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Colorectal Cancer Statistics, 2020

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[Correction added on March 14, 2020, after first online publication: The figure 3 legend inset AI/AN was inversed in the initial publication. It has been corrected.]

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Abstract: Colorectal cancer (CRC) is the second most common cause of cancer death in the United States. Every 3 years, the American Cancer Society provides an update of CRC occurrence based on incidence data (available through 2016) from population-based cancer registries and mortality data (through 2017) from the National Center for Health Statistics. In 2020, approximately 147,950 individuals will be diagnosed with CRC and 53,200 will die from the disease, including 17,930 cases and 3,640 deaths in individuals aged younger than 50 years. The incidence rate during 2012 through 2016 ranged from 30 (per 100,000 persons) in Asian/Pacific Islanders to 45.7 in blacks and 89 in Alaska Natives. Rapid declines in incidence among screening-aged individuals during the 2000s continued during 2011 through 2016 in those aged 65 years and older (by 3.3% annually) but reversed in those aged 50 to 64 years, among whom rates increased by 1% annually. Among individuals aged younger than 50 years, the incidence rate increased by approximately 2% annually for tumors in the proximal and distal colon, as well as the rectum, driven by trends in non-Hispanic whites. CRC death rates during 2008 through 2017 declined by 3% annually in individuals aged 65 years and older and by 0.6% annually in individuals aged 50 to 64 years while increasing by 1.3% annually in those aged younger than 50 years. Mortality declines among individuals aged 50 years and older were steepest among blacks, who also had the only decreasing trend among those aged younger than 50 years, and excluded American Indians/Alaska Natives, among whom rates remained stable. Progress against CRC can be accelerated by increasing access to guideline-recommended screening and high-quality treatment, particularly among Alaska Natives, and elucidating causes for rising incidence in young and middle-aged adults. **CA Cancer J Clin 2020;70:145-164. © 2020 American Cancer Society.**

Keywords: colon and rectum neoplasms, epidemiology, health disparities, screening and early detection

Introduction

Colorectal cancer (CRC) is the third most common cause of cancer death in both men and women in the United States, and ranks second when men and women are combined. However, more than one-half of all cases and deaths are attributable to modifiable risk factors, such as smoking, an unhealthy diet, high alcohol consumption, physical inactivity, and excess body weight, and thus potentially preventable.[1] CRC morbidity and mortality can also be mitigated through appropriate screening and surveillance.[2] In this article, we provide a comprehensive overview of current CRC statistics in the United States, including the estimated numbers of new cases and deaths in 2020 by age and incidence, survival, and mortality rates and trends by age and race/ethnicity based on incidence data through 2016 and mortality data through 2017. CRC screening prevalence in 2018 for adults aged 50 years and older is also presented nationally and by state.

Materials and Methods

Data Sources

Cancer incidence data in the United States are collected by the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) program

and the Centers for Disease Control and Prevention's (CDC's) National Program of Cancer Registries (NPCR). Combined SEER and NPCR data, as provided by the North American Association of Central Cancer Registries, are the source for national incidence trends (1995-2016); the estimated new CRC diagnoses in 2020; case distributions by stage, age, and subsite (2012-2016); and 5-year average annual incidence rates (2012-2016).[3] Incidence trends were based on all available data during 1995 through 2016, covering 95% of the US population.

Historical incidence and relative survival trends dating back to 1975 are based on data from the 9 oldest SEER registries (Connecticut, Iowa, Hawaii, New Mexico, Utah, and the metropolitan areas of Atlanta, Detroit, San Francisco-Oakland, and Seattle-Puget Sound), representing approximately 9% of the US population.[4] The SEER 18 catchment area (SEER 9 plus registries for Alaska Natives [ANs], Georgia, California, Kentucky, Louisiana, and New Jersey) is the source for 5-year relative survival by age and 5-year cause-specific survival by race/ethnicity.[5] The SEER 21 catchment area (SEER 18 plus Idaho, Massachusetts, and New York) achieves 37% population coverage and is the source for the lifetime probability of developing CRC cancer. Some of the data presented herein were previously published in the NCI's *SEER Cancer Statistics Review, 1975 to 2016*.[6]

US mortality data from 1930 to 2017 were obtained from the CDC's National Center for Health Statistics (NCHS).[7,8] Detailed information on decedent race/ethnicity is limited to deaths occurring from 1990 onward. Incidence and mortality rates for ANs separate from American Indians (AIs) were based on cases collected by the SEER program's Alaska Native Tumor Registry and deaths occurring in AI/ANs in Preferred/Referred Care Delivery Area counties in Alaska as reported by the NCHS. Because of data limitations, there may be some cross-contamination between rates for ANs and AIs provided separately.

CRC screening prevalence at the state level was obtained from 2018 Behavioral Risk Factor Surveillance System (BRFSS) public use data.[9] The BRFSS is a survey coordinated by the CDC and conducted by individual state health departments to provide state prevalence estimates of health behaviors. Data are collected from computer-assisted telephone interviews with adults aged 18 years and older. In 2011, the CDC modified the BRFSS weighting procedures and expanded them to include households without landline telephone service (ie, cellular service only).[10] Therefore, BRFSS estimates for 2011 and later, including those herein, should not be compared with earlier estimates.

National CRC screening prevalence (2000-2018) was obtained from the NCHS' National Health Interview Survey (NHIS).[11] The NHIS is a centralized survey conducted by the US Census Bureau that is designed to provide national prevalence estimates on health behaviors such as cancer screening. Data are collected through computer-assisted, in-person interviews of individuals aged 18 years and older.

