cause of death on death certificates and/or an undercount in the case estimate.

Note: These are model-based estimates that should be interpreted with caution and not compared to those for previous years.

TABLE 2. Estimated New Cases for Selected Cancers by State, 2018*

STATE	ALL CASES	FEMALE BREAST	UTERINE CERVIX	COLON & RECTUM	UTERINE CORPUS	LEUKEMIA	LUNG & BRONCHUS	MELANOMA OF SKIN	NON-HODGKIN LYMPHOMA	PROSTATE	URINARY BLADDER
Alabama	27,830	3,760	220	2,230	770	830	4,190	1,380	990	2,460	1,110
Alaska	3,550	510	†	270	120	110	460	130	140	360	160
Arizona	34,740	5,700	270	2,840	1,210	1,150	4,460	1,880	1,480	3,180	1,810
Arkansas	16,130	2,160	150	1,370	480	510	2,720	670	650	1,260	720
California	178,130	29,360	1,540	14,400	6,610	6,220	18,760	9,830	8,190	15,190	7,800
Colorado	25,570	3,630	180	1,850	870	910	2,560	1,640	1,100	3,190	1,180
Connecticut	21,240	3,540	120	1,520	890	760	2,700	970	970	2,220	1,210
Delaware	6,110	780	†	450	210	180	890	380	250	640	290
Dist. of Columbia	3,260	520	†	240	120	70	310	120	120	420	80
Florida	135,170	19,860	1,100	11,670	4,450	4,770	18,710	7,940	5,990	13,630	6,600
Georgia	56,920	7,490	430	4,120	1,600	1,590	7,160	3,040	1,970	5,340	1,960
Hawaii	6,280	1,150	50	650	280	200	830	490	270	510	260
Idaho	8,450	1,070	50	630	290	310	1,060	590	390	900	490
Illinois	66,330	9,960	570	5,340	2,800	2,170	9,220	2,980	2,830	6,300	3,190
Indiana	37,250	5,630	290	3,190	1,400	1,210	5,840	1,900	1,600	3,460	1,740
Iowa	17,630	2,560	110	1,510	710	700	2,480	1,050	810	1,580	880
Kansas	15,400	2,290	110	1,220	530	590	2,050	850	640	1,360	660
Kentucky	25,990	3,720	210	2,370	850	960	5,150	1,440	1,060	2,210	1,200
Louisiana	25,080	3,570	210	2,310	670	740	3,660	1,000	1,040	2,600	1,000
Maine	8,600	1,350	50	660	380	320	1,450	470	400	710	580
Maryland	33,810	5,940	220	2,950	1,270	910	4,270	1,690	1,290	3,470	1,500
Massachusetts	37,130	6,490	210	2,630	1,590	1,150	5,140	2,090	1,650	4,060	2,040
Michigan	56,590	8,730	370	4,510	2,330	1,820	8,780	2,890	2,590	5,400	3,070
Minnesota	31,270	4,500	140	2,270	1,120	1,270	3,980	1,420	1,420	2,920	1,380
Mississippi	18,130	2,240	150	1,550	430	560	2,690	590	560	1,370	620
Missouri	35,520	5,160	250	2,890	1,240	1,240	5,750	1,800	1,480	3,000	1,640
Montana	6,080	1,020	†	520	220	230	830	440	280	810	350
Nebraska	10,320	1,560	70	900	380	410	1,310	540	460	960	490
Nevada	14,060	2,180	130	1,130	410	500	2,090	790	580	1,190	770
New Hampshire	8,080	1,360	†	590	360	280	1,230	460	370	840	520
New Jersey	53,260	8,550	380	4,100	2,180	1,990	5,870	2,830	2,370	5,430	2,590
New Mexico	9,730	1,470	80	800	340	360	1,090	500	410	960	390
New York	110,800	17,890	870	9,080	4,580	4,410	13,190	4,920	4,890	9,880	5,440
North Carolina	55,130	7,760	410	4,440	1,910	2,050	8,490	3,310	2,240	5,580	2,530
North Dakota	4,110	570	†	350	140	150	500	220	170	380	200
Ohio	68,470	10,610	480	5,550	2,740	2,060	10,760	3,400	2,880	5,810	3,350
Oklahoma	19,030	2,870	170	1,670	590	710	3,210	860	860	1,670	890
Oregon	21,520	3,400	140	1,510	890	650	3,140	1,570	1,010	2,040	1,130
Pennsylvania	80,960	12,140	500	6,440	3,320	2,930	10,470	4,320	3,430	7,360	4,240
Rhode Island	5,920	1,010	†	460	260	190	880	280	270	740	360
South Carolina	30,450	4,540	220	2,410	920	960	4,630	1,820	1,150	3,080	1,310
South Dakota	5,100	740	†	440	170	190	650	270	220	510	260
Tennessee	36,760	5,590	310	3,110	1,130	1,370	6,030	1,900	1,540	2,750	1,660
Texas	121,860	18,260	1,360	10,080	4,000	4,580	15,460	4,440	5,460	12,600	4,530
Utah	10,950	1,720	70	780	400	480	900	1,010	520	1,250	440
Vermont	3,840	600	†	270	160	120	560	230	170	390	250
Virginia	42,420	7,510	290	3,380	1,570	1,250	5,860	2,620	1,760	4,200	1,900
Washington	36,170	5,580	240	2,710	1,390	1,330	4,810	2,650	1,770	3,730	1,940
West Virginia	12,110	1,700	90	1,030	450	390	2,060	720	480	820	620
Wisconsin	33,340	5,420	190	2,650	1,410	1,350	4,400	1,740	1,410	3,660	1,710
Wyoming	2,780	450	†	210	100	100	330	200	120	330	160
United States	**1,735,350**	**266,120**	**13,240**	**140,250**	**63,230**	**60,300**	**234,030**	**91,270**	**74,680**	**164,690**	**81,190**

*Rounded to the nearest 10; excludes basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder.

†Estimate is fewer than 50 cases.

Note: These are model-based estimates that should be interpreted with caution and not compared to those for previous years. State estimates may not add to US total due to rounding and the exclusion of states with fewer than 50 cases.

TABLE 3. Probability (%) of Developing Invasive Cancer Within Selected Age Intervals by Sex, United States, 2012 to 2014*

		BIRTH TO 49	50 TO 59	60 TO 69	≥70	BIRTH TO DEATH
All sites†	Male	3.4 (1 in 30)	6.1 (1 in 16)	13.4 (1 in 7)	32.2 (1 in 3)	39.7 (1 in 3)
	Female	5.5 (1 in 18)	6.1 (1 in 16)	9.9 (1 in 10)	26.0 (1 in 4)	37.6 (1 in 3)
Breast	Female	1.9 (1 in 52)	2.3 (1 in 43)	3.4 (1 in 29)	6.8 (1 in 15)	12.4 (1 in 8)
Colorectum	Male	0.3 (1 in 287)	0.7 (1 in 145)	1.2 (1 in 85)	3.4 (1 in 29)	4.5 (1 in 22)
	Female	0.3 (1 in 306)	0.5 (1 in 194)	0.8 (1 in 122)	3.1 (1 in 32)	4.2 (1 in 24)
Kidney & renal pelvis	Male	0.2 (1 in 456)	0.4 (1 in 284)	0.6 (1 in 155)	1.3 (1 in 74)	2.1 (1 in 48)
	Female	0.1 (1 in 706)	0.2 (1 in 579)	0.3 (1 in 320)	0.7 (1 in 136)	1.2 (1 in 83)
Leukemia	Male	0.2 (1 in 400)	0.2 (1 in 573)	0.4 (1 in 260)	1.4 (1 in 71)	1.8 (1 in 56)
	Female	0.2 (1 in 515)	0.1 (1 in 887)	0.2 (1 in 446)	0.9 (1 in 111)	1.3 (1 in 80)
Lung & bronchus	Male	0.1 (1 in 682)	0.7 (1 in 154)	1.9 (1 in 54)	6.1 (1 in 16)	6.9 (1 in 15)
	Female	0.2 (1 in 635)	0.6 (1 in 178)	1.4 (1 in 70)	4.8 (1 in 21)	5.9 (1 in 17)
Melanoma of the skin‡	Male	0.5 (1 in 218)	0.5 (1 in 191)	0.9 (1 in 106)	2.6 (1 in 38)	3.6 (1 in 27)
	Female	0.7 (1 in 152)	0.4 (1 in 254)	0.5 (1 in 202)	1.1 (1 in 91)	2.4 (1 in 42)
Non-Hodgkin lymphoma	Male	0.3 (1 in 382)	0.3 (1 in 349)	0.6 (1 in 174)	1.8 (1 in 54)	2.4 (1 in 42)
	Female	0.2 (1 in 545)	0.2 (1 in 480)	0.4 (1 in 248)	1.3 (1 in 74)	1.9 (1 in 54)
Prostate	Male	0.2 (1 in 403)	1.7 (1 in 58)	4.8 (1 in 21)	8.2 (1 in 12)	11.6 (1 in 9)
Thyroid	Male	0.2 (1 in 517)	0.1 (1 in 791)	0.2 (1 in 606)	0.2 (1 in 425)	0.6 (1 in 160)
	Female	0.8 (1 in 124)	0.4 (1 in 271)	0.3 (1 in 289)	0.4 (1 in 256)	1.8 (1 in 56)
Uterine cervix	Female	0.3 (1 in 368)	0.1 (1 in 845)	0.1 (1 in 942)	0.2 (1 in 605)	0.6 (1 in 162)
Uterine corpus	Female	0.3 (1 in 342)	0.6 (1 in 166)	1.0 (1 in 103)	1.3 (1 in 75)	2.8 (1 in 35)

*For people free of cancer at beginning of age interval.

†All sites excludes basal cell and squamous cell skin cancers and in situ cancers except urinary bladder.

‡Probabilities for non-Hispanic whites only.

1960, respectively. The methods for abstraction and age adjustment of mortality data are described elsewhere.[3,4]

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 data. Long-term incidence and survival trends (1975-2014) were based on data from 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), representing approximately 9% of the US population.[5] The lifetime probability of developing cancer and contemporary stage distribution and survival statistics were based on data from all 18 SEER registries (the SEER 9 registries plus Alaska Natives, California, Georgia, Kentucky, Louisiana, and New Jersey), covering 28% of the US population.[6] The probability of developing cancer was calculated using NCI's DevCan software (version 6.7.5).[7] Some of the statistical information presented herein was adapted from data previously published in the *SEER Cancer Statistics Review 1975-2014*.[8]

The North American Association of Central Cancer Registries (NAACCR) compiles and reports incidence data from 1995 onward for registries that participate in the SEER program and/or the NPCR. These data approach 100% coverage of the US population in the most recent time period and were the source for the projected new cancer cases in 2018 and cross-sectional incidence rates by state and race/ethnicity.[9,10] Some of the incidence data presented herein were previously published in volumes 1 and 2 of *Cancer in North America: 2010-2014*.[11,12]

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 (ICCC).[13,14] Causes of death were classified according to the *International Classification of Diseases*.[15] All incidence and death rates were age-standardized to the 2000 US standard population and expressed per 100,000 population, as calculated by NCI's SEER*Stat software (version 8.3.4).[16] The annual percent change in rates was quantified using NCI's Joinpoint Regression Program (version 4.5.0.1).[17]

Whenever possible, cancer incidence rates presented in this report were adjusted for delays in reporting, which occur because of a lag in case capture or data corrections. Delay adjustment has the largest effect on the most recent years of data for cancers that are frequently diagnosed in outpatient settings (eg, melanoma, leukemia, and prostate cancer) and provides a more accurate portrayal of the cancer burden in the most recent time period.[18] For example, the leukemia incidence rate for 2014 is 13% higher after adjusting for reporting delays.[19]

Projected Cancer Cases and Deaths in 2018

The most recent year for which reported incidence and mortality data are available lags 2 to 4 years behind the current

Estimated New Cases

Males			Females		
Prostate	164,690	19%	Breast	266,120	30%
Lung & bronchus	121,680	14%	Lung & bronchus	112,350	13%
Colon & rectum	75,610	9%	Colon & rectum	64,640	7%
Urinary bladder	62,380	7%	Uterine corpus	63,230	7%
Melanoma of the skin	55,150	6%	Thyroid	40,900	5%
Kidney & renal pelvis	42,680	5%	Melanoma of the skin	36,120	4%
Non-Hodgkin lymphoma	41,730	5%	Non-Hodgkin lymphoma	32,950	4%
Oral cavity & pharynx	37,160	4%	Pancreas	26,240	3%
Leukemia	35,030	4%	Leukemia	25,270	3%
Liver & intrahepatic bile duct	30,610	4%	Kidney & renal pelvis	22,660	3%
All Sites	**856,370**	**100%**	**All Sites**	**878,980**	**100%**

Estimated Deaths

Males			Females		
Lung & bronchus	83,550	26%	Lung & bronchus	70,500	25%
Prostate	29,430	9%	Breast	40,920	14%
Colon & rectum	27,390	8%	Colon & rectum	23,240	8%
Pancreas	23,020	7%	Pancreas	21,310	7%
Liver & intrahepatic bile duct	20,540	6%	Ovary	14,070	5%
Leukemia	14,270	4%	Uterine corpus	11,350	4%
Esophagus	12,850	4%	Leukemia	10,100	4%
Urinary bladder	12,520	4%	Liver & intrahepatic bile duct	9,660	3%
Non-Hodgkin lymphoma	11,510	4%	Non-Hodgkin lymphoma	8,400	3%
Kidney & renal pelvis	10,010	3%	Brain & other nervous system	7,340	3%
All Sites	**323,630**	**100%**	**All Sites**	**286,010**	**100%**

FIGURE 1. Ten Leading Cancer Types for the Estimated New Cancer Cases and Deaths by Sex, United States, 2018. Estimates are rounded to the nearest 10 and cases 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.

year due to the time required for data collection, compilation, quality control, and dissemination. Therefore, we projected the numbers of new cancer cases and deaths in the United States in 2018 to provide an estimate of the contemporary cancer burden.

To calculate the number of invasive cancer cases, a generalized linear mixed model was used to estimate complete counts for each county (or health service area for rare cancers) from 2000 through 2014 using high-quality incidence data from 48 states and DC (approximately 96% population coverage) and geographic variations in sociodemographic and lifestyle factors, medical settings, and cancer screening behaviors.[20] Data were unavailable for all years for Kansas and Minnesota and for some years for other states. Modeled counts were adjusted for delays in cancer reporting using registry-specific or combined delay ratios and aggregated to obtain national- and state-level counts for each year. Finally, a time series projection method (vector autoregression) was applied to all 15 years of modeled data to estimate counts for 2018. This method cannot estimate numbers of basal cell or squamous cell skin cancers because data on the occurrence of these cancers are generally not reported to cancer registries. For complete details of the case projection methodology, please refer to Zhu et al.[21]

In situ cases of female breast carcinoma and melanoma of the skin diagnosed in 2018 were estimated by first approximating the number of cases occurring annually from 2005 through 2014 based on age-specific NAACCR incidence rates (data from 46 states and DC with high-quality data every year) and US population estimates provided in SEER*-Stat. Counts were then adjusted for delays in reporting using SEER delay factors for invasive breast cancer and melanoma, respectively, because delay factors are not available for in situ cases. Counts were then projected to 2018 based on the average annual percent change during the entire time period as generated by the joinpoint regression model.