Projected New Cases and Deaths in 2020

The most recent year for which incidence and mortality data are available lags from 2 to 4 years behind the current year because of the time required for data collection, compilation, quality control, and dissemination. Therefore, the American Cancer Society projects the numbers of new cancer cases and deaths in the United States in the current year to provide an estimate of the contemporary cancer burden. These estimates cannot be used for tracking cancer occurrence over time because they are model-based and because the methodology changes every few years to implement improvements in modeling techniques, increased cancer registration coverage, and updated risk factor surveillance. The methods for projecting the total number of new CRC cases and deaths that will occur in 2020 is described in detail elsewhere.[12,13] To account for the rapid changes in CRC age distribution, the numbers of new cases and deaths by age were calculated by projecting age-specific cases and deaths occurring during the most recent 15 years of available data. These projected proportions were then applied to the previously published CRC estimate for all ages combined.[14]

Statistical Analysis

CRC cases were classified according to codes from the *International Classification of Diseases for Oncology* as colon (C18.0-C18.9 and C26.0) or rectum (C19.9 and C20.9).[15] Colon tumors were further designated by anatomic location as proximal (C18.0 and C18.2-C18.5), distal (C18.6-C18.7), appendix (18.1), or not otherwise specified (C18.8, C18.9, and C26.0). Incidence trends exclude appendix (C18.1) except where specified. Because of the large number of rectal cancer deaths that are misclassified as colon,[16] colon and rectal cancer deaths were combined in all mortality analyses. This misclassification does not affect the calculation of relative survival rates.

SEER*Stat (version 8.3.6) was used to calculate age-adjusted (2000 US standard population using 19 age groups) CRC incidence and mortality rates, expressed per 100,000 population, as well as rate ratios with accompanying 95% confidence intervals (95% CIs).[17] Underlying population denominator data for rate calculations were provided by the US Census Bureau through SEER*Stat and were based on the 2017 vintage population estimates. Incidence trends were based on rates adjusted for delays in reporting using US Cancer Statistics race-specific and age-specific delay factors.[18] Delay adjustment accounts for the additional time required for the complete registration of cases and more

TABLE 1. Estimated Numbers of New Colorectal Cancer Cases and Deaths by Age, United States, 2020

	CASES						DEATHS	
AGE, YEARS	COLORECTUM	PERCENT	COLON	PERCENT	RECTUM	PERCENT	COLORECTUM[a]	PERCENT
Birth to 49	17,930	12%	11,540	11%	6,390	15%	3,640	7%
50 to 64	50,010	34%	32,290	31%	17,720	41%	13,380	25%
≥65	80,010	54%	60,780	58%	19,230	44%	36,180	68%
All ages	147,950	100%	104,610	100%	43,340	100%	53,200	100%

Note: Estimates are rounded to the nearest 10 and exclude in situ carcinoma.
[a]Deaths for colon and rectal cancers are combined because a large number of rectal cancer deaths are misclassified as colon.

accurately reflects cancer trends in the most recent time period.[19] Incidence and mortality trends were quantified using Joinpoint regression (version 4.7.0.0; NCI).[20] The lifetime probability of developing cancer was obtained from the NCI's DevCan software (version 6.7.7).[21] All tests of statistical significance were 2-sided, and a P value <.05 was considered statistically significant.

Selected Findings

Estimated Cases and Deaths in 2020

There are projected to be 147,950 individuals newly diagnosed with CRC in the United States in 2020, including 104,610 cases of colon cancer and 43,340 cases of rectal cancer. Although the majority of these occur in individuals aged 50 years and older, 17,930 new cases of CRC (12%) will be diagnosed in individuals aged younger than 50 years (Table 1). In addition, there will be an estimated 53,200 CRC deaths in 2020, including 3640 decedents (7%) aged younger than 50 years.

Contemporary Incidence and Mortality

During the most recent 5 data years, the annual age-standardized CRC incidence rate was 38.7 per 100,000 persons (2012-2016), and the mortality rate was 13.9 per 100,000 persons (2013-2017) (Fig. 1). The incidence rate escalates rapidly with age, approximately doubling with each 5-year age increase until age 50 years and increasing by approximately 30% with subsequent groups aged 55 years and older (Fig. 2). For example, the rate increases from 90.2 per 100,000 population in individuals aged 60 to 64 years, to 121.4 per 100,000 population in those aged 65 to 69 years, all the way up to 258.8 per 100,000 population in those aged 85 years and older. However, the rate in individuals aged 55 to 59 years is only 15% higher than that in those aged 50 to 54 years (68.4 vs 59.5 per 100,000 population, respectively), partly because the natural age-associated risk in individuals aged 50 to 54 years is disrupted by first-time CRC screening and the detection of prevalent cancers. The screening effect is magnified in incidence rates by single year of age, with higher rates in individuals aged 50 to 51 years compared with those aged 52 to 55 years (Fig. 2, inset).

As a result of declining incidence in older age groups coinciding with increasing incidence in younger individuals, the CRC patient population as a whole is rapidly shifting younger.[22] For example, the median age of diagnosis has dropped from 72 years during 2001-2002 to 66 years during 2015-2016.[4] The median age at CRC diagnosis is younger for rectal cancer (63 years) than for colon cancer (69 years) and for blacks (64 years) than for whites (68 years).[6]

Overall incidence rates are highest for tumors in the proximal colon and lowest for those in the distal colon, reflecting the anatomic distribution in older age groups; one-half of all CRCs in individuals aged 65 years and older occur in the proximal colon (Table 2). In contrast, among those aged younger than 50 years, rectal tumors are most common (37%), followed by those in the distal colon (25%).

Sex disparities

Although the lifetime risk of CRC is similar in men (4.4%) and women (4.1%) because women have a longer life expectancy, the incidence rate is 31% higher in men. This disparity

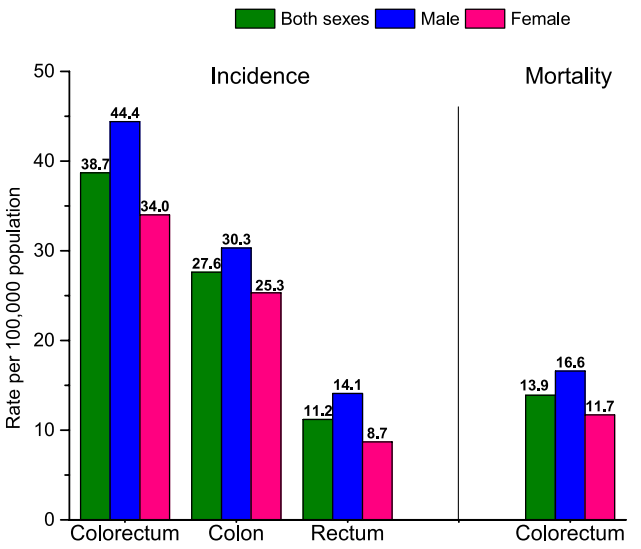

FIGURE 1. Colorectal Cancer Incidence (2012 to 2016) and Mortality (2013 to 2017) Rates by Subsite and Sex, United States. Mortality rates by anatomic subsite are not available because a large proportion of rectal cancer deaths are misclassified as colon. Rates are age adjusted to the 2000 US standard population. Source: Incidence: North American Association of Central Cancer Registries (NAACCR), 2019; Mortality: National Center for Health Statistics (NCHS), 2019.