TABLE 4. Estimated Deaths for Selected Cancers by State, 2018*

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	10,720	330	670	950	400	500	3,140	300	240	740	490
Alaska	1,120	†	70	100	†	60	290	†	†	80	50
Arizona	12,390	380	850	1,040	540	680	2,850	410	310	970	680
Arkansas	6,910	190	410	600	260	290	2,130	200	150	430	280
California	60,650	1,860	4,500	5,300	2,580	3,900	11,830	2,140	1,570	4,570	3,490
Colorado	8,000	270	580	660	340	410	1,600	250	230	580	510
Connecticut	6,590	200	410	460	290	320	1,570	220	160	520	320
Delaware	2,080	50	140	140	80	110	580	70	50	160	90
Dist. of Columbia	1,030	†	110	90	†	80	200	†	†	90	70
Florida	45,030	1,290	2,940	3,640	1,820	2,150	11,760	1,510	970	3,300	2,260
Georgia	17,730	500	1,320	1,580	620	890	4,650	530	420	1,210	870
Hawaii	2,580	50	160	230	90	180	590	100	†	230	120
Idaho	3,020	100	210	240	120	140	680	110	80	240	200
Illinois	24,670	620	1,720	2,080	980	1,100	6,410	790	560	1,680	1,160
Indiana	13,820	350	860	1,110	550	550	3,960	450	290	910	600
Iowa	6,570	190	370	570	250	260	1,740	250	150	460	300
Kansas	5,600	170	350	470	260	240	1,490	180	120	420	260
Kentucky	10,590	260	580	830	380	440	3,530	320	190	660	390
Louisiana	9,370	220	610	830	330	550	2,580	290	170	730	400
Maine	3,360	100	180	230	130	120	970	110	60	230	150
Maryland	10,780	290	810	870	420	580	2,560	340	260	850	530
Massachusetts	12,610	370	750	890	520	650	3,180	380	320	960	600
Michigan	21,380	570	1,400	1,670	840	880	5,860	750	500	1,610	940
Minnesota	10,080	300	630	770	460	410	2,420	380	230	750	520
Mississippi	6,750	220	420	640	230	310	1,930	170	110	490	310
Missouri	13,280	320	850	1,050	520	580	3,950	370	250	920	550
Montana	2,110	70	140	180	80	90	510	70	50	150	130
Nebraska	3,550	110	230	320	150	130	890	130	70	250	190
Nevada	5,330	150	390	520	210	240	1,380	150	120	380	280
New Hampshire	2,810	80	170	190	110	100	760	80	70	210	130
New Jersey	16,040	430	1,250	1,400	650	720	3,670	510	400	1,300	750
New Mexico	3,750	100	260	340	140	240	760	120	110	270	220
New York	35,350	900	2,390	2,970	1,460	1,710	8,490	1,200	910	2,760	1,680
North Carolina	20,380	540	1,370	1,570	760	1,010	5,770	610	430	1,390	940
North Dakota	1,290	†	80	110	60	†	310	50	†	90	70
Ohio	25,740	640	1,700	2,100	1,000	1,040	7,200	860	550	1,860	1,110
Oklahoma	8,470	210	530	750	350	400	2,460	270	190	540	390
Oregon	8,310	260	530	650	310	480	2,000	280	240	620	450
Pennsylvania	28,620	710	1,880	2,380	1,180	1,270	7,280	970	670	2,160	1,300
Rhode Island	2,180	50	130	160	90	120	610	60	50	150	100
South Carolina	10,630	270	710	860	400	470	2,900	300	230	730	520
South Dakota	1,680	60	110	160	80	60	440	50	†	110	80
Tennessee	14,900	350	920	1,220	540	700	4,480	460	310	960	600
Texas	41,030	1,130	2,880	3,740	1,660	2,700	9,310	1,330	920	2,880	1,830
Utah	3,270	130	280	280	170	150	470	130	110	270	220
Vermont	1,450	50	80	110	50	50	390	50	†	110	60
Virginia	15,260	400	1,090	1,210	550	720	3,780	490	370	1,120	700
Washington	13,030	400	860	970	520	710	3,080	450	340	950	690
West Virginia	4,900	110	280	430	200	190	1,470	150	90	300	180
Wisconsin	11,840	360	720	890	520	450	3,000	420	230	890	620
Wyoming	980	†	70	80	60	†	220	†	†	70	†
United States	**609,640**	**16,830**	**40,920**	**50,630**	**24,370**	**30,200**	**154,050**	**19,910**	**14,070**	**44,330**	**29,430**

*Rounded to the nearest 10.

†Estimate is fewer than 50 deaths.

Note: These are model-based estimates that should be interpreted with caution and not compared to those for previous years. State estimates may not add to US total due to rounding and the exclusion of states with fewer than 50 deaths.

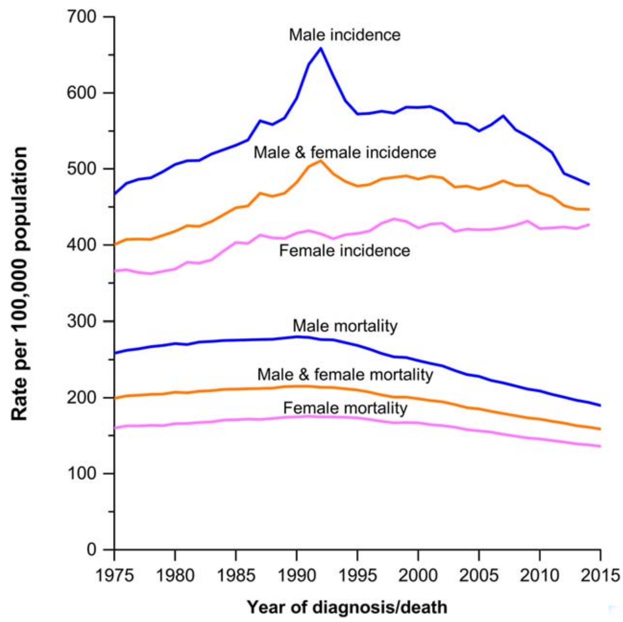


FIGURE 2. Trends in Cancer Incidence (1975 to 2014) and Death Rates (1975 to 2015) by Sex, United States.
Rates are age adjusted to the 2000 US standard population. Incidence rates also are adjusted for delays in reporting.

The number of cancer deaths expected to occur in 2018 was estimated based on the most recent joinpoint-generated annual percent change in reported cancer deaths from 2001 through 2015 at the state and national levels as reported to the NCHS. For the complete details of this methodology, please refer to Chen et al.[22]

Other Statistics

The number of cancer deaths averted in men and women due to the reduction in cancer death rates since the early 1990s was estimated by summing the difference between the annual number of recorded cancer deaths from 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 rates in the peak year for age-standardized cancer death rates (1990 in men and 1991 in women) to the corresponding age- and sex-specific populations in subsequent years through 2015. We also calculated the racial disparity in overall cancer mortality by state and age (<65 years and ≥65 years) in 2015 based on death rate ratios (DRRs) comparing non-Hispanic blacks (NHBs) with non-Hispanic whites (NHWs) using SEER*Stat.

Selected Findings

Expected Numbers of New Cancer Cases

Table 1 presents the estimated numbers of new cases of invasive cancer expected in the United States in 2018 by sex. The overall estimate of 1,735,350 cases is the equivalent of more than 4,700 new cancer diagnoses each day. In addition, about 63,960 cases of female breast carcinoma in situ and 87,290 cases of melanoma in situ of the skin are expected to be diagnosed in 2018. The estimated numbers of new cases by state for selected cancers are shown in Table 2.

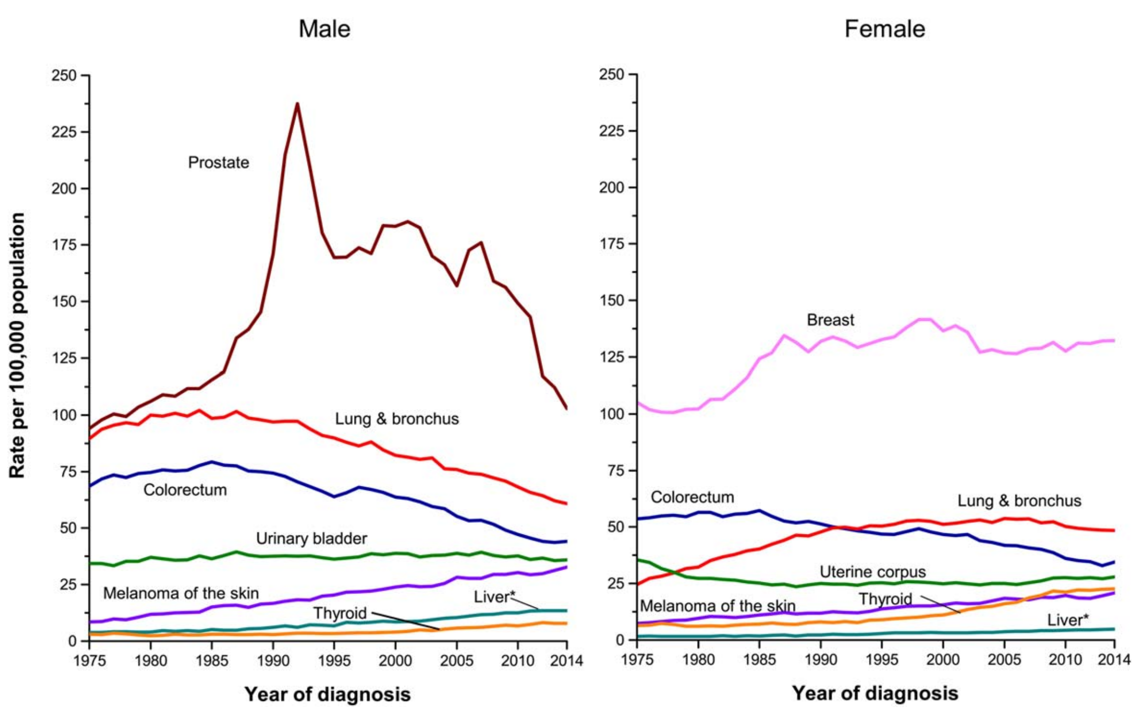


FIGURE 3. Trends in Incidence Rates for Selected Cancers by Sex, United States, 1975 to 2014.specific
Rates are age adjusted to the 2000 US standard population and adjusted for delays in reporting. *Includes intrahepatic bile duct.

TABLE 5. Trends in Delay-Adjusted Incidence Rates for Selected Cancers by Sex, United States, 1975 to 2014

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		TREND 6		2005-2014	2010-2014
	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	AAPC	AAPC
All sites														
Overall	1975-1989	1.2*	1989-1992	2.8	1992-1995	−2.4	1995-1998	1.1	1998-2009	−0.3*	2009-2014	−1.4*	−0.9*	−1.4*
Male	1975-1989	1.3*	1989-1992	5.2*	1992-1995	−4.8*	1995-2000	0.4	2000-2009	−0.7*	2009-2014	−2.7*	−1.8*	−2.7*
Female	1975-1979	−0.3	1979-1987	1.6*	1987-1995	0.1	1995-1998	1.5	1998-2003	−0.6	2003-2014	0.1	0.1	0.1
Female breast	1975-1980	−0.5	1980-1987	4.0*	1987-1994	−0.2	1994-1999	1.8*	1999-2004	−2.3*	2004-2014	0.4*	0.4*	0.4*
Colorectum														
Male	1975-1985	1.1*	1985-1991	−1.2*	1991-1995	−3.2*	1995-1998	2.1	1998-2014	−2.9*			−2.9*	−2.9*
Female	1975-1985	0.3	1985-1995	−1.9*	1995-1998	1.8	1998-2008	−2.0*	2008-2012	−4.1*	2012-2014	0.4	−2.4*	−1.9
Liver & intrahepatic bile duct														
Male	1975-1984	2.2*	1984-2011	3.9*	2011-2014	0.4							2.7*	1.3
Female	1975-1983	0.6	1983-1996	4.1*	1996-2014	2.8*							2.8*	2.8*
Lung & bronchus														
Male	1975-1982	1.5*	1982-1991	−0.5*	1991-2008	−1.7*	2008-2014	−2.9*					−2.5*	−2.9*
Female	1975-1982	5.6*	1982-1991	3.4*	1991-2006	0.5*	2006-2014	−1.4*					−1.2*	−1.4*
Melanoma of skin														
Male	1975-1986	5.4*	1986-2005	3.1*	2005-2014	1.8*							1.8*	1.8*
Female	1975-1986	4.0*	1986-1993	0.6	1993-1996	5.4	1996-2009	2.3*	2009-2012	−1.3	2012-2014	6.1	1.9	2.3
Pancreas														
Male	1975-1995	−0.8*	1995-2014	0.9*									0.9*	0.9*
Female	1975-1984	1.4*	1984-1996	−0.5	1996-2014	1.0*							1.0*	1.0*
Prostate	1975-1988	2.6*	1988-1992	16.5*	1992-1995	−11.6*	1995-2000	2.3	2000-2010	−1.8*	2010-2014	−10.1*	−5.6*	−10.1*
Thyroid														
Male	1975-1980	−4.6	1980-1997	1.8*	1997-2012	5.5*	2012-2014	−1.5					3.9*	2.0
Female	1975-1977	6.6	1977-1980	−5.2	1980-1993	2.3*	1993-1999	4.5*	1999-2009	7.1*	2009-2014	1.3*	3.9*	1.3*
Uterine corpus	1975-1979	−6.0*	1979-1988	−1.7*	1988-1997	0.7*	1997-2006	−0.4*	2006-2009	3.5	2009-2014	0.2	1.2*	0.2

AAPC indicates average annual percent change; APC, annual percent change based on delay-adjusted incidence rates age adjusted to the 2000 US standard population.

*The APC or AAPC is significantly different from zero ($P < .05$).

Note: Trends analyzed by the Joinpoint Regression Program, version 4.5.0.1, allowing up to 5 joinpoints. Trends are based on Surveillance, Epidemiology, and End Results (SEER) 9 areas.

Figure 1 depicts the most common cancers expected to occur in men and women in 2018. Prostate, lung and bronchus (referred to as lung hereafter), and colorectal cancers account for 42% of all cases in men, with prostate cancer alone accounting for almost 1 in 5 new diagnoses. For women, the 3 most common cancers are breast, lung, and colorectum, which collectively represent one-half of all cases; breast cancer alone accounts for 30% all new cancer diagnoses in women.

The lifetime probability of being diagnosed with invasive cancer is slightly higher for men (39.7%) than for women (37.6%) (Table 3). The reasons for the increased susceptibility in men are not well understood, but to some extent reflect differences in environmental exposures, endogenous hormones, and probably complex interactions between these influences. Adult height, which is determined by genetics and childhood nutrition, is positively associated with cancer incidence and death in both men and women,[23] and has been estimated to account for one-third of the sex disparity.[24]

Expected Numbers of Cancer Deaths

An estimated 609,640 Americans will die from cancer in 2018, corresponding to almost 1,700 deaths per day (Table 1). The most common causes of cancer death are cancers of the lung, prostate, and colorectum in men and the lung, breast, and colorectum in women (Fig. 1). These 4 cancers account for 45% of all cancer deaths, with one-quarter due to lung cancer. Table 4 provides the estimated numbers of cancer deaths in 2018 by state for selected cancers.

Trends in Cancer Incidence

Figure 2 illustrates long-term trends in cancer incidence rates for all cancers combined by sex. Cancer incidence patterns reflect trends in behaviors associated with cancer risk and changes in medical practice, such as the use of cancer screening tests. The volatility in incidence for males compared with females reflects rapid changes in prostate cancer incidence, which spiked in the late 1980s and early 1990s (Fig. 3) due to a surge in the detection of asymptomatic disease as a result of widespread prostate-specific antigen (PSA) testing.[25]

Over the past decade of data, the overall cancer incidence rate in men declined by about 2% per year, with the pace accelerating in more recent years (Table 5). This trend reflects large continuing declines for cancers of the lung and colorectum, in addition to a sharp reduction in prostate cancer incidence of about 10% annually from 2010 to 2014. The drop in prostate cancer incidence has been attributed to

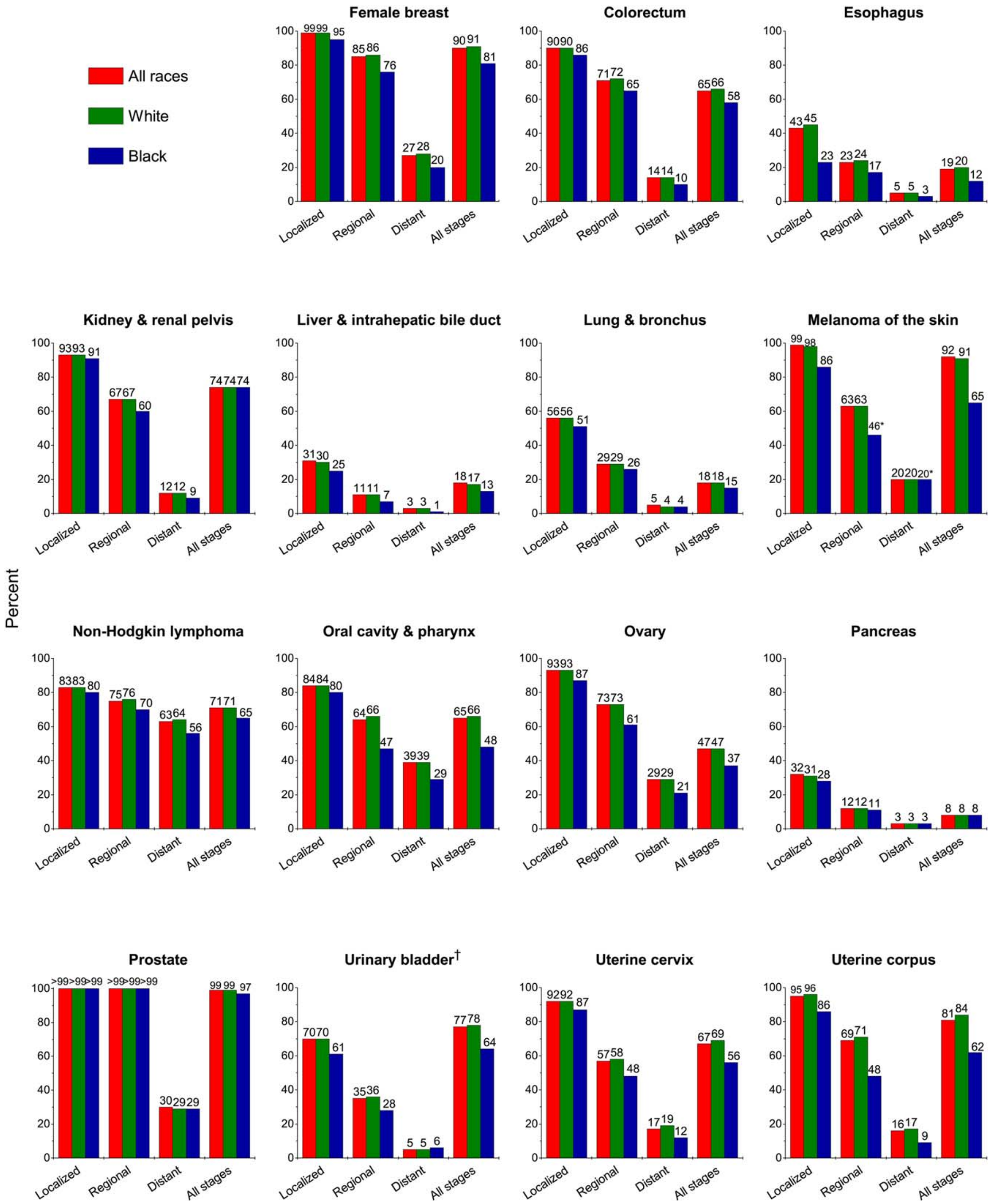


FIGURE 4. Five-Year Relative Survival Rates for Selected Cancers by Race and Stage at Diagnosis, United States, 2007 to 2013.
*The standard error is between 5 and 10 percentage points. †The survival rate for carcinoma in situ of the urinary bladder is 96% in all races, 96% in whites, and 91% in blacks.

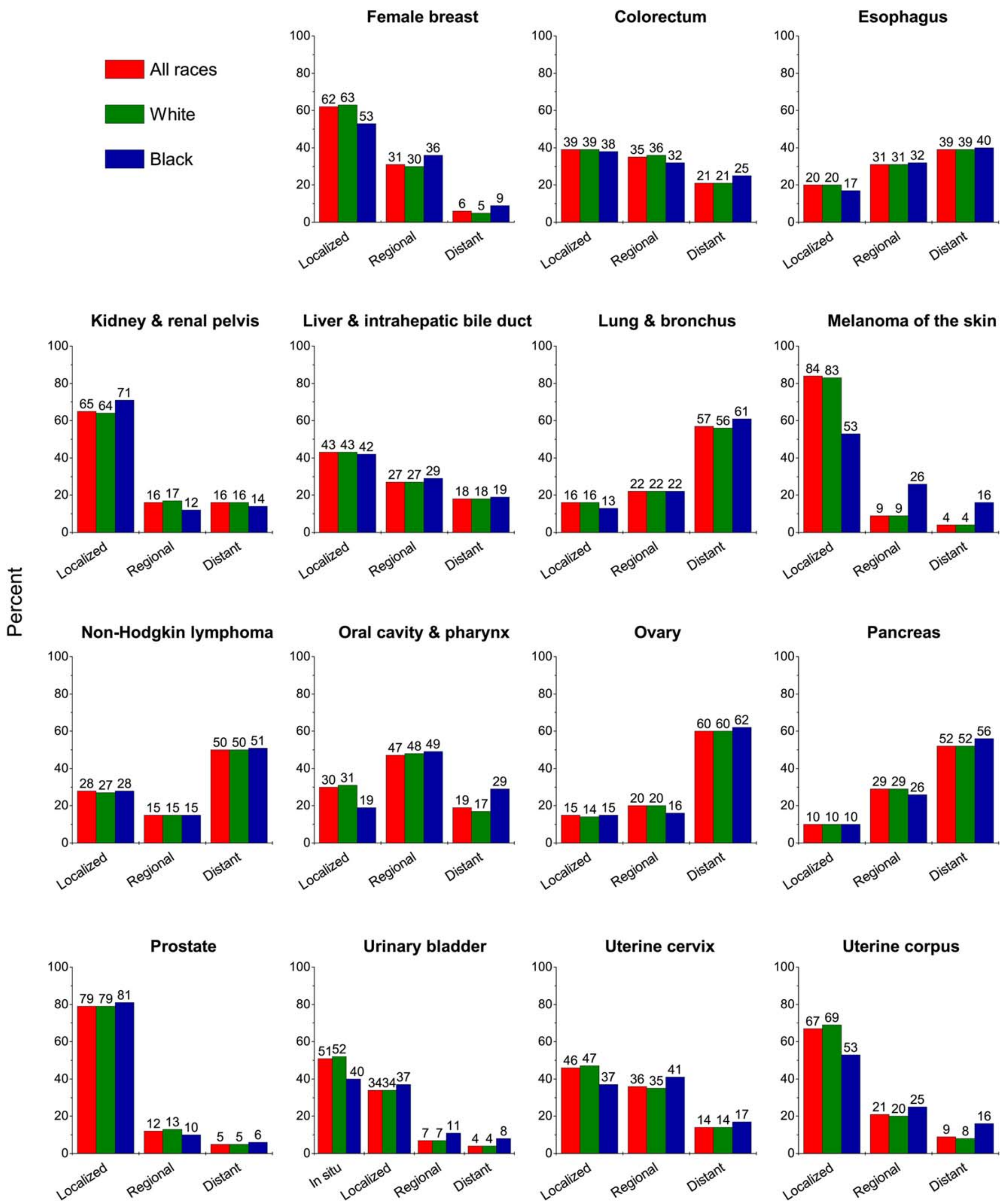


FIGURE 5. Stage Distribution for Selected Cancers by Race, United States, 2007 to 2013. Stage categories do not sum to 100% because some cases are unstaged.

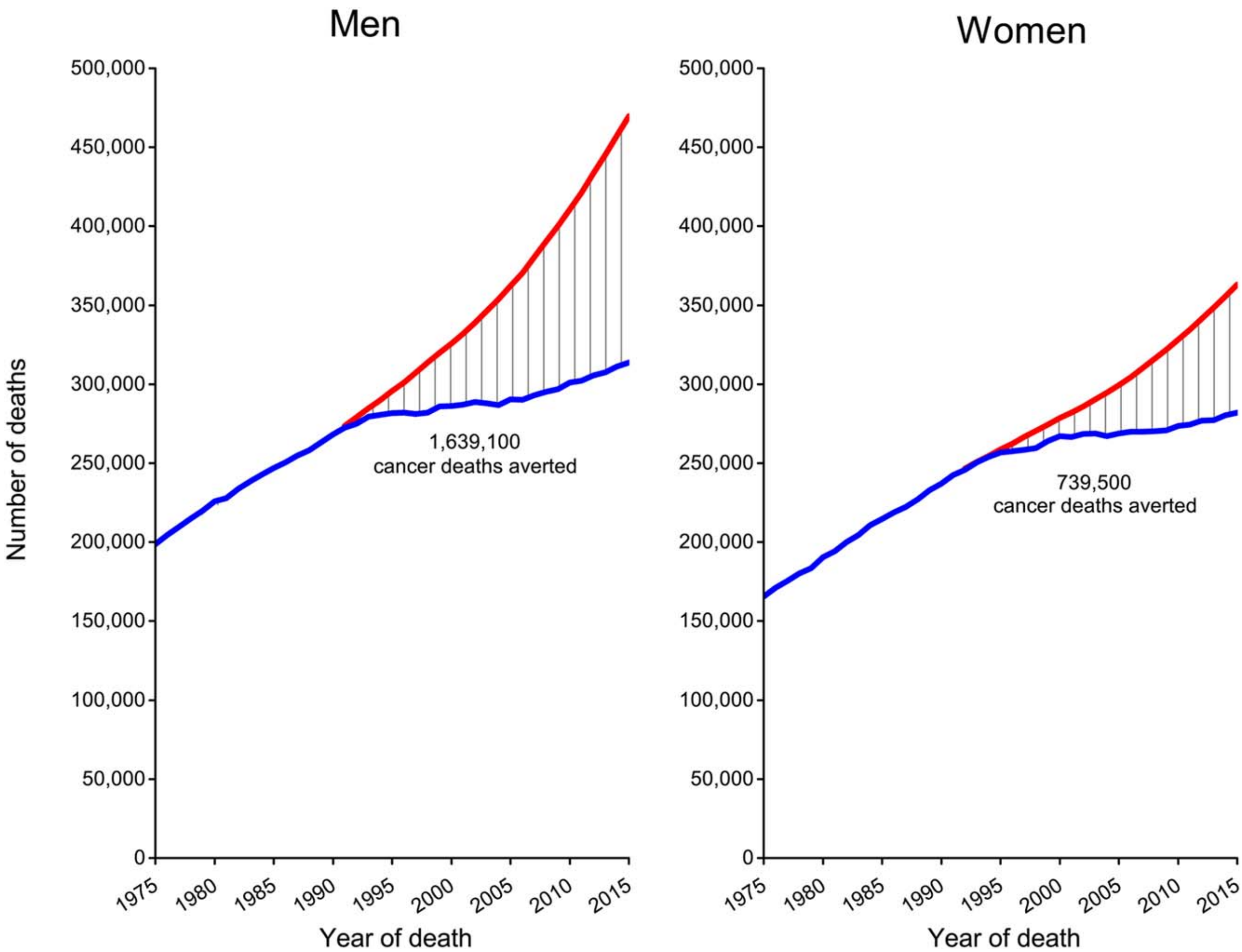


FIGURE 6. Total Number of Cancer Deaths Averted From 1991 to 2015 in Men and From 1992 to 2015 in Women, United States.
The blue line represents the actual number of cancer deaths recorded in each year, and the red line represents the number of cancer deaths that would have been expected if cancer death rates had remained at their peak.

decreased PSA testing from 2008 to 2013 in the wake of US Preventive Services Task Force recommendations against routine use of the test to screen for prostate cancer (Grade D) in ages 75 and older in 2008 and in all men in 2011 because of growing concerns about overdiagnosis and overtreatment.[26,27] The effect of screening reductions on the incidence of advanced disease is being monitored closely. One analysis of SEER data through 2012 indicated a slight uptick in the diagnosis of distant stage prostate cancer among men aged 50 to 69 years,[28] which may reflect the larger downturn in PSA testing among younger men.[29,30] In April 2017, the Task Force issued a draft statement revising its recommendation for men aged 55 to 69 years to informed decision making (Grade C) based on an updated evidence review.[31,32]

The overall cancer incidence rate in women has remained generally stable over the past few decades because declines in lung and colorectal cancers have been offset by increasing or stable rates for breast, uterine corpus, and thyroid cancers and for melanoma (Table 5). The slight increase in breast cancer incidence from 2005 to 2014 was driven by increases of 0.3% to 0.4% per year among Hispanic and black women and 1.7% per year among Asian/Pacific Islander women; rates among NHWs and American Indians/Alaska Natives remained stable.[33]