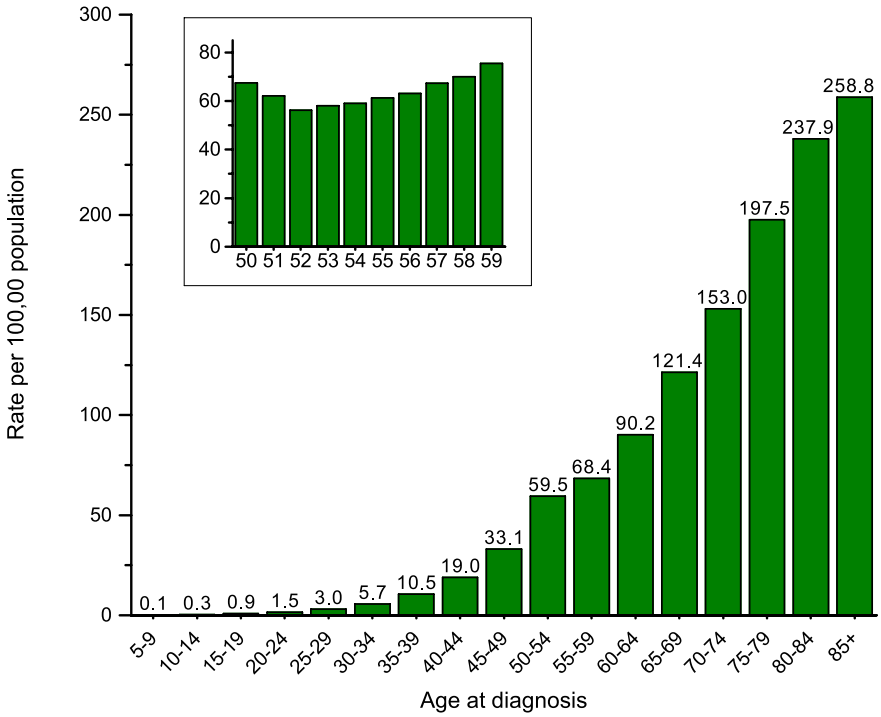

FIGURE 2. Age-Specific Colorectal Cancer Incidence Rates, United States, 2012 to 2016. Rates are age adjusted to the 2000 US standard population. Source: Main figure, NAACCR, 2019; *Inset*: Surveillance, Epidemiology, and End Results Program (SEER), 2019.

is largest for rectal tumors (male-to-female incidence rate ratio [IRR], 1.62; 95% CI, 1.60-1.63) and smallest for tumors in the proximal colon (IRR, 1.07; 95% CI, 1.07-1.08). This partly reflects the higher proportion of proximal tumors in women compared with men (45% vs 36%, respectively) (Table 2). These differences and subsite-specific variations in clinical, biological, and molecular characteristics suggest distinct etiologic mechanisms based on anatomic location.[23-28]

The sex disparity also varies substantially by age. For example, incidence is comparable in those younger than 45 years, but it is 40% to 50% higher in men than in women aged 55 to 74 years. Reasons for the higher rates in older men are not completely understood but partly reflect differences in cumulative exposure to risk factors, and probably sex hormones, as well as complex interactions between these influences.[29,30]

Racial/ethnic disparities

CRC incidence and mortality rates also vary substantially by race and ethnicity. Among the 5 major racial/ethnic groups depicted in Figure 3, rates are highest in non-Hispanic blacks (hereafter, blacks), followed closely by AI/ANs, and lowest in Asian Americans/Pacific Islanders (APIs). During 2012 through 2016, incidence rates in blacks (45.7 per 100,000 population) were approximately 20% higher than those in non-Hispanic whites (NHWs; 38.6 per 100,000 population) and 50% higher than those in APIs (30.0 per 100,000 population). Notably, the magnitude of the disparity for

TABLE 2. Colorectal Cancer Incidence Rates and Proportions of Cases by Tumor Subsite, United States, 2012 to 2016[a]

			SEX-SPECIFIC				AGE-SPECIFIC					
	OVERALL		MALE		FEMALE		BIRTH TO 49		50 TO 64		≥65	
	RATE	PROPORTION	RATE	PROPORTION	RATE	PROPORTION	RATE	PROPORTION	RATE	PROPORTION	RATE	PROPORTION
Proximal	15.7	40%	16.5	36%	14.9	45%	1.8	23%	21.3	31%	88.1	49%
Distal	8.4	22%	10.1	23%	7.0	20%	1.9	25%	17.7	25%	34.4	19%
Rectal	11.2	29%	14.1	32%	8.7	25%	2.9	37%	25.8	36%	41.1	23%
Appendix	1.3	3%	1.2	3%	1.4	4%	0.8	10%	2.4	3%	3.0	2%
Large intestine, NOS	2.2	6%	2.5	5%	1.9	6%	0.3	4%	3.0	4%	12.3	7%
Colorectum (including appendix)	**38.7**	**100%**	**44.4**	**100%**	**34.0**	**100%**	**7.7**	**100%**	**70.3**	**100%**	**178.9**	**100%**

Abbreviation: NOS, not otherwise specified.
[a]Rates are per 100,000 population and age adjusted to the 2000 US standard population.
Source: NAACCR, 2019.