Lung cancer incidence rates continue to decline about twice as fast in men as in women, reflecting historical differences in tobacco uptake and cessation, as well as upturns in female smoking prevalence in some birth cohorts.[34,35] In contrast, colorectal cancer (CRC) incidence patterns are generally similar in men and women (Fig. 3); from 2005 through 2014, incidence rates declined annually by about 2% to 3%, although the trend may have stabilized in women during the most recent data years (Table 5). Reductions in CRC incidence prior to 2000 are attributed equally to changes in risk factors and the use of screening, which allows for the removal of premalignant lesions.[36] However, more recent rapid declines are thought to primarily reflect increased uptake of colonoscopy, which now is the predominant screening test.[37,38] Colonoscopy use among US adults aged 50 years and older tripled from 21% in 2000 to 60% in 2015.[39]

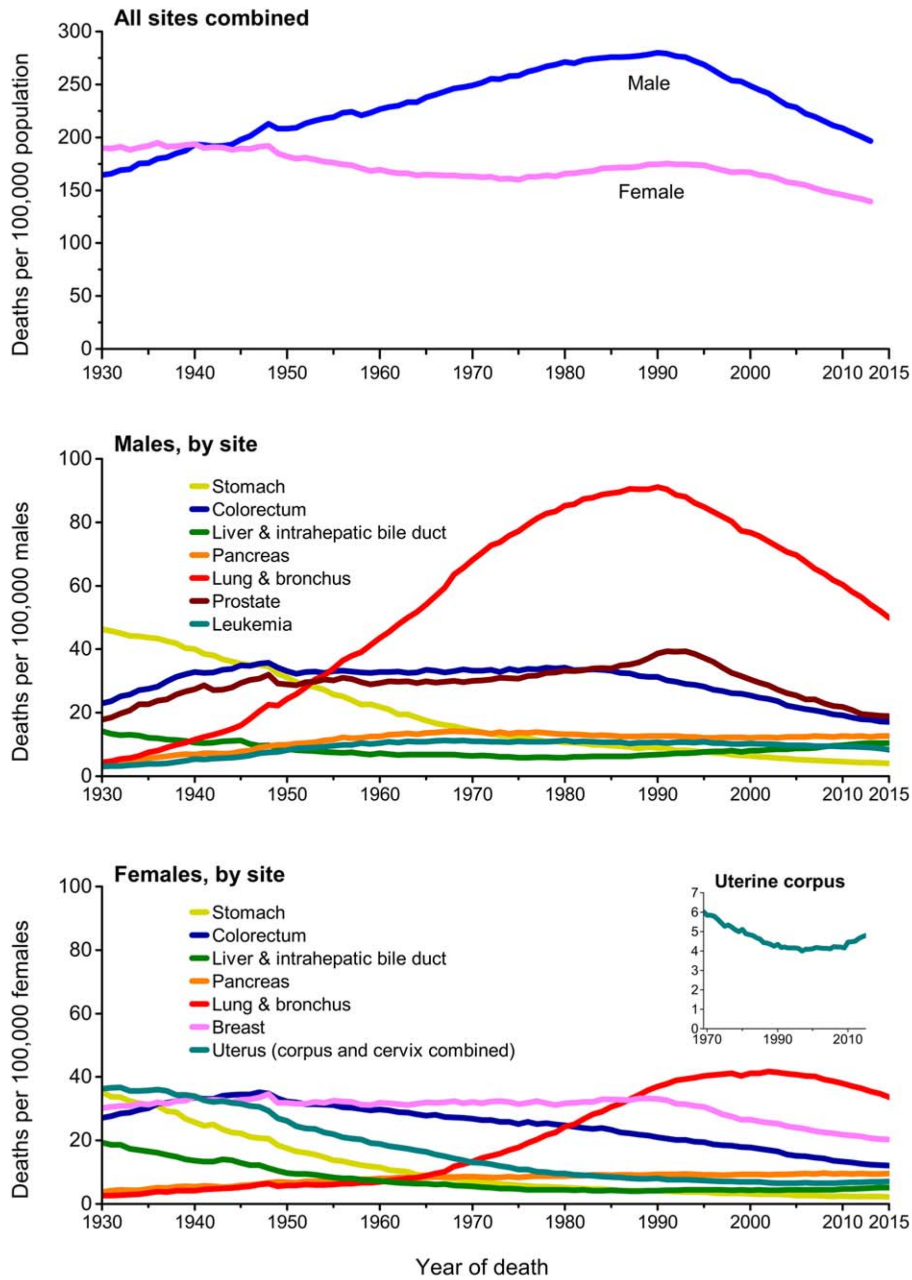


FIGURE 7. Trends in Cancer Death Rates by Sex Overall and for Selected Cancers, United States, 1930 to 2015.
Rates are age adjusted to the 2000 US standard population. Due to improvements in International Classification of Diseases (ICD) coding over time, numerator data for cancers of the lung and bronchus, 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.

In contrast to the rapid declines in CRC incidence overall, which are driven by trends in older age groups, rates in individuals aged younger than 55 years increased by almost 2% per year from the mid-1990s to 2014.[40]

Liver cancer incidence continues to increase rapidly in women, but appears to be plateauing in men since 2010 (Table 5). However, trends vary by age; from 2010 to 2014, rates increased annually by 1% to 2% in men and women aged younger than 40 years, decreased or were stable in men and women aged 40 to 59 years, and increased annually by 8% in individuals aged 60 to 69 years and by 3% in those aged 70 years and older.[40] There is potential to avert much of the future burden of liver cancer associated with hepatitis C virus (HCV) infection through increased HCV detection coupled with new, well-tolerated antiviral therapies that lower the risk of hepatocellular carcinoma.[41,42] Most HCV-infected individuals are undiagnosed, and 80% are baby boomers (those born between 1945 and 1965), for whom one-time screening has been recommended since 2012.[43,44] Several states have even mandated that health care providers offer HCV testing to appropriate patients.[45] However, of the

TABLE 6. Trends in Death Rates for Selected Cancers by Sex, United States, 1975 to 2015

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		TREND 6		2006-2015	2011-2015
	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	AAPC	AAPC
All sites														
Overall	1975-1984	0.5*	1984-1991	0.3*	1991-1994	−0.5	1994-1998	−1.3*	1998-2001	−0.8*	2001-2015	−1.5*	−1.5*	−1.5*
Male	1975-1979	1.0*	1979-1990	0.3*	1990-1993	−0.5	1993-2001	−1.5*	2001-2015	−1.8*			−1.8*	−1.8*
Female	1975-1990	0.6*	1990-1994	−0.2	1994-2002	−0.8*	2002-2015	−1.4*					−1.4*	−1.4*
Female breast	1975-1990	0.4*	1990-1995	−1.8*	1995-1998	−3.4*	1998-2015	−1.8*					−1.8*	−1.8*
Colorectum														
Male	1975-1979	0.6	1979-1987	−0.6*	1987-2002	−1.9*	2002-2005	−4.1*	2005-2015	−2.5*			−2.5*	−2.5*
Female	1975-1984	−1.0*	1984-2001	−1.8*	2001-2012	−2.9*	2012-2015	−1.4					−2.4*	−1.8*
Liver & intrahepatic bile duct														
Male	1975-1985	1.5*	1985-1996	3.8*	1996-1999	0.3	1999-2013	2.7*	2013-2015	0.6			2.2*	1.6*
Female	1975-1978	−1.5	1978-1988	1.4*	1988-1995	3.9*	1995-2000	0.4	2000-2008	1.5*	2008-2015	2.7*	2.4*	2.7*
Lung & bronchus														
Male	1975-1978	2.4*	1978-1984	1.2*	1984-1991	0.3*	1991-2005	−1.9*	2005-2012	−3.0*	2012-2015	−4.0*	−3.3*	−3.8*
Female	1975-1982	6.0*	1982-1990	4.2*	1990-1995	1.7*	1995-2003	0.3*	2003-2009	−1.1*	2009-2015	−2.3*	−1.9*	−2.3*
Melanoma of skin														
Male	1975-1987	2.4*	1987-1997	0.9*	1997-2000	−1.7	2000-2009	0.9*	2009-2013	−0.9	2013-2015	−5.0*	−1.3	−3.0*
Female	1975-1989	0.8*	1989-2015	−0.7*									−0.7*	−0.7*
Pancreas														
Male	1975-1986	−0.8*	1986-2000	−0.3*	2000-2015	0.3*							0.3*	0.3*
Female	1975-1984	0.8*	1984-2003	0.1	2003-2006	1.1	2006-2015	−0.0					−0.0	−0.0
Prostate	1975-1987	0.9*	1987-1991	3.0*	1991-1994	−0.5	1994-1998	−4.2*	1998-2013	−3.5*	2013-2015	−0.8	−2.9*	−2.2*
Uterine corpus	1975-1989	−1.6*	1989-1997	−0.7*	1997-2008	0.3*	2008-2015	1.9*					1.6*	1.9*

AAPC indicates average annual percent change; APC, annual percent change based on mortality rates age adjusted to the 2000 US standard population.

*The APC or AAPC is significantly different from zero ($P < .05$).

Note: Trends analyzed by the Joinpoint Regression Program, version 4.5.0.1, allowing up to 5 joinpoints.

more than 76 million estimated baby boomers in 2015, only 14% reported having received HCV testing.[46] Adding to the disease burden is a worrisome 2-fold increase in HCV infections from 2010 to 2014 (following a stable trend) driven by individuals aged 20-39 years as a consequence of the opioid epidemic.

The long-term, rapid rise in melanoma incidence appears to be slowing, particularly among younger age groups; from 2005 to 2014, rates were stable in men and women aged younger than 50 years (except for declines of 0.7% annually in men aged 40-49 years), while increasing more rapidly with advancing age in those aged 50 years and older. Incidence rates for thyroid cancer also may have begun to stabilize in recent years, particularly among whites,[8] in the wake of changes in clinical practice guidelines that include more conservative indications for biopsy and the reclassification of noninvasive follicular thyroid neoplasm with papillary-like nuclear features.[47-49]

TABLE 7. Ten Leading Causes of Death in the United States, 2014 and 2015

RANK		2014 NO.	2014 PERCENT	2014 RATE	2015 NO.	2015 PERCENT	2015 RATE	RELATIVE CHANGE IN RATE
	All Causes	**2,626,418**		**724.4**	**2,712,630**		**732.5**	**1.1%**
1	Heart disease	614,348	23%	166.8	633,842	23%	168.3	0.9%
2	Cancer	591,699	23%	161.3	595,930	22%	158.6	−1.7%
3	Chronic lower respiratory diseases	147,101	6%	40.6	155,041	6%	41.8	3.0%
4	Accidents (unintentional injuries)	136,053	5%	40.4	146,571	5%	43.1	6.7%
5	Cerebrovascular disease	133,103	5%	36.5	140,323	5%	37.6	3.0%
6	Alzheimer disease	93,541	4%	25.4	110,561	4%	29.4	15.7%
7	Diabetes mellitus	76,488	3%	21.0	79,535	3%	21.3	1.4%
8	Influenza and pneumonia	55,227	2%	15.1	57,062	2%	15.2	0.7%
9	Nephritis, nephrotic syndrome, & nephrosis	48,146	2%	13.2	49,959	2%	13.4	1.5%
10	Intentional self-harm (suicide)	42,773	2%	12.9	44,193	2%	13.3	3.1%

Death counts include unknown age.

Rates are per 100,000 population and age adjusted to the 2000 US standard population.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention.

TABLE 8. Ten Leading Causes of Death in the United States by Age and Sex, 2015

	ALL AGES		AGES 1 TO 19		AGES 20 TO 39		AGES 40 TO 59		AGES 60 TO 79		AGES ≥80	
	MALE All Causes 1,373,404	FEMALE All Causes 1,339,226	MALE All Causes 12,621	FEMALE All Causes 6,941	MALE All Causes 71,130	FEMALE All Causes 32,112	MALE All Causes 228,199	FEMALE All Causes 147,555	MALE All Causes 556,520	FEMALE All Causes 427,097	MALE All Causes 491,831	FEMALE All Causes 715,031
1	Heart diseases 335,002	Heart diseases 298,840	Accidents (unintentional injuries) 4,442	Accidents (unintentional injuries) 2,230	Accidents (unintentional injuries) 27,692	Accidents (unintentional injuries) 9,877	Heart diseases 51,810	Cancer 48,995	Cancer 170,331	Cancer 138,798	Heart diseases 141,863	Heart diseases 193,226
2	Cancer 313,818	Cancer 282,112	Assault (homicide) 1,797	Cancer 791	Intentional self-harm (suicide) 10,862	Cancer 4,420	Cancer 51,244	Heart diseases 22,614	Heart diseases 135,522	Heart diseases 79,944	Cancer 87,155	Cancer 89,081
3	Accidents (unintentional injuries) 92,919	Chronic lower respiratory diseases 82,543	Intentional self-harm (suicide) 1,792	Intentional self-harm (suicide) 682	Assault (homicide) 8,217	Intentional self-harm (suicide) 2,856	Accidents (unintentional injuries) 27,779	Accidents (unintentional injuries) 13,311	Chronic lower respiratory diseases 36,579	Chronic lower respiratory diseases 35,984	Chronic lower respiratory diseases 29,807	Alzheimer disease 66,730
4	Chronic lower respiratory diseases 72,498	Cerebrovascular diseases 82,035	Cancer 1,011	Assault (homicide) 457	Heart diseases 5,250	Heart diseases 2,629	Intentional self-harm (suicide) 12,357	Chronic lower respiratory diseases 6,063	Cerebrovascular disease 22,697	Cerebrovascular disease 20,931	Cerebrovascular disease 28,190	Cerebrovascular disease 55,301
5	Cerebrovascular diseases 58,288	Alzheimer disease 76,871	Congenital anomalies 530	Congenital anomalies 437	Cancer 4,040	Assault (homicide) 1,428	Chronic liver disease & cirrhosis 11,550	Chronic liver disease & cirrhosis 5,970	Diabetes mellitus 21,478	Diabetes mellitus 15,884	Alzheimer disease 26,711	Chronic lower respiratory diseases 40,096
6	Diabetes mellitus 43,123	Accidents (unintentional injuries) 53,652	Heart diseases 385	Heart diseases 278	Chronic liver disease & cirrhosis 1,172	Pregnancy, childbirth & puerperium 741	Diabetes mellitus 8,451	Cerebrovascular diseases 5,079	Accidents (unintentional injuries) 18,376	Accidents (unintentional injuries) 10,020	Influenza & pneumonia 14,712	Influenza & pneumonia 20,074
7	Intentional self-harm (suicide) 33,994	Diabetes mellitus 36,412	Chronic lower respiratory diseases 167	Influenza & pneumonia 112	Diabetes mellitus 981	Chronic liver disease & cirrhosis 700	Cerebrovascular disease 6,530	Diabetes mellitus 5,072	Chronic liver disease & cirrhosis 11,258	Alzheimer disease 9,940	Accidents (unintentional injuries) 13,861	Accidents (unintentional injuries) 17,674
8	Alzheimer disease 33,690	Influenza & pneumonia 30,159	Influenza & pneumonia 131	Chronic lower respiratory diseases 109	HIV disease 729	Diabetes mellitus 679	Chronic lower respiratory diseases 5,541	Intentional self-harm (suicide) 4,447	Nephritis, nephrotic syndrome & nephrosis 10,357	Nephritis, nephrotic syndrome & nephrosis 8,762	Diabetes mellitus 12,164	Diabetes mellitus 14,739
9	Influenza & pneumonia 26,903	Nephritis, nephrotic syndrome & nephrosis 24,518	Cerebrovascular disease 103	Cerebrovascular disease 84	Cerebrovascular disease 710	Cerebrovascular disease 601	Assault (homicide) 3,177	Septicemia 2,673	Influenza & pneumonia 8,999	Septicemia 8,233	Nephritis, nephrotic syndrome & nephrosis 11,890	Nephritis, nephrotic syndrome & nephrosis 13,476
10	Chronic liver disease & cirrhosis 25,666	Septicemia 21,388	Septicemia 79	Septicemia 78	Congenital anomalies 496	Septicemia 371	Septicemia 2,886	Nephritis, nephrotic syndrome & nephrosis 1,946	Septicemia 8,756	Influenza & pneumonia 7,663	Parkinson disease 10,764	Hypertension & hypertensive renal disease* 12,297

HIV indicates human immunodeficiency virus.