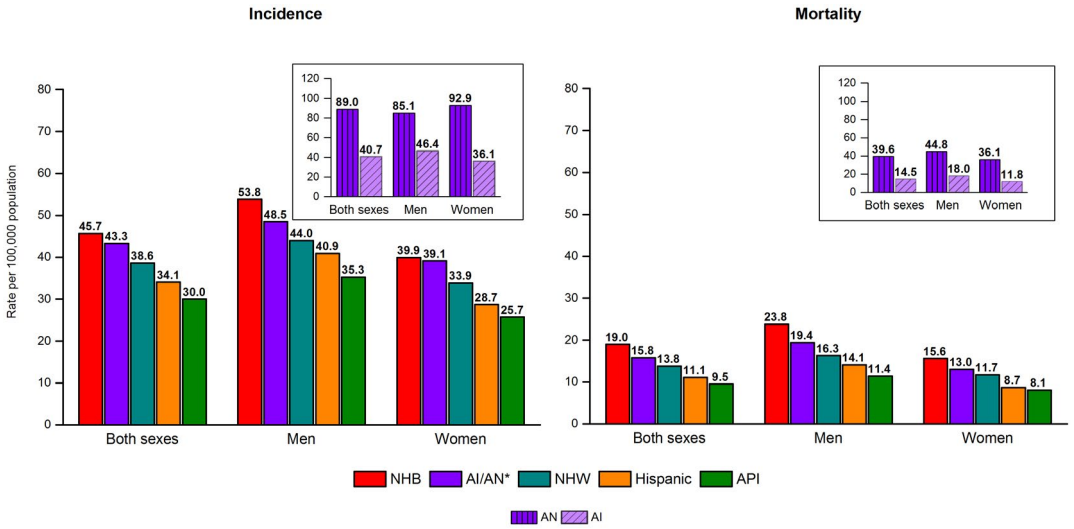

FIGURE 3. Colorectal Cancer Incidence (2012 to 2016) and Mortality (2013 to 2017) Rates by Race/Ethnicity and Sex, United States. Rates are age adjusted to the 2000 US standard population. *Statistics are based on data from Purchased/Referred Care Delivery Area counties. American Indian (AI) (excluding Alaska Native [AN]) and AN incidence rates exclude data from Kansas and Minnesota. Incidence rates for AN men and women are not statistically significantly different. Rates are age adjusted to the 2000 US standard population. API indicates Asian/Pacific Islander; NHB, non-Hispanic black; NHW, non-Hispanic white. Source: Incidence: North American Association of Central Cancer Registries, 2019; Mortality: National Center for Health Statistics, 2019.

mortality is double that for incidence. During 2013 through 2017, CRC death rates in blacks (19.0 per 100,000 population) were almost 40% higher than those in NHWs (13.8 per 100,000 population) and twice those in APIs (9.5 per 100,000 population).

Reasons for racial disparities in CRC are complex but largely reflect differences in risk factor prevalence and health care access driven by disproportionately low socioeconomic status among black individuals.[31] In 2018, the median family income was $41,361 among blacks compared with $70,642 among NHWs, with 21% and 8%, respectively, living in poverty.[32] People with the lowest socioeconomic status, measured by self-reported education and census-tract socioeconomic deprivation, are 40% more likely to be diagnosed with CRC than those with the highest socioeconomic status.[33] Close to one-half (44%) of this disparity is attributed to differences in the prevalence of CRC risk factors (eg, smoking, obesity),[34] and a similar proportion is because of historical differences in CRC screening uptake.[35] After controlling for risk factor prevalence, black individuals are no more likely than whites to develop adenomas or CRC but are less likely to receive both timely follow-up of a positive screening test and high-quality colonoscopy,[36,37] contributing to higher mortality. Beyond access to high-quality care, inequities in comorbidities and differences in tumor characteristics, such as grade, histology, and anatomic subsite, also likely contribute to racial disparities in mortality.[38-41]

The burden of CRC also varies greatly within the broadly defined racial/ethnic groups presented in Figure 3. For example, although CRC incidence in API men overall is 25% lower than in NHW men, rates in Japanese men are 23% higher.[42] Even more alarming is the burden among ANs, who have the highest CRC incidence (89 per 100,000 population) and mortality (40 per 100,000 population) rates in the United States, double those in blacks. ANs also have a disproportionately high burden of advanced adenomas.[43] CRC has been the most commonly diagnosed cancer in ANs since the early 1970s for reasons that are unknown but may include a higher prevalence of risk factors, such as a diet high in animal fat and low in fruits and vegetables, vitamin D deficiency, smoking, obesity, and diabetes.[44,45] In addition, ANs, particularly rural residents, have a high prevalence of *Helicobacter pylori*,[46] a bacteria associated with inflammation and cancer of the stomach that may also be associated with CRC risk.[47,48] The high CRC burden among ANs is compounded by inadequate availability of endoscopic services in much of Alaska.[49,50] A recent study found that Alaska had the lowest CRC screening rate in the nation after accounting for county-level variation within states.[51] In addition, the primary mode of screening at Indian Health Service facilities is stool testing, which has limited capacity for cancer prevention and must be repeated annually to be effective in reducing mortality. Adherence to annual testing and follow-up colonoscopy of abnormal stool tests is a major barrier for the Indian Health Service and other low-resource settings.[52,53] Notably, AI/ANs are the only racial and ethnic group for which CRC mortality rates are not declining.

Geographic disparities

The striking variation in CRC incidence globally reflects the large impact of lifestyle factors on cancer occurrence.[54] Similarly, wide differences within the United States in the prevalence of CRC risk factors, such as smoking and excess

body weight, as well as differences in access to high-quality health care and screening, result in large geographic disparities. CRC incidence and mortality rates are lowest in the West and highest in Appalachia and parts of the South and Midwest. Incidence rates range from 29.7 per 100,000 population in Utah to 49.2 per 100,000 population in Kentucky, and mortality rates range from 11.0 per 100,000 population in Connecticut and 11.2 per 100,000 population in Utah to 18.3 per 100,000 population in Mississippi (Table 3).[3] Geographic patterns are generally similar for blacks and whites, particularly for mortality, highlighting the larger influence of socioeconomic status over race in cancer disparities.[55]

Temporal Trends in Incidence and Mortality

Incidence trends

Among both men and women, overall CRC incidence rates increased from 1975 through the mid-1980s, but since have generally decreased (Fig. 4). The decline before 2000 is attributed equally to changing patterns in risk factors (eg, reductions in smoking) and increasing use of CRC screening,[56] whereas the accelerated decline since 2000 is thought to reflect the rapid dissemination of colonoscopy screening, which has a larger capacity for cancer prevention than other tests. Among adults aged 50 years and older, colonoscopy prevalence tripled from 20% in 2000 to 61% in 2018 (Fig. 5).[11] This surge occurred mostly during the 2000s and was largely driven by Medicare expansion of colonoscopy screening coverage from high-risk individuals to all beneficiaries in 2001.[57-59]

Tables 4, 5, and 6 present age-specific CRC incidence trends during 1995 through 2016 by anatomic subsite, stage at diagnosis, and race/ethnicity based on cancer registry data that have been adjusted for delays in case reporting and reflect 95% of the US population. Rapid declines in CRC incidence during the 2000s persisted in individuals aged 65 years and older (Fig. 6), among whom rates dropped by 3.3% per year from 2011 to 2016. The steepest declines in this age group were for tumors in the distal colon (4% annually; Table 4) and for localized stage disease (5.4% annually; Table 5). CRC incidence rates in this age group declined by approximately 4% annually in NHWs, blacks, APIs, and Hispanics and 2% annually in AI/ANs (Table 6).

Among individuals aged 50 to 64 years, however, declines in incidence of 2% to 3% per year during the 2000s have reversed in recent years, with rates during 2011 through 2016 increasing by 1.0% per year (Table 4). The uptick is similar to the trend in individuals aged younger than 50 years and likely reflects elevated disease risk in generations born since 1950 being carried forward by aging birth cohorts, a phenomenon referred to as a *birth cohort effect*.[60] A strong birth cohort effect has been demonstrated in CRC incidence patterns both in the United States[22] and in other high-income countries.[61] Incidence increased in individuals aged 50 to 64 years for tumors in the distal colon and rectum (Table 4) and for regional-stage and unknown-stage diagnoses (Table 5) and was stable for proximal colon tumors and disease diagnosed at a localized or distant stage. CRC incidence trends in this age group also varied by race/ethnicity; rates increased in NHWs (by 1.3% per year) and AI/ANs (by 0.6% per year), decreased in blacks (by 1.6% per year) and APIs (by 0.5% per year), and were stable in Hispanics (Table 6).

Incidence rates in individuals aged younger than 50 years have been increasing since the mid-1990s, driven largely by rectal tumors.[22,62] However, in the most recent 5 data years (2012-2016), incidence rates rose by 1.8% annually for tumors in the proximal and distal colon as well as in the rectum, and by 2.2% annually overall (including unknown subsite; Table 4). The increased incidence in those aged younger than 50 years is confined to advanced-stage diagnoses (Table 5) and is steepest among NHWs (2% per year) and AI/ANs (2.2% per year) (Table 6). The smaller increases in blacks (by 0.5% per year) and APIs (0.4% per year) were confined to rectal tumors (data not shown). As a result of these trends, CRC incidence rates in NHWs ages 20-49 years are now equivalent to those in blacks (14.1 per 100,000 during 2015-2016), despite being 40% higher in blacks during 1995-1996.[3] CRC incidence is also increasing uniquely among individuals aged younger than 50 years in many other high-income countries, including Australia, Canada, Germany, and the United Kingdom.[61,63,64] Notably, incidence rates in Austria, where opportunistic screening has occurred in individuals aged 40 years and older since the 1980s, are increasing in those aged 20 to 39 years but decreasing in those 40 to 49 years.[63,65] Causes for the increase in early-onset CRC are unknown but likely stem from changes in diet and other lifestyle factors that are typically first reflected in cancer rates for young age groups.[66]

Appendiceal cancer

Tumor classification systems, and thus cancer surveillance data, group appendiceal malignancies with those in the colon and rectum. However, accumulating data suggest that these rare malignancies (incidence rate, 1.3 per 100,000 person-years during 2012-2016) are distinct from CRC in histology, molecular profile, and clinical characteristics, including response to treatment.[67-69] In 2010, the American Joint Committee on Cancer classified appendiceal carcinomas as separate from CRC for the first time and a new classification was added for appendiceal carcinoid tumors.[70,71] This occurred in parallel with the World Health Organization behavior code revision for well-differentiated neuroendocrine tumors of the appendix from borderline malignant to malignant, and thus newly reportable,[72] which was broadly implemented by US cancer registries in January 2015.[73]

Changes in classification coupled with enhanced detection through advanced imaging have resulted in sharp increases in appendiceal cancer incidence rates, particularly among

TABLE 3. Colorectal Cancer Incidence (2012 to 2016) and Mortality (2013 to 2017) Rates and Screening Prevalence (2018) by State, United States[a]