*Includes primary and secondary hypertension.

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.

Source: US Final Mortality Data, 2015, National Center for Health Statistics, Centers for Disease Control and Prevention, 2017.

TABLE 9. Five Leading Causes of Cancer Death by Age and Sex, United States, 2015

ALL AGES	<20	20 TO 39	40 TO 59	60 TO 79	≥80
MALE					
ALL SITES 313,818	**ALL SITES 1,042**	**ALL SITES 4,040**	**ALL SITES 51,244**	**ALL SITES 170,331**	**ALL SITES 87,155**
Lung & bronchus 83,648	Brain & ONS* 297	Brain & ONS* 546	Lung & bronchus 12,595	Lung & bronchus 51,361	Lung & bronchus 19,459
Prostate 28,848	Leukemia 282	Leukemia 518	Colorectum 5,913	Colorectum 13,728	Prostate 14,821
Colorectum 27,508	Bones & joints 118	Colorectum 489	Liver* 4,306	Prostate 12,722	Colorectum 7,377
Pancreas 21,392	Soft tissue (including heart) 84	Non-Hodgkin lymphoma 236	Pancreas 3,817	Pancreas 12,581	Urinary bladder 5,431
Liver* 17,414	Non-Hodgkin lymphoma 42	Soft tissue (including heart) 229	Esophagus 2,586	Liver* 10,302	Pancreas 4,860
FEMALE					
ALL SITES 282,112	**ALL SITES 813**	**ALL SITES 4,420**	**ALL SITES 48,995**	**ALL SITES 138,798**	**ALL SITES 89,081**
Lung & bronchus 70,074	Brain & ONS* 234	Breast 1,049	Breast 10,736	Lung & bronchus 39,925	Lung & bronchus 19,582
Breast 41,524	Leukemia 208	Uterine cervix 439	Lung & bronchus 10,387	Breast 18,762	Breast 10,976
Colorectum 24,888	Bone & joints 79	Colorectum 369	Colorectum 4,399	Pancreas 10,443	Colorectum 9,829
Pancreas 20,223	Soft tissue (including heart) 74	Brain & ONS* 355	Ovary 2,749	Colorectum 10,287	Pancreas 7,034
Ovary 13,920	Non-Hodgkin lymphoma 31	Leukemia 318	Pancreas 2,668	Ovary 7,375	Non-Hodgkin lymphoma 3,947

ONS indicates other nervous system.

*Includes intrahepatic bile duct.

Note: Ranking order excludes category titles that begin with the word "Other."

Cancer Survival

For all cancers combined, the 5-year relative survival rate is 68% in whites and 61% in blacks.[8] Figure 4 shows 5-year relative survival rates by cancer type and race during the most recent time period (2007-2013). For all stages combined, survival is highest for prostate cancer (99%), melanoma of the skin (92%), and female breast cancer (90%) and lowest for cancers of the pancreas (8%), lung (18%), and liver (18%). Survival is lower for black than for white patients for every cancer type shown in Figure 4 except cancers of the kidney and pancreas, with an absolute difference ≥10% for more than one-half of these. The largest differences are for melanoma (26%) and cancers of the uterine corpus (22%) and oral cavity and pharynx (18%), in part reflecting a much later stage at diagnosis in black patients (Fig. 5). Blacks are more likely than whites to be diagnosed with cancer at an advanced stage, but also have lower stage-specific survival for most cancer types. After adjusting for sex, age, and stage at diagnosis, the relative risk of death after a cancer diagnosis is 33% higher in black patients than in white patients.[50] The disparity is even more striking for American Indians/Alaska Natives, who are 51% more likely than whites to die from their cancer.

Cancer survival has improved since the mid-1970s for all of the most common cancers except those of the uterine cervix and uterine corpus,[50] although increased survival for some cancer types (eg, breast and prostate) is difficult to interpret because of changes in detection practice (eg, lead time bias). Progress has been especially rapid for hematopoietic and lymphoid malignancies due to improvements in treatment protocols, including the discovery of targeted therapies. For example, the 5-year relative survival rate for chronic myeloid leukemia increased from 22% for patients diagnosed in the mid-1970s to 68% for those diagnosed during 2007 through 2013.[8] Based on a review of clinical trial data, most patients with chronic myeloid leukemia who are treated with tyrosine

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

	ALL RACES COMBINED	NON-HISPANIC WHITE	NON-HISPANIC BLACK	ASIAN/PACIFIC ISLANDER	AMERICAN INDIAN/ ALASKA NATIVE*	HISPANIC
Incidence, 2010-2014						
All sites						
Male	501.9	510.7	560.9	302.8	425.3	386.3
Female	417.9	436.0	407.4	287.6	388.7	329.6
Breast (female)	123.6	128.7	125.5	90.8	100.7	91.9
Colon & rectum						
Male	45.9	45.2	56.4	37.0	50.1	41.9
Female	34.8	34.5	41.7	27.0	41.3	29.3
Kidney & renal pelvis						
Male	21.8	22.1	24.8	10.9	30.0	20.7
Female	11.3	11.3	12.9	4.9	17.4	12.0
Liver & intrahepatic bile duct						
Male	12.1	10.0	17.2	20.0	20.1	19.8
Female	4.2	3.4	5.1	7.6	8.8	7.6
Lung & bronchus						
Male	73	75.9	87.9	45.2	71.9	40.6
Female	52.8	57.6	50.1	27.9	55.9	25.2
Prostate	114.9	107.0	186.8	58.4	78.3	97.0
Stomach						
Male	9.2	7.9	14.3	14.1	11.6	12.9
Female	4.7	3.5	7.8	8.1	6.5	7.8
Uterine cervix	7.6	7.0	9.5	6.0	9.1	9.7
Mortality, 2011-2015						
All sites						
Male	196.7	200.7	246.1	120.4	181.4	140.0
Female	139.5	143.7	163.2	87.7	127.6	96.7
Breast (female)	20.9	20.8	29.5	11.3	14.3	14.2
Colon & rectum						
Male	17.3	16.9	25.1	12.0	20.2	14.6
Female	12.2	12.1	16.5	8.6	13.6	9.0
Kidney & renal pelvis						
Male	5.6	5.8	5.7	2.6	8.4	5.0
Female	2.4	2.5	2.4	1.1	4.1	2.3
Liver & intrahepatic bile duct						
Male	9.4	8.2	13.5	14.0	14.8	13.0
Female	3.8	3.4	4.7	6.0	7.0	5.9
Lung & bronchus						
Male	53.8	56.3	66.9	31.0	45.0	26.4
Female	35.4	39.0	34.4	17.7	30.6	13.3
Prostate	19.5	18.2	40.8	8.7	19.7	16.1
Stomach						
Male	4.3	3.4	8.5	6.8	7.3	6.7
Female	2.3	1.7	4.0	4.2	3.5	4.0
Uterine cervix	2.3	2.1	3.8	1.8	2.6	2.6

Rates are per 100,000 population and age adjusted to the 2000 US standard population. Nonwhite and nonblack race categories are not mutually exclusive of Hispanic origin.

*Data based on Indian Health Service Contract Health Service Delivery Areas (CHSDA) counties.

kinase inhibitors experience near normal life expectancy, particularly those diagnosed before age 65 years.[51] In general, oncology advances have benefitted patients aged 50 to 64 years more than their older counterparts, likely reflecting lower efficacy or use of new therapies in the elderly population.[52] Survival gains are also often stage specific; for example, patients with liver cancer diagnosed at a localized stage had among the largest absolute gains in survival over the past 3 decades, largely because of advances in liver transplantation, whereas those diagnosed with distant stage disease had no improvement.[50]

In contrast to the steady increase in survival observed for most cancer types, advances have been slow for lung and pancreatic cancers, which are typically diagnosed at a distant stage (Fig. 5), for which the 5-year survival rates are 5% and 3%, respectively. There is potential for lung cancer to be diagnosed at an earlier stage among high-risk individuals through the use of screening with low-dose computed tomography (LDCT), which has been shown to reduce lung cancer mortality by up to 20% among current and former smokers with a smoking history of 30 or more pack-years.[53,54] However, in 2015, only 4% of the 6.8 million

TABLE 11. State Variation in the Racial Disparity in Cancer Mortality in the United States, 2015

	NHW		NHB			
	RATE	COUNT	RATE	COUNT	NHB:NHW DRR (95% CI)	2011-2015 % FOREIGN-BORN NHB*
Total US	**163.3**	**467,198**	**185.8**	**68,522**	**1.14 (1.13–1.15)**	**9%**
Dist. of Columbia	110.9	221	209.4	792	1.89 (1.62–2.21)	6%
Wisconsin	158.8	10,568	206.2	535	1.30 (1.18–1.42)	3%
Illinois	171.1	19,166	214.0	3,845	1.25 (1.21–1.30)	3%
Louisiana	172.8	6,281	215.6	2,922	1.25 (1.19–1.31)	1%
Minnesota	152.8	9,227	186.9	300	1.22 (1.07–1.39)	30%
Nebraska	159.2	3,277	194.6	115	1.22 (1.00–1.48)	12%
Pennsylvania	166.2	25,110	202.0	2,659	1.22 (1.17–1.27)	7%
California	156.9	37,076	188.6	4,448	1.20 (1.16–1.24)	6%
Missouri	173.0	11,438	203.7	1,310	1.18 (1.11–1.25)	3%
South Carolina	162.8	7,258	191.5	2,528	1.18 (1.12–1.23)	1%
Texas	158.6	25,548	184.7	4,826	1.16 (1.13–1.20)	6%
Kansas	165.8	5,050	192.9	286	1.16 (1.02–1.32)	6%
New Jersey	160.0	12,492	184.9	2,116	1.16 (1.10–1.21)	16%
Maryland	154.8	6,982	178.7	3,033	1.15 (1.10–1.21)	11%
Michigan	166.5	17,484	192.0	2,607	1.15 (1.10–1.20)	2%
North Carolina	163.3	14,725	186.9	3,930	1.14 (1.10–1.19)	3%
Colorado	135.7	6,336	154.4	266	1.14 (1.00–1.29)	14%
Tennessee	180.2	12,023	204.8	1,954	1.14 (1.08–1.19)	3%
Alabama	173.3	7,854	196.4	2,387	1.13 (1.08–1.19)	1%
Oregon	163.4	7,486	185.1	110	1.13 (0.92–1.38)	16%
Ohio	175.0	22,246	197.7	2,744	1.13 (1.08–1.18)	4%
Arkansas	185.5	5,735	208.3	853	1.12 (1.04–1.21)	1%
Virginia	162.0	11,377	181.2	2,813	1.12 (1.07–1.17)	6%
Mississippi	184.3	4,407	204.0	2,017	1.11 (1.05–1.17)	0%
Oklahoma	185.3	6,965	202.4	505	1.09 (0.99–1.20)	3%
Georgia	165.1	11,812	179.2	4,614	1.09 (1.05–1.12)	5%
Indiana	178.5	12,237	191.5	997	1.07 (1.00–1.15)	3%
Connecticut	149.5	5,745	158.3	517	1.06 (0.96–1.16)	20%
New York	154.9	25,321	161.2	4,827	1.04 (1.01–1.07)	28%
West Virginia	191.2	4,672	197.0	139	1.03 (0.86–1.23)	3%
Florida	159.1	33,552	163.3	4,596	1.03 (0.99–1.06)	20%
Arizona	145.6	9,482	149.2	339	1.03 (0.91–1.15)	9%
Kentucky	198.3	9,577	200.7	628	1.01 (0.93–1.10)	4%
Delaware	169.7	1,617	169.0	323	1.00 (0.88–1.13)	7%
Nevada	174.3	3,918	173.2	386	0.99 (0.89–1.11)	7%
Washington	162.4	11,205	160.9	340	0.99 (0.88–1.11)	20%
New Mexico	151.4	2,153	139.5	56	0.92 (0.69–1.21)	7%
Massachusetts	154.7	11,168	137.3	561	0.89 (0.81–0.97)	34%
Iowa	166.6	6,327	143.3	84	0.86 (0.67–1.08)	13%
Rhode Island	169.3	2,048	136.0	68	0.80 (0.61–1.03)	29%

CI indicates confidence interval; DRR, death rate ratio; NHB, non-Hispanic black; NHW, non-Hispanic white.

States with ≥50 cancer deaths among NHB individuals.*Based on data from the 5-year American Community Survey, 2011-2015.

Gray shading indicates that the death rate for NHB individuals is statistically significantly higher than that for NHW individuals.

No shading indicates that there is no statistical difference between the death rate for NHB and NHW individuals.

Blue shading indicates that the death rate for NHB individuals is statistically significantly lower than that for NHW individuals.

eligible Americans reported being screened for lung cancer with LDCT.[55]

Trends in Cancer Mortality

Mortality trends are the best indicator of progress against cancer because they are less affected by detection practices than incidence and survival.[56] The overall cancer death rate rose during most of the 20th century, largely driven by rapid increases in lung cancer deaths among men as a consequence of the tobacco epidemic, but has declined by about 1.5% per year since the early 1990s. From its peak of 215.1 (per 100,000 population) in 1991, the cancer death rate dropped 26% to 158.6 in 2015. This decline, which is larger in men (32% since 1990) than in women (23% since 1991), translates to approximately 2,378,600 fewer cancer deaths (1,639,100 in men and 739,500 in women) than what would have occurred if peak rates had persisted (Fig. 6).