	INCIDENCE				MORTALITY				SCREENING, %			
	ALL RACES	NHW	NHB	HISPANIC	ALL RACES	NHW	NHB	HISPANIC	AGES ≥50	AGES 50 TO 64	AGES ≥65	AGES 50 TO 75
Alabama	44.0	42.3	50.5	26.5	15.9	14.9	21.4	7.9	70	63	76	70
Alaska	41.9	35.1	28.4	24.0	15.5	12.4	[b]	7.0	62	52	70	60
Arizona	33.1	33.3	33.3	33.3	12.8	13.0	17.2	11.7	67	59	76	66
Arkansas	43.8	42.8	51.3	30.9	16.4	16.0	22.5	4.8	67	58	74	66
California	35.5	36.2	43.4	32.4	12.7	13.2	18.5	11.0	73	64	82	72
Colorado	33.5	32.3	40.9	38.6	12.0	11.7	15.4	13.7	69	62	74	69
Connecticut	36.6	35.8	40.0	39.8	11.0	11.1	13.0	9.5	75	71	78	75
Delaware	37.4	37.0	43.5	39.4	13.4	13.4	16.2	6.8	73	67	78	72
District of Columbia[c,d]	42.9	28.4	51.3	28.5	15.5	7.6	21.4	6.8	74	69	78	74
Florida	36.6	36.1	41.9	36.7	13.0	13.1	16.9	11.7	71	61	80	69
Georgia	41.8	40.6	47.8	33.6	15.1	14.2	19.1	7.7	70	61	78	68
Hawaii	41.6	40.0	39.7	44.2	12.4	12.6	10.5	13.9	73	69	75	75
Idaho	35.5	35.7	26.4	27.6	13.0	13.2	[b]	9.7	67	59	72	66
Illinois	43.1	42.9	53.2	32.6	15.0	14.7	23.0	9.3	67	61	70	67
Indiana	42.7	42.9	46.3	33.1	15.3	15.2	20.2	8.2	68	61	73	68
Iowa	44.4	44.8	46.4	27.3	14.6	14.8	16.7	7.1	71	66	74	71
Kansas	39.8	39.6	45.9	33.9	14.8	14.7	20.3	12.4	68	60	74	67
Kentucky	49.2	49.4	50.8	27.2	16.7	16.7	19.8	6.6	70	63	76	69
Louisiana	45.9	43.5	55.3	25.8	16.9	15.5	22.4	6.2	70	64	76	69
Maine	37.4	37.5	28.0	19.4	12.9	12.9	[b]	[b]	75	69	79	75
Maryland	36.4	36.2	40.4	24.8	13.8	13.3	17.3	6.3	73	67	78	73
Massachusetts	35.2	35.2	38.1	27.2	11.9	12.0	13.4	7.8	76	72	78	77
Michigan	37.5	36.2	46.9	30.3	14.0	13.5	19.8	10.3	74	69	77	74
Minnesota	38.1	37.5	43.7	39.1	12.4	12.3	13.5	10.2	73	68	77	73
Mississippi	48.1	44.6	58.0	15.6	18.3	16.7	23.1	[b]	64	54	73	62
Missouri	41.1	40.8	47.5	26.6	14.7	14.4	19.9	7.9	69	62	75	69
Montana	38.0	36.9	15.6	47.3	13.3	12.9	[b]	[b]	65	56	71	64
Nebraska	43.0	42.9	52.5	35.4	14.7	14.8	23.3	8.6	68	62	72	68
Nevada[c]	36.9	37.9	39.5	29.9	16.6	17.4	22.9	11.2	62	52	69	60
New Hampshire	37.6	37.5	41.0	21.0	12.7	12.9	[b]	[b]	75	70	78	75
New Jersey	41.1	41.9	46.6	37.6	14.0	14.5	18.3	10.0	68	59	75	67
New Mexico	33.0	30.5	31.8	36.2	13.6	12.4	16.4	15.1	63	55	66	64
New York	38.9	39.3	42.1	35.1	13.0	13.1	15.5	10.4	70	65	75	70
North Carolina	37.1	36.4	42.6	25.9	13.4	12.7	18.1	6.2	71	64	77	71
North Dakota	44.7	44.1	22.3	29.4	13.5	13.6	[b]	[b]	67	61	72	67
Ohio	41.5	41.2	41.7	26.4	15.4	15.3	18.8	7.3	68	61	75	67
Oklahoma	42.4	40.6	46.9	35.4	17.0	16.7	21.0	10.3	64	54	73	62
Oregon	34.4	34.4	35.6	32.0	13.2	13.3	16.4	8.5	72	66	77	72
Pennsylvania	41.9	41.7	45.6	32.9	14.9	14.7	18.7	11.0	70	66	72	72
Rhode Island	34.6	34.3	29.2	27.9	12.5	12.9	10.7	6.3	75	70	79	76
South Carolina	38.6	37.1	44.4	29.8	14.4	13.3	19.0	6.9	72	62	80	70
South Dakota	41.9	41.0	24.6	33.0	16.1	15.7	[b]	[b]	69	63	74	69
Tennessee	40.5	40.0	47.5	19.3	15.5	14.9	22.1	4.7	70	60	77	69
Texas	37.7	37.9	47.4	36.0	14.1	14.1	20.5	12.6	62	53	71	60
Utah	29.7	29.0	48.4	35.1	11.2	11.1	23.0	10.5	69	63	73	70
Vermont	35.2	35.2	35.3	8.4	14.8	15.1	[b]	[b]	71	65	72	71
Virginia	35.8	35.0	43.1	24.4	13.7	13.2	19.1	7.4	70	63	75	70
Washington	35.6	35.6	38.2	30.9	12.4	12.7	15.4	7.9	72	65	77	72
West Virginia	46.4	46.5	46.9	28.4	17.9	18.0	21.4	[b]	68	61	74	67
Wisconsin	37.2	36.4	52.2	27.3	13.1	12.8	20.1	8.8	74	69	77	75
Wyoming	33.0	32.6	34.5	37.6	11.8	12.0	[b]	10.2	60	50	67	58
Puerto Rico[e]	42.3	—	—	—	15.4	—	—	—	58	48	70	55
United States[f]	**38.7**	**38.6**	**45.7**	**34.1**	**13.9**	**13.8**	**19.0**	**11.1**	**70**	**63**	**75**	**69**

Abbreviations: NHB, non-Hispanic black; NHW, non-Hispanic white.
Note: Screening prevalence is age adjusted to the 2000 US standard population; reflects a fecal occult blood test within the past year, or sigmoidoscopy within the past 5 years, or colonoscopy within the past 10 years; and does not distinguish between examinations for screening and diagnosis.
[a]Rates are per 100,000 population and are age adjusted to the 2000 US standard population.
[b]Statistics are not displayed because there were fewer than 25 cases or deaths.
[c]Incidence data for the District of Columbia and Nevada are not included in US combined incidence rates because data did not meet inclusion standards for all years during 2012 through 2016 according to the North American Association of Central Cancer Registries (NAACCR).
[d]Rates are based on cases diagnosed during 2012 through 2014.
[e]Incidence data for Puerto Rico are not included in US combined rates for comparability to previously published data. Puerto Rico rates are not available by race/ethnicity. Mortality rates are for 2012 through 2016.
[f]Screening prevalence for the United States is the median of state values.
Source: Incidence, NAACCR, 2019; Mortality, NCHS, 2019; Screening, Behavioral Risk Factor Surveillance System, 2019.

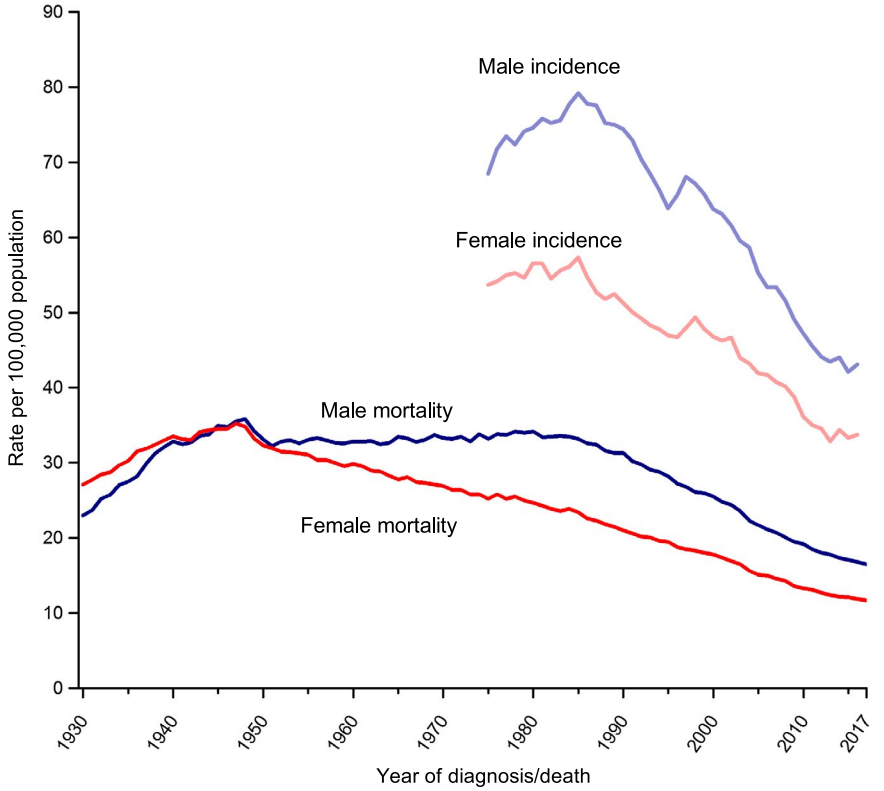

FIGURE 4. Trends in Colorectal Cancer Incidence (1975 to 2013) and Mortality (1930 to 2014) Rates by Sex, United States. Because of changes in International Classification of Diseases coding for mortality, numerator information has changed over time. Incidence rates exclude the appendix and are age adjusted to the 2000 US standard population. Source: Incidence: SEER Program, 2019; Mortality: NCHS, 2019.

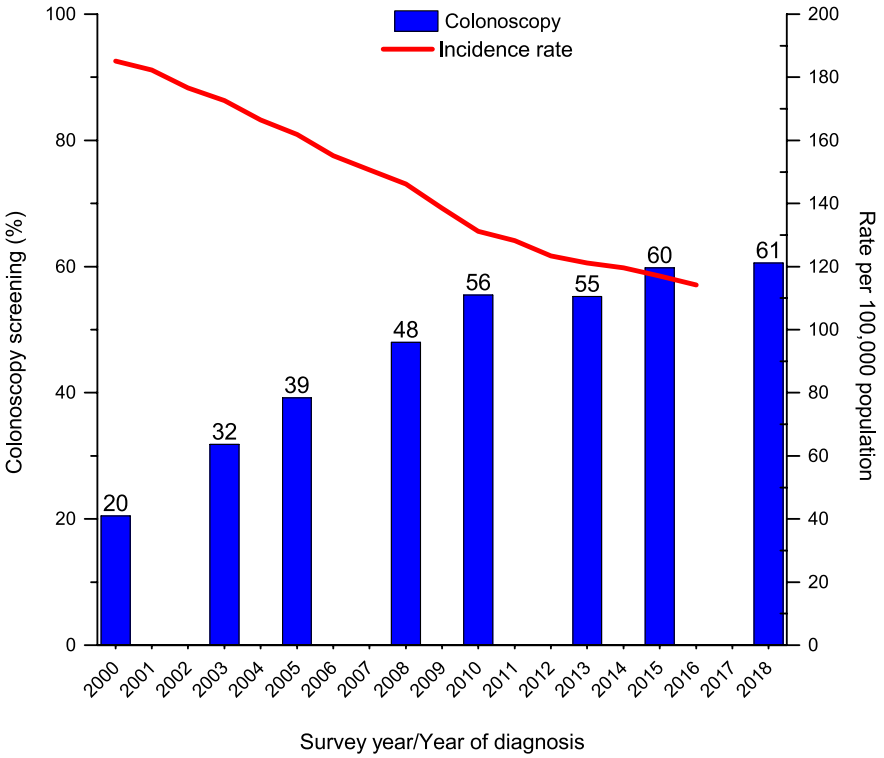

FIGURE 5. Trends in Colonoscopy Prevalence (2000 to 2018) and Colorectal Cancer Incidence Rates (2000 to 2016), Adults ≥50 Years, United States. Prevalence was based on colonoscopy within the past 10 years of the survey date. Incidence rates exclude the appendix and are age adjusted to the 2000 US standard population and adjusted for reporting delays. Source: Colonoscopy prevalence: National Health Interview Survey, 2019; Incidence: NAACCR, 2019.