The decline in cancer mortality over the past 2 decades is primarily the result of steady reductions in smoking and advances in early detection and treatment, reflected in considerable decreases for the 4 major cancers (lung, breast, prostate, and colorectum) (Fig. 7). Specifically, the death rate dropped

TABLE 12. Incidence Rates for Selected Cancers by State, United States, 2010 to 2014

	ALL CANCERS		BREAST	COLORECTUM		LUNG & BRONCHUS		NON-HODGKIN LYMPHOMA		PROSTATE	URINARY BLADDER	
STATE	MALE	FEMALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	MALE	FEMALE
Alabama	533.2	394.9	119.6	52.2	36.9	92.5	52.1	19.6	14.0	129.3	34.0	7.6
Alaska	447.7	411.9	125.4	46.6	40.2	67.5	53.3	20.9	13.5	91.4	33.8	9.6
Arizona	413.8	375.0	112.4	39.2	29.8	56.0	45.4	18.4	13.4	80.8	32.2	8.0
Arkansas	528.0	398.1	112.7	50.1	37.1	99.0	60.7	20.4	14.8	120.7	36.0	7.4
California	459.3	388.5	120.7	42.5	32.6	51.0	39.9	22.8	15.3	109.3	31.4	7.4
Colorado	445.4	390.2	123.7	37.9	30.8	48.3	41.6	21.1	14.5	110.9	32.7	8.1
Connecticut	526.7	458.4	139.2	44.4	34.3	69.7	56.8	25.6	17.2	118.8	46.9	12.4
Delaware	570.7	456.4	133.1	43.5	32.9	81.3	62.9	25.4	17.3	141.6	42.2	10.9
Dist. of Columbia	534.4	446.1	143.5	48.7	40.3	67.4	49.5	22.5	13.1	159.7	23.3	9.0
Florida	479.4	396.9	115.5	42.5	32.3	71.4	53.1	21.0	14.5	103.6	33.2	8.2
Georgia	534.1	410.9	123.5	48.9	35.6	84.6	52.2	21.9	14.7	129.3	33.3	7.8
Hawaii	444.1	407.4	136.0	51.3	36.5	56.9	38.1	22.1	14.6	90.1	23.7	5.7
Idaho	477.5	410.5	120.5	39.8	32.5	55.7	46.8	21.9	15.4	119.7	37.9	8.7
Illinois	520.1	437.9	130.0	52.5	38.1	79.2	57.8	23.5	16.3	119.4	37.5	9.4
Indiana	494.3	425.6	120.1	48.8	38.5	88.9	60.8	22.8	16.1	95.7	36.7	9.1
Iowa	529.6	439.5	122.8	51.7	39.8	78.3	53.0	26.9	18.1	112.2	38.4	9.0
Kansas*	521.8	430.0	123.5	47.4	36.1	73.1	52.8	24.0	16.8	124.1	38.8	9.3
Kentucky	590.8	472.7	123.3	59.3	42.4	116.3	79.7	25.2	16.7	113.0	40.2	10.1
Louisiana	576.5	420.8	123.2	56.0	41.4	90.8	54.9	23.9	16.7	144.4	33.5	7.7
Maine	517.6	454.0	125.5	42.7	34.3	83.9	65.3	22.8	18.2	99.8	47.5	12.4
Maryland	502.5	421.0	131.0	42.6	33.3	66.6	52.0	20.7	15.1	131.5	37.0	9.4
Massachusetts	504.1	449.3	136.1	42.9	33.7	70.3	60.5	23.4	16.6	114.2	40.5	11.3
Michigan	516.4	426.3	122.2	44.0	34.0	77.2	58.8	24.4	16.9	126.3	39.1	10.2
Minnesota*	510.9	434.6	130.2	43.8	34.7	61.8	50.2	27.1	18.1	119.4	38.5	9.6
Mississippi	558.7	407.4	115.5	58.2	41.8	101.4	56.3	20.9	14.3	135.5	30.9	7.4
Missouri	502.0	427.6	125.9	49.7	36.6	89.0	64.3	22.6	15.4	101.0	33.8	8.7
Montana	485.9	424.7	123.1	44.2	34.1	60.9	53.8	22.6	16.3	116.6	36.0	10.1
Nebraska	507.5	416.0	121.8	49.9	38.2	71.8	50.2	24.8	16.9	119.6	37.1	8.2
Nevada*,†	504.8	403.2	114.3	50.7	36.4	71.9	60.5	20.4	14.9	136.8	39.0	10.8
New Hampshire	527.5	463.1	140.4	40.9	34.2	71.2	63.3	25.3	17.4	123.5	48.1	12.1
New Jersey	543.0	452.9	132.0	47.9	37.8	65.6	52.5	25.5	17.9	139.4	41.5	10.6
New Mexico*,‡	417.1	363.8	112.6	40.2	30.5	49.1	36.3	17.6	13.2	99.4	26.1	6.0
New York	546.4	451.0	129.0	46.9	35.7	69.9	54.2	26.3	17.8	136.8	41.0	10.5
North Carolina	527.9	421.4	129.4	43.7	33.0	88.5	56.1	21.4	14.5	125.0	35.5	8.8
North Dakota	510.4	414.5	121.4	53.8	40.0	70.8	48.9	22.8	18.2	123.2	37.0	8.7
Ohio	504.6	424.4	122.9	47.9	35.8	83.7	59.0	22.9	15.3	111.8	38.6	9.2
Oklahoma	502.0	412.3	117.8	48.6	36.9	86.6	58.7	22.1	15.0	108.3	33.6	7.9
Oregon	467.9	419.2	126.0	40.8	31.2	63.1	53.4	22.4	15.8	101.1	38.0	8.9
Pennsylvania	543.9	461.3	129.8	49.9	37.5	78.3	56.1	26.0	17.9	117.5	43.9	11.1
Rhode Island	518.5	457.9	130.3	41.2	34.7	77.7	63.7	26.5	18.1	108.5	45.1	12.8
South Carolina	521.3	411.9	127.2	44.7	33.8	85.7	53.7	20.0	14.0	121.4	34.7	8.6
South Dakota	498.4	428.1	130.7	51.6	38.8	69.7	50.8	24.6	16.1	116.8	35.1	8.9
Tennessee	529.2	418.7	121.1	46.8	36.4	95.7	61.0	21.5	14.9	119.1	34.5	8.0
Texas	465.1	380.2	111.5	46.3	32.2	68.0	44.7	21.5	15.0	99.4	27.4	6.4
Utah	457.4	373.9	114.7	35.5	27.7	32.7	24.1	23.2	15.1	130.6	29.8	6.0
Vermont	493.3	437.4	130.1	39.3	33.0	71.8	59.7	26.5	17.5	98.4	38.9	10.6
Virginia	460.8	398.7	126.9	41.1	33.1	73.1	50.8	20.9	14.1	107.6	31.1	8.2
Washington	502.1	437.9	134.9	40.9	32.9	65.5	53.7	25.3	16.7	116.3	37.6	9.3
West Virginia	523.7	443.8	114.8	53.1	40.9	98.7	66.2	21.8	16.0	99.6	39.9	10.5
Wisconsin	515.8	437.3	127.9	43.6	33.6	69.5	54.8	25.5	17.3	116.0	39.9	10.0
Wyoming	447.2	382.5	113.5	41.7	30.5	49.4	44.1	19.7	13.3	108.5	36.0	9.3
United States	**501.9**	**417.9**	**123.6**	**45.9**	**34.8**	**73.0**	**52.8**	**22.9**	**15.8**	**114.9**	**35.8**	**8.8**

Rates are per 100,000 population and age adjusted to the 2000 US standard population.

*This state's data are not included in the US combined rates because they did not consent (Kansas) or because they did not meet high-quality standards for one or more years during 2010 to 2014 according to the North American Association of Central Cancer Registries (NAACCR).

†Rates are based on incidence data for 2008 to 2010.

‡Rates are based on incidence data for 2010 to 2012.

TABLE 13. Death Rates for Selected Cancers by State, United States, 2011 to 2015

	ALL SITES		BREAST	COLORECTUM		LUNG & BRONCHUS		NON-HODGKIN LYMPHOMA		PANCREAS		PROSTATE
STATE	MALE	FEMALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
Alabama	231.6	145.7	21.8	20.1	13.4	73.7	38.2	7.3	4.5	13.4	9.8	22.7
Alaska	196.1	146.5	19.7	17.4	13.6	53.1	40.0	7.3	4.1	11.1	10.8	18.5
Arizona	170.6	124.9	19.4	15.2	10.9	41.5	30.1	6.5	4.2	11.5	8.9	17.8
Arkansas	234.2	152.5	21.6	21.2	14.1	78.5	43.7	7.4	4.6	12.6	9.2	20.0
California	173.8	128.2	20.2	15.6	11.4	38.2	27.4	7.0	4.3	11.8	9.1	19.7
Colorado	163.7	122.2	19.0	14.3	10.7	34.0	27.3	6.5	3.8	10.7	8.4	21.4
Connecticut	178.4	130.8	18.3	13.5	10.4	43.9	32.9	7.1	4.2	12.1	9.8	17.9
Delaware	201.6	149.2	21.6	16.1	11.1	59.4	40.9	7.7	4.4	13.8	10.3	18.1
Dist. of Columbia	205.0	159.1	28.9	18.3	14.7	47.2	32.7	6.1	3.2	15.6	11.5	32.3
Florida	185.8	130.4	19.8	15.9	11.1	52.1	34.5	7.0	4.1	12.0	8.9	17.2
Georgia	209.2	138.9	22.1	19.3	12.4	62.2	34.5	7.1	4.2	12.3	9.1	22.5
Hawaii	164.9	114.9	15.9	16.7	10.3	40.0	25.1	6.7	3.8	12.8	9.9	13.7
Idaho	183.5	132.4	20.5	15.7	10.9	41.9	31.3	8.0	5.0	12.9	9.5	23.6
Illinois	205.9	148.4	22.3	18.9	13.1	57.3	38.3	7.7	4.5	12.8	9.6	20.5
Indiana	221.4	152.1	21.4	19.0	13.4	68.4	42.2	8.3	5.1	13.0	9.6	20.4
Iowa	204.1	141.6	19.2	18.2	13.6	58.0	36.0	8.7	5.1	12.7	9.3	19.5
Kansas	198.1	143.1	20.0	17.9	12.6	55.9	38.3	7.4	4.8	12.9	10.2	18.8
Kentucky	245.7	165.9	21.7	20.7	14.1	86.6	53.5	8.7	4.9	13.1	9.7	19.5
Louisiana	233.4	154.5	23.6	21.3	14.6	70.6	40.7	8.7	4.7	15.2	11.3	21.5
Maine	211.8	150.1	18.0	15.4	11.7	63.3	42.4	7.8	5.3	11.9	10.8	19.6
Maryland	193.9	141.0	22.4	17.1	11.9	50.0	35.4	7.1	4.2	13.8	10.0	20.1
Massachusetts	191.3	138.1	18.5	15.1	10.9	49.5	36.9	6.9	4.3	12.7	10.0	18.8
Michigan	205.3	149.5	21.7	17.3	12.3	58.6	40.9	8.7	5.0	13.3	10.3	19.0
Minnesota	184.7	134.3	18.6	14.7	11.3	45.8	33.6	8.4	5.0	12.4	9.0	19.9
Mississippi	249.9	156.0	23.3	23.4	15.5	80.3	40.5	7.3	4.0	15.1	11.2	25.2
Missouri	213.9	152.4	22.2	18.7	12.9	67.3	44.0	7.3	4.4	12.9	9.8	18.0
Montana	181.1	138.3	20.2	16.3	11.1	45.7	37.4	7.0	4.2	10.8	9.5	20.2
Nebraska	194.8	137.1	20.0	18.3	13.6	52.5	34.4	7.4	4.7	12.4	8.8	20.2
Nevada	188.8	143.8	22.2	19.6	13.6	51.2	40.6	6.5	3.8	12.1	8.8	20.5
New Hampshire	196.4	142.1	19.6	13.6	12.5	52.6	40.5	7.0	4.3	13.1	9.2	19.8
New Jersey	186.2	139.0	22.4	17.9	12.4	45.9	32.9	7.3	4.3	13.1	10.2	18.5
New Mexico	173.0	123.6	18.9	16.8	11.5	36.3	26.2	6.1	4.1	10.9	8.4	20.3
New York	183.5	135.9	20.2	16.4	11.8	47.5	32.9	7.2	4.3	12.9	9.9	18.7
North Carolina	210.7	140.4	21.3	17.0	11.7	65.0	37.1	7.3	4.4	12.7	9.4	20.7
North Dakota	186.9	128.7	17.5	17.0	12.0	50.6	31.3	6.7	4.7	12.3	8.7	19.4
Ohio	215.9	153.5	22.9	19.1	13.4	64.6	42.1	8.3	4.9	13.3	10.2	19.5
Oklahoma	225.3	156.5	23.0	20.9	14.1	70.0	44.6	8.2	4.8	12.3	9.7	20.5
Oregon	193.1	143.9	20.2	16.1	12.0	48.3	37.8	7.7	4.7	13.0	9.7	21.1
Pennsylvania	207.1	147.1	21.9	18.4	13.2	57.1	36.5	8.1	4.7	13.7	10.1	19.2
Rhode Island	206.8	140.6	18.5	16.2	11.9	58.8	41.2	6.6	4.5	12.9	9.1	19.2
South Carolina	218.7	143.2	22.3	18.0	12.6	65.0	36.6	7.0	4.3	13.1	9.7	22.5
South Dakota	192.3	136.5	19.9	19.3	13.0	52.8	35.6	7.3	4.0	11.6	9.1	18.7
Tennessee	230.7	152.7	22.0	19.7	13.6	75.1	43.2	8.2	4.8	12.6	9.8	19.9
Texas	190.4	131.2	20.2	17.9	11.6	49.8	30.6	7.1	4.3	11.6	8.9	18.1
Utah	148.8	110.3	20.3	13.0	9.7	23.9	15.9	6.7	4.6	11.2	8.6	20.4
Vermont	197.7	144.7	19.0	15.6	12.4	51.3	39.6	8.5	4.2	12.9	9.8	19.4
Virginia	198.0	139.7	21.8	16.7	11.8	55.4	35.4	7.3	4.4	12.9	9.5	20.2
Washington	187.9	138.3	19.9	14.8	11.0	47.5	35.3	7.9	4.7	12.3	9.5	20.1
West Virginia	233.4	163.2	22.2	21.7	15.6	75.7	45.7	7.8	5.0	12.4	9.1	17.6
Wisconsin	198.3	141.6	20.0	16.1	11.7	51.8	36.4	8.0	4.7	13.3	10.1	21.2
Wyoming	170.7	130.0	18.5	16.9	10.1	39.8	31.8	6.8	4.6	10.3	8.6	16.3
United States	**196.7**	**139.5**	**20.9**	**17.3**	**12.2**	**53.8**	**35.4**	**7.4**	**4.5**	**12.6**	**9.5**	**19.5**

Rates are per 100,000 population and age adjusted to the 2000 US standard population.

39% from 1989 to 2015 for female breast cancer, 52% from 1993 to 2015 for prostate cancer, and 52% from 1970 to 2015 for CRC. Lung cancer death rates declined 45% from 1990 to 2015 among males and 19% from 2002 to 2015 among females due to reduced tobacco use because of increased awareness of the health hazards of smoking and the implementation of comprehensive tobacco control.[57] The rapid declines in prostate cancer mortality, attributed to earlier detection due to PSA testing and advances in treatment,[58] appear to be plateauing in recent years in men aged younger than 70 years.[1] Similarly, CRC death rates increased slightly in individuals aged younger than 55 years since the mid-2000s,[59] despite rapid declines in older age groups.

In contrast to the overall declining trends for the 4 major cancers, death rates rose during 2011 through 2015 for liver cancer by 2.7% per year in women and by 1.6% per year in men, as well as for uterine corpus cancer by about 2% per year and for pancreatic cancer in men by 0.3% per year (Table 6). Death rates also increased slightly for cancers of the brain and other nervous system in both sexes and the oral cavity and pharynx in men.[1]

Recorded Number of Deaths in 2015

A total of 2,712,630 deaths were recorded in the United States in 2015, 22% of which were from cancer (Table 7). Of the 10 leading causes of death, cancer was the only one for which the age-standardized death rate declined from 2014 to 2015 (by 1.7%).[60] Cancer is the second leading cause of death after heart disease in both men and women nationally, but is the leading cause of death in many states[61] and in Hispanic and Asian Americans.[62,63] Cancer is the first or second leading cause of death for every age group shown in Table 8 among females, whereas accidents, assault, and suicide predominate among males aged younger than 40 years.

Table 9 presents the number of deaths in 2015 for the 5 leading cancer types by age and sex. Among men, the leading cause of cancer death is brain and other nervous system tumors before age 40 years and lung cancer in those of older ages. Among women, the leading cause of cancer death is brain and other nervous system tumors before age 20 years, breast cancer from ages 20 to 59 years, and lung cancer thereafter. Notably, cervical cancer is the second leading cause of cancer death in women aged 20 to 39 years, underscoring the need for increased screening in young women, as well higher uptake of the human papillomavirus (HPV) vaccination. In 2016, only one-half (49.5%) of females aged 13 to 17 years were up to date with HPV vaccination.[64]

Cancer Disparities by Race/Ethnicity

Cancer occurrence and outcomes vary considerably between racial and ethnic groups, largely because of inequalities in wealth that lead to differences in risk factor exposures and barriers to high-quality cancer prevention, early detection, and treatment.[65,66] Cancer incidence and mortality are generally highest among NHBs and lowest among Asian/Pacific Islanders (Table 10). The overall cancer incidence rate in NHB men is 85% higher than that in Asian/Pacific Islander men and 10% higher than that in NHW men, although rates are higher in NHWs compared with NHBs for men aged younger than 45 years and older than 80 years. Notably, NHB women have 7% lower cancer incidence than NHW women because of lower rates of breast and lung cancer, but 14% higher overall cancer mortality.

In men and women combined, the cancer death rate in 2015 was 14% higher in NHBs than in NHWs (death rate ratio [DRR], 1.14; 95% confidence interval [95% CI], 1.13-1.15), down from a peak of 33% in 1993. However, the racial gap was substantially larger for individuals aged younger than 65 years (DRR, 1.31; 95% CI, 1.29-1.32) than for those aged 65 years or older (DRR, 1.07; 95% CI, 1.06-1.09), probably in part due to universal health care access for seniors through Medicare. Racial inequalities have also been shown to vary substantially across states.[33] Among the 40 states (including DC) for which there was a sufficient number (≥50) of cancer deaths in NHBs for stable estimates, the DRR in blacks

TABLE 14. Five-Year Relative Survival Rate (%) for the Most Common Childhood and Adolescent Cancers, United States, 2007 to 2013

	BIRTH TO 14	15 TO 19
All ICCC groups combined	83.0	84.2
Lymphoid leukemia	90.5	74.2
Acute myeloid leukemia	65.1	61.5
Hodgkin lymphoma	97.6	96.1
Non-Hodgkin lymphoma	90.6	87.1
Central nervous system neoplasms	72.5	78.9
Neuroblastoma & other peripheral nervous cell tumors	79.0	62.8*
Retinoblastoma	95.2	†
Renal tumors	91.8	72.7*
Hepatic tumors	79.0	50.9*
Osteosarcoma	69.8	65.5
Ewing tumor & related bone sarcomas	77.7	61.5
Soft tissue and other extraosseous sarcomas	74.6	68.2
Rhabdomyosarcoma	69.8	45.9
Germ cell and gonadal tumors	92.4	92.0
Thyroid carcinoma	99.4	99.5
Malignant melanoma	93.3	94.0

ICCC indicates International Classification of Childhood Cancer.

Survival rates are adjusted for normal life expectancy and are based on follow-up of patients through 2014.

*The standard error of the survival rate is between 5 and 10 percentage points.

†Statistic could not be calculated due to fewer than 25 cases during 2007 to 2013.

versus whites ranged from 1.89 (95% CI, 1.62-2.21) in DC to 0.89 (95% CI, 0.81-0.97) in Massachusetts (Table 11). Death rates were not statistically significantly different in 13 states, albeit some of which had few deaths. Importantly, a lack of racial disparity is not always indicative of progress. For example, Kentucky and West Virginia, for which death rates were not statistically different by race, have the highest cancer death rates in NHWs of all states while DC, with the largest disparity, has the lowest rate. Among individuals aged 65 years and older, death rates were lower in NHBs than in NHWs in New York (871.3 per 100,000 population vs 909.6) as well as Massachusetts (754.0 per 100,000 population vs 925.3), and were not statistically significantly different in one-half (19 of 37) of states. Notably, among those aged younger than 65 years, the disparity was ≥45% in DC (DRR, 2.89; 95% CI, 2.16-3.91), Wisconsin (DRR, 1.78; 95% CI, 1.56-2.02), Kansas (DRR, 1.51; 95% CI, 1.25-1.81), Louisiana (DRR, 1.49; 95% CI, 1.38-1.60), Illinois (DRR, 1.48; 95% CI, 1.39-1.57), and California (DRR, 1.45; 95% CI, 1.38-1.54); of these 6 states, all but Kansas also had statistically significantly higher rates in blacks aged 65 years and older.

Some of the variation in racial disparities by state may reflect the growing number of black immigrants, who are healthier and older than their native-born counterparts, and now account for 9% of the US black population. The number of foreign-born blacks more than doubled over the past 2 decades, from 1.4 million in 1990 to 3.8 million in 2013, and is highly concentrated in the Northeast and the South.[67] The proportion of the black population that was foreign born in 2011-2015 was ≥28% in 10 states, including New York (28%) and Massachusetts (34%) (Table 11). Immigrant populations have lower disease rates than those born in the United States, partly because of more favorable characteristics such as lower smoking and obesity prevalence.[68-70] One study found that foreign-born blacks in the United States have cancer mortality rates that are about 10% lower than those of native NHWs and 40% lower than those of native blacks.[68] Comprehensive health care reform in Massachusetts, which began rolling out in 2006 and has achieved near-universal insurance coverage, has been associated with mortality reductions[71] and may have also contributed to the state's success in eliminating racial disparities.

Geographic Variation in Cancer Occurrence

Tables 12 and 13 show cancer incidence and mortality rates for selected cancers by state. State variation in cancer incidence results from differences in medical detection practice and the prevalence of risk factors, such as smoking, obesity, and other health behaviors. For example, the large geographic variation in HPV vaccination coverage, which ranged from 29% in Mississippi and South Carolina to 71% in Rhode Island in 2016,[64] may contribute to future differential patterns in HPV-associated cancers.[72,73] Geographic disparities, which have increased over time,[74,75] often reflect the national distribution of poverty. This trend may be exacerbated by widening inequalities in access to health care because of state differences in Medicaid expansion and other initiatives to improve insurance coverage.[76,77]

The largest geographic variation in cancer occurrence by far is for lung cancer, reflecting the large historical and continuing differences in smoking prevalence between states.[57] For example, lung cancer incidence rates in Kentucky (116 per 100,000 population in men and 80 per 100,000 population in women), where smoking prevalence continues to be highest, are about 3.5 times higher than those in Utah (33 per 100,000 population in men and 24 per 100,000 population in women), where smoking prevalence is lowest. In 2015, more than one-quarter (26%) of residents in Kentucky and West Virginia were current smokers compared with 9% in Utah.[78] Smoking history similarly predicts state disparities in smoking-attributable mortality; the proportion of total cancer deaths caused by smoking in 2014 was 38% in men and 29% in women in Kentucky, compared with 22% and 11%, respectively, in Utah.

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. In 2018, an estimated 10,590 children (birth to 14 years) will be diagnosed with cancer (excluding benign/borderline malignant brain tumors) and 1,180 will die from the disease. Benign and borderline malignant brain tumors are not included in the 2018 case estimates because the calculation method requires historical data and these tumors were not required to be reported to cancer registries until 2004.

Leukemia accounts for 29% of all childhood cancers (including benign and borderline malignant brain tumors), three-quarters of which are lymphoid. Brain and other nervous system tumors are second most common (26%), of which approximately one-quarter are benign/borderline malignant. The third most common category is lymphomas and reticuloendothelial neoplasms (12%), almost one-half of which are non-Hodgkin lymphoma (including Burkitt lymphoma) and one-quarter of which are Hodgkin lymphoma. Soft tissue sarcomas (almost one-half of which are rhabdomyosarcoma) and neuroblastoma each account for 6% of childhood cancers, followed by renal (Wilms) tumors (5%).[9]

Cancers in adolescents (aged 15 to 19 years) differ somewhat from those in children in terms of type and distribution. For example, brain and other nervous system tumors (21%) (more than one-half [58%] of which are benign/borderline malignant) and lymphoma (20%) are equally common, and there are almost twice as many cases of Hodgkin lymphoma as non-Hodgkin lymphoma. Leukemia is third (13%), followed by germ cell and gonadal tumors (11%) and thyroid carcinoma (11%). Melanoma of the skin accounts for 4% of the cancers diagnosed in adolescents.

Although overall cancer incidence in children and adolescents has been increasing slightly (by 0.6% per year) since 1975, rates appear to have stabilized over the past 5 data years. In contrast, death rates in individuals aged birth to 19 years have declined continuously, from 6.5 (per 100,000 population) in 1970 to 2.3 in 2015, an overall reduction of 65% (67% in children and 61% in adolescents). The 5-year relative survival rate for all cancers combined improved from 58% during the mid-1970s to 83% during 2007 through 2013 for children and from 68% to 84% for adolescents. However, survival varies substantially by cancer type and age at diagnosis (Table 14).

Limitations

Although the estimated numbers of new cancer cases and deaths expected to occur in 2018 provide a reasonably accurate portrayal of the contemporary cancer burden, they are model-based, 3-year- or 4-year-ahead projections that should be interpreted with caution and not be used to track trends over time. First, the estimates may be affected by changes in methodology as we take advantage of improvements in 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 2014 for incidence and 2015 for mortality) and cannot anticipate abrupt fluctuations for cancers affected by changes in detection practice (eg, PSA testing and prostate cancer). Third, the model can be oversensitive to sudden or large changes in observed data. The most informative metrics for tracking cancer trends are age-standardized or age-specific cancer death rates from the NCHS and cancer incidence rates from SEER, NPCR, and/or NAACCR.

Errors in reporting race/ethnicity in medical records and on death certificates may result in underestimates of cancer incidence and mortality rates in nonwhite and nonblack populations. This is particularly relevant for American Indian/Alaska Native 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 substantial and important differences in the cancer burden within these subpopulations. For example, although Hispanics in the United States have the lowest lung cancer mortality overall (one-half that in NHWs), within this population, rates in Cuban men approach those of NHW men.[79] Similarly, lung cancer rates are equivalent in Hawaiian and NHW men, but about 50% lower in Asian/Pacific Islanders overall.[63] Thus, the high burden of lung and other cancers among Cuban Americans and Hawaiians is completely concealed by the presentation of aggregated data.

Conclusions

The continuous decline in cancer death rates over 2 decades has resulted in an overall drop of 26%, resulting in approximately 2.4 million fewer cancer deaths during this time period. While the racial gap in cancer mortality continues to narrow, this progress primarily reflects older age groups, masking stark persistent inequalities for young and middle-aged black Americans. High cancer mortality in Kentucky and West Virginia, irrespective of race, highlights the strong influence of socioeconomic and health policy factors on the cancer burden. Nevertheless, the elimination of racial disparities in many states, let alone lower cancer mortality in blacks in Massachusetts and New York, demonstrates the potential for the nation. Advancing the fight against cancer for all citizens requires broader application of existing cancer control knowledge, including smoking cessation and the increased uptake of cancer-preventing cervical and colorectal cancer screening and HPV vaccination, across all segments of the population, with an emphasis on disadvantaged groups. ■

References

1. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Mortality-All COD, Total US (1969-2015) <Early release with Vintage 2014 Katrina/Rita Population Adjustment>-Linked To County Attributes-Total US, 1969-2015 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch; 2017; underlying mortality data provided by National Center for Health Statistics 2017.
2. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Mortality-All COD, Total US (1990-2015) <Early release with Vintage 2015 Katrina/Rita Population Adjustment>-Linked To County Attributes-Total US, 1969-2015 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program; 2017; underlying mortality data provided by National Center for Health Statistics 2017.
3. Wingo PA, Cardinez CJ, Landis SH, et al. Long-term trends in cancer mortality in the United States, 1930-1998. *Cancer*. 2003; 97(suppl 12):3133-3275.
4. Murphy SL, Kochanek KD, Xu J, Heron M. Deaths: Final Data for 2012. National Vital Statistics Reports. Vol 63. No. 9. Hyattsville, MD: National Center for Health Statistics; 2015.
5. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Incidence-SEER 9 Regs Research Data, Nov. 2016 Sub (1973-2014) <Katrina/Rita Population Adjustment>-Linked To County Attributes-Total US, 1969-2015 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program; 2017.
6. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Incidence-SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov. 2016 Sub (2000-2014) <Katrina/Rita Population Adjustment>-Linked To County Attributes-Total US, 1969-2015 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch; 2017.
7. Statistical Research and Applications Branch. DevCan: Probability of Developing or Dying of Cancer Software. Version 6.7.5. Bethesda, MD: Surveillance Research Program, Statistical Methodology and Applications, National Cancer Institute; 2017.
8. Howlader N, Noone AM, Krapcho M, et al. SEER Cancer Statistics Review, 1975-2014. Bethesda, MD: National Cancer Institute; 2017.
9. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: North American Association of

Central Cancer Registries (NAACCR) Incidence Data-CiNA Analytic File, 1995-2014, for Expanded Races, Custom File With County, ACS Facts and Figures Projection Project (Which Includes Data From CDC's National Program of Cancer Registries [NPCR], CCCR's Provincial and Territorial Registries, and the NCI's Surveillance, Epidemiology, and End Results [SEER] Registries). Bethesda, MD: North American Association of Central Cancer Registries; 2017.

10. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: North American Association of Central Cancer Registries (NAACCR) Incidence Data-CiNA Analytic File, 1995-2014, for NHIAv2 Origin, Custom File With County, ACS Facts and Figures Projection Project (Which Includes Data From CDC's National Program of Cancer Registries [NPCR], CCCR's Provincial and Territorial Registries, and the NCI's Surveillance, Epidemiology, and End Results [SEER] Registries). Bethesda, MD: North American Association of Central Cancer Registries; 2017.

11. Copeland G, Lake A, Firth R, et al. Cancer in North America: 2010-2014. Vol 1. Combined Cancer Incidence for the United States, Canada and North America. Springfield, IL: North American Association of Central Cancer Registries Inc; 2017.

12. Copeland G, Lake A, Firth R, et al. Cancer in North America: 2010-2014. Vol 2. Registry-Specific Cancer Incidence in the United States and Canada. Springfield, IL: North American Association of Central Cancer Registries Inc; 2017.

13. Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of Childhood Cancer, Third Edition. *Cancer.* 2005;103:1457-1467.

14. Fritz A, Percy C, Jack A, et al. International Classification of Diseases for Oncology. 3rd ed. Geneva: World Health Organization; 2000.

15. World Health Organization. International Statistical Classification of Diseases and Related Health Problems. 10th Rev. Vols I-III. Geneva: World Health Organization; 2011.

16. Surveillance Research Program, National Cancer Institute. SEER*Stat Software. Version 8.3.4. Bethesda, MD: Surveillance Research Program, National Cancer Institute; 2017.

17. Statistical Research and Applications Branch, National Cancer Institute. Joinpoint Regression Program, Version 4.5.0.1. Bethesda, MD: Statistical Research and Applications Branch, National Cancer Institute; 2017.

18. Clegg LX, Feuer EJ, Midthune DN, Fay MP, Hankey BF. Impact of reporting delay and reporting error on cancer incidence rates and trends. *J Natl Cancer Inst.* 2002;94:1537-1545.

19. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Incidence-SEER 18 Regs Research Data with Delay-Adjustment, Malignant Only, Nov. 2016 Sub (2000-2014) <Katrina/Rita Population Adjustment>-Linked To County Attributes-Total US, 1969-2015 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch; 2017.

20. Pickle LW, Hao Y, Jemal A, et al. A new method of estimating United States and state-level cancer incidence counts for the current calendar year. *CA Cancer J Clin.* 2007;57:30-42.

21. Zhu L, Pickle LW, Ghosh K, et al. Predicting US- and state-level cancer counts for the current calendar year: Part II: evaluation of spatiotemporal projection methods for incidence. *Cancer.* 2012;118:1100-1109.

22. Chen HS, Portier K, Ghosh K, et al. Predicting US- and state-level cancer counts for the current calendar year: Part I: evaluation of temporal projection methods for mortality. *Cancer.* 2012;118:1091-1099.

23. Wiren S, Haggstrom C, Ulmer H, et al. Pooled cohort study on height and risk of cancer and cancer death. *Cancer Causes Control.* 2014;25:151-159.

24. Walter RB, Brasky TM, Buckley SA, Potter JD, White E. Height as an explanatory factor for sex differences in human cancer. *J Natl Cancer Inst.* 2013;105:860-868.

25. Potosky AL, Miller BA, Albertsen PC, Kramer BS. The role of increasing detection in the rising incidence of prostate cancer. *JAMA.* 1995;273:548-552.

26. Jemal A, Fedewa SA, Ma J, et al. Prostate Cancer Incidence and PSA Testing Patterns in Relation to USPSTF Screening Recommendations. *JAMA.* 2015;314:2054-2061.

27. Moyer VA; US Preventive Services Task Force. Screening for prostate cancer: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med.* 2012;157:120-134.

28. Hoffman RM, Meisner AL, Arap W, et al. Trends in United States prostate cancer incidence rates by age and stage, 1995-2012. *Cancer Epidemiol Biomarkers Prev.* 2016;25:259-263.

29. Fleshner K, Carlsson SV, Roobol MJ. The effect of the USPSTF PSA screening recommendation on prostate cancer incidence patterns in the USA. *Nat Rev Urol.* 2017;14:26-37.

30. Fedewa SA, Ward EM, Brawley O, Jemal A. Recent patterns of prostate-specific antigen testing for prostate cancer screening in the United States. *JAMA Intern Med.* 2017;177:1040-1042.

31. U.S. Preventive Services Task Force. Draft recommendation statement: screening for prostate cancer. www.screeningforprostatecancer.org. Accessed September 27, 2017.

32. Fenton J, Weyrick M, Durbin S, Liu Y, Bang H, Melnikow J. Prostate-specific antigen-based screening for prostate cancer: a systematic evidence review for the U.S. Preventive Services Task Force. Rockville, MD: Agency for Healthcare Research and Quality; 2017. AHRQ Pub. No. 17-05229-EF-1.

33. DeSantis CE, Ma J, Goding Sauer A, Newman LA, Jemal A. Breast cancer statistics, 2017: racial disparity in mortality by state. *CA Cancer J Clin.* 2017;67:439-448.

34. Harris JE. Cigarette smoking among successive birth cohorts of men and women in the United States during 1900-80. *J Natl Cancer Inst.* 1983;71:473-479.

35. Jemal A, Ma J, Rosenberg PS, Siegel R, Anderson WF. Increasing lung cancer death rates among young women in southern and midwestern states. *J Clin Oncol.* 2012;30:2739-2744.

36. Edwards BK, Ward E, Kohler BA, et al. Annual report to the nation on the status of cancer, 1975-2006, featuring colorectal cancer trends and impact of interventions (risk factors, screening, and treatment) to reduce future rates. *Cancer.* 2010;116:544-573.

37. Cress RD, Morris C, Ellison GL, Goodman MT. Secular changes in colorectal cancer incidence by subsite, stage at diagnosis, and race/ethnicity, 1992-2001. *Cancer.* 2006;107(suppl 5):1142-1152.

38. Siegel RL, Ward EM, Jemal A. Trends in colorectal cancer incidence rates in the United States by tumor location and stage, 1992-2008. *Cancer Epidemiol Biomarkers Prev.* 2012;21:411-416.

39. National Center for Health Statistics, Centers for Disease Control and Prevention. National Health Interview Surveys, 2000 and 2015. Public Use Data Files 2001. Atlanta, GA: National Center for Health Statistics, Centers for Disease Control and Prevention; 2016.

40. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Incidence-SEER 9 Regs Research Data with Delay-Adjustment, Malignant Only, Nov. 2016 Sub (1975-2014) <Katrina/Rita Population Adjustment>-Linked To County Attributes-Total U.S., 1969-2015 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch; 2017.

41. Kohli A, Shaffer A, Sherman A, Kottilil S. Treatment of hepatitis C: a systematic review. *JAMA.* 2014;312:631-640.

42. Morgan RL, Baack B, Smith BD, Yartel A, Pitasi M, Falck-Ytter Y. Eradication of hepatitis C virus infection and the development of hepatocellular carcinoma: a meta-analysis of observational studies. *Ann Intern Med.* 2013;158(5 pt 1):329-337.

43. Smith BD, Morgan RL, Beckett GA, et al; Centers for Disease Control and Prevention. Recommendations for the identification of chronic hepatitis C virus infection among persons born during 1945-1965. *MMWR Recomm Rep.* 2012;61:1-32.

44. Moyer VA; US Preventive Services Task Force. Screening for hepatitis C virus infection in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med.* 2013;159:349-357.

45. National Conference of State Legislatures. Hepatitis C: overview. ncsl.org/research/health/hepatitis-c-overview.aspx. Accessed September 29, 2017.

46. Jemal A, Fedewa SA. Recent hepatitis C virus testing patterns among baby boomers. *Am J Prev Med.* 2017;53:e31-e33.

47. Morris LG, Tuttle RM, Davies L. Changing trends in the incidence of thyroid cancer in the United States. *JAMA Otolaryngol Head Neck Surg.* 2016;142:709-711.

48. Baloch ZW, Harrell RM, Brett EM, Randolph G, Garber JR; AACE Endocrine Surgery Scientific Committee and Thyroid Scientific Committee. American Association of Clinical Endocrinologists and American College of Endocrinology Disease State Commentary: managing thyroid tumors diagnosed as noninvasive follicular thyroid neoplasm with papillary-like nuclear features. *Endocr Pract.* 2017;23:1150-1155.

49. Nikiforov YE, Seethala RR, Tallini G, et al. Nomenclature revision for encapsulated follicular variant of papillary thyroid carcinoma: a paradigm shift to reduce overtreatment of indolent tumors. *JAMA Oncol.* 2016;2:1023-1029.

50. Jemal A, Ward EM, Johnson CJ, et al. Annual report to the nation on the status of cancer, 1975-2014, featuring survival. *J Natl Cancer Inst.* 2017;109(9).

51. Sasaki K, Strom SS, O'Brien S, et al. Relative survival in patients with chronic-phase chronic myeloid leukaemia in the tyrosine-kinase inhibitor era: analysis of patient data from six prospective clinical trials. *Lancet Haematol.* 2015;2:e186-e193.

52. Zeng C, Wen W, Morgans AK, Pao W, Shu XO, Zheng W. Disparities by race, age, and sex in the improvement of survival for major cancers: results from the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) Program in the United States, 1990 to 2010. *JAMA Oncol.* 2015;1:88-96.

53. National Lung Screening Trial Research Team, Aberle DR, Adams AM, et al. Reduced lung-cancer mortality with low-dose computed tomographic screening. *N Engl J Med.* 2011;365:395-409.

54. Marcus PM, Doria-Rose VP, Gareen IF, et al. Did death certificates and a death review process agree on lung cancer cause of death in the National Lung Screening Trial? *Clin Trials.* 2016;13:434-438.

55. Jemal A, Fedewa SA. Lung cancer screening with low-dose computed tomography in the United States-2010 to 2015. *JAMA Oncol.* 2017;3:1278-1281.

56. Welch HG, Schwartz LM, Woloshin S. Are increasing 5-year survival rates evidence of success against cancer? *JAMA.* 2000;283: 2975-2978.

57. Jemal A, Thun MJ, Ries LA, et al. Annual report to the nation on the status of cancer, 1975-2005, featuring trends in lung cancer, tobacco use, and tobacco control. *J Natl Cancer Inst.* 2008;100:1672-1694.

58. Etzioni R, Tsodikov A, Mariotto A, et al. Quantifying the role of PSA screening in the US prostate cancer mortality decline. *Cancer Causes Control.* 2008;19:175-181.

59. Siegel RL, Miller KD, Jemal A. Colorectal cancer mortality rates in adults aged 20 to 54 years in the United States, 1970-2014. *JAMA.* 2017;318:572-574.

60. Xu J, Murphy SL, Kochanek KD, Arias E. Mortality in the United States, 2015. *NCHS Data Brief.* 2016(267):1-8.

61. Heron M, Anderson RN. Changes in the Leading Cause of Death: Recent Patterns in Heart Disease and Cancer Mortality. Hyattsville, MD: National Center for Health Statistics; 2016. NCHS Data Brief No. 254.

62. Siegel R, Naishadham D, Jemal A. Cancer statistics for Hispanics/Latinos, 2012. *CA Cancer J Clin.* 2012;62:283-298.

63. Torre LA, Sauer AM, Chen MS Jr, Kagawa-Singer M, Jemal A, Siegel RL. Cancer statistics for Asian Americans, Native Hawaiians, and Pacific Islanders, 2016: converging incidence in males and females. *CA Cancer J Clin.* 2016;66:182-202.

64. Walker TY, Elam-Evans LD, Singleton JA, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13-17 years-United States, 2016. *MMWR Morb Mortal Wkly Rep.* 2017; 66:874-882.

65. Ward E, Jemal A, Cokkinides V, et al. Cancer disparities by race/ethnicity and socioeconomic status. *CA Cancer J Clin.* 2004;54:78-93.

66. Bach PB, Schrag D, Brawley OW, Galaznik A, Yakren S, Begg CB. Survival of blacks and whites after a cancer diagnosis. *JAMA.* 2002;287:2106-2113.

67. Anderson M. A Rising Share of the U.S. Black Population is Foreign Born. Washington, DC: Pew Research Center; 2015.

68. Singh GK, Hiatt RA. Trends and disparities in socioeconomic and behavioural characteristics, life expectancy, and cause-specific mortality of native-born and foreign-born populations in the United States, 1979-2003. *Int J Epidemiol.* 2006;35:903-919.

69. Kennedy S, Kidd MP, McDonald JT, Biddle N. The healthy immigrant effect: patterns and evidence from four countries. *Int. Migration & Integration.* 2015;16:317-332.

70. Pinheiro PS, Callahan KE, Ragin C, Hage RW, Hylton T, Kobetz EN. Black heterogeneity in cancer mortality: US-Blacks, Haitians, and Jamaicans. *Cancer Control.* 2016;23:347-358.

71. Sommers BD, Long SK, Baicker K. Changes in mortality after Massachusetts health care reform: a quasi-experimental study. *Ann Intern Med.* 2014;160:585-593.

72. Hariri S, Bennett NM, Niccolai LM, et al; HPV-IMPACT Working Group. Reduction in HPV 16/18-associated high grade cervical lesions following HPV vaccine introduction in the United States-2008-2012. *Vaccine.* 2015;33:1608-1613.

73. Watson M, Soman A, Flagg EW, et al. Surveillance of high-grade cervical cancer precursors (CIN III/AIS) in four population-based cancer registries, United States, 2009-2012. *Prev Med.* 2017;103:60-65.

74. Ezzati M, Friedman AB, Kulkarni SC, Murray CJ. The reversal of fortunes: trends in county mortality and cross-county mortality disparities in the United States. *PLoS Med.* 2008;5:e66.

75. Mokdad AH, Dwyer-Lindgren L, Fitzmaurice C, et al. Trends and patterns of disparities in cancer mortality among US counties, 1980-2014. *JAMA.* 2017;317:388-406.

76. Nguyen BT, Han X, Jemal A, Drope J. Diet quality, risk factors and access to care among low-income uninsured American adults in states expanding Medicaid vs. states not expanding under the Affordable Care Act. *Prev Med.* 2016;91:169-171.

77. Sommers BD, Gawande AA, Baicker K. Health insurance coverage and health-what the recent evidence tells us. *N Engl J Med.* 2017;377:586-593.

78. Sauer AG, Siegel RL, Jemal A, Fedewa SA. Updated review of prevalence of major risk factors and use of screening tests for cancer in the United States. *Cancer Epidemiol Biomarkers Prev.* 2017;26:1192-1208.

79. Siegel RL, Fedewa SA, Miller KD, et al. Cancer statistics for Hispanics/Latinos, 2015. *CA Cancer J Clin.* 2015;65:457-480.