TABLE 4. Trends in Colorectal Cancer Incidence Rates by Age and Subsite, United States, 1995 to 2016

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		AAPC	
AGE	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	2007 TO 2016	2012 TO 2016
Total colorectum (excluding appendix)												
Birth to 49	1995-1999	3.4[a]	1999-2008	1.5[a]	2008-2011	−0.1	2011-2016	2.2[a]			1.4[a]	2.2[a]
50 to 64	1995-2000	0.7	2000-2007	−1.8[a]	2007-2011	−2.9[a]	2011-2016	1.0[a]			−0.7[a]	1.0[a]
≥65	1995-1998	0.9[a]	1998-2002	−2.1[a]	2002-2008	−3.7[a]	2008-2011	−5.1[a]	2011-2016	−3.3[a]	−4.0[a]	−3.3[a]
All ages	1995-1998	1.1[a]	1998-2001	−1.2	2001-2008	−2.7[a]	2008-2011	−4.1[a]	2011-2016	−1.5[a]	−2.5[a]	−1.5[a]
Total colorectum (including appendix)												
Birth to 49	1995-2000	3.3[a]	2000-2013	1.4[a]	2013-2016	5.2[a]					2.7[a]	4.3[a]
50 to 64	1995-2000	0.8	2000-2007	−1.7[a]	2007-2011	−2.7[a]	2011-2016	1.3[a]			−0.5	1.3[a]
≥65	1995-1998	0.9[a]	1998-2002	−2.1[a]	2002-2008	−3.7[a]	2008-2011	−5.0[a]	2011-2016	−3.2[a]	−3.9[a]	−3.2[a]
All ages	1995-1998	1.3	1998-2003	−1.6[a]	2003-2012	−3.1[a]	2012-2016	−0.8			−2.1[a]	−0.8
Proximal colon[b]												
Birth to 49	1995-2003	1.6[a]	2003-2013	−0.0	2013-2016	2.5[a]					0.8[a]	1.8[a]
50 to 64	1995-2003	0.3	2003-2011	−3.1[a]	2011-2016	−0.1					−1.4[a]	−0.1
≥65	1995-1998	1.5[a]	1998-2001	−0.6	2001-2007	−2.5[a]	2007-2010	−4.6[a]	2010-2016	−3.4[a]	−3.8[a]	−3.4[a]
All ages	1995-1998	1.7[a]	1998-2002	−0.6[a]	2002-2008	−2.5[a]	2008-2011	−4.3[a]	2011-2016	−2.1[a]	−2.9[a]	−2.1[a]
Distal colon												
Birth to 49	1995-2016	1.8[a]									1.8[a]	1.8[a]
50 to 64	1995-1998	1.9[a]	1998-2008	−2.1[a]	2008-2011	−4.8[a]	2011-2016	1.5[a]			−1.0[a]	1.5[a]
≥65	1995-1998	0.4	1998-2002	−3.0[a]	2002-2007	−5.2[a]	2007-2012	−6.3[a]	2012-2016	−4.0[a]	−5.3[a]	−4.0[a]
All ages	1995-1998	1.1	1998-2003	−2.5[a]	2003-2012	−4.2[a]	2012-2016	−1.2[a]			−2.9[a]	−1.2[a]
Rectum												
Birth to 49	1995-2000	4.3[a]	2000-2016	1.8[a]							1.8[a]	1.8[a]
50 to 64	1995-2000	1.2[a]	2000-2011	−1.3[a]	2011-2016	1.7[a]					0.4	1.7[a]
≥65	1995-1998	1.2	1998-2004	−3.2[a]	2004-2012	−4.4[a]	2012-2016	−2.7[a]			−3.7[a]	−2.7[a]
All ages	1995-1998	1.9[a]	1998-2005	−2.0[a]	2005-2011	−2.7[a]	2011-2016	−0.4			−1.5[a]	−0.4
Appendix												
Birth to 49	1995-2011	5.0[a]	2011-2016	24.4[a]							15.4[a]	24.4[a]
50 to 64	1995-2013	5.6[a]	2013-2016	11.6[a]							7.6[a]	10.1[a]
≥65	1995-2013	4.4[a]	2013-2016	10.2[a]							6.3[a]	8.7[a]
All ages	1995-2012	5.1[a]	2012-2016	16.7[a]							10.1[a]	16.7[a]
Large intestine, not otherwise specified												
Birth to 49	1995-1997	−6.8	1997-2000	3.5	2000-2016	−0.6[a]					−0.6[a]	−0.6[a]
50 to 64	1995-2009	−3.3[a]	2009-2016	−0.6							−1.2[a]	−0.6
≥65	1995-2016	−3.7[a]									−3.7[a]	−3.7[a]
All ages	1995-2016	−3.2[a]									−3.2[a]	−3.2[a]

Abbreviations: AAPC, average annual percent change over the most recent 5 to 10 data years; APC, annual percent change based on incidence rates age adjusted to the 2000 US standard population.
Note: Trends based on incidence rates were adjusted for delays in case reporting and analyzed using the Joinpoint Regression Program, version 4.7.0.0, allowing up to 4 joinpoints.
[a]The APC or AAPC is significantly different from zero ($P < .05$).
[b]Proximal colon excludes the appendix (code C18.1, International Classification of Diseases for Oncology).
Source: NAACCR, 2019.

young adults.[74,75] From 2012 through 2016, rates have risen by 9% to 10% per year in individuals aged 50 and older and by 24% per year in those aged younger than 50 years (Table 4). The steeper increase in younger individuals may in part reflect incidental diagnoses among patients who undergo appendectomy, approximately 80% of whom are aged younger than 50 years.[76] Approximately 40% of malignant appendiceal cancers in 2016 were diagnosed in patients aged younger than 50 years, two-thirds of which were carcinoid tumors and only 5% of which were nonmucinous adenocarcinoma.[3] Thus, it is increasingly important to exclude appendiceal tumors when tracking CRC incidence, especially among young age groups. The annual percent change in CRC incidence in individuals aged younger than 50 years during 2012 through 2016 is 4.3% per year when appendiceal cancers are included versus 2.2% per year when they are excluded.

TABLE 5. Trends in Colorectal Cancer Incidence Rates (Excluding Appendix) by Age and Stage, United States, 1995 to 2016

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		AAPC	
AGE	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	2007 TO 2016	2012 TO 2016
Localized												
Birth to 49	1995-2006	3.8[a]	2006-2016	−0.8							−0.8	−0.8
50 to 64	1995-2005	2.0[a]	2005-2011	−3.3[a]	2011-2016	−0.7					−1.8[a]	−0.7
≥65	1995-2005	0.5	2005-2016	−5.4[a]							−5.4[a]	−5.4[a]
All ages	1995-2005	1.0[a]	2005-2016	−4.2[a]							−4.2[a]	−4.2[a]
Regional												
Birth to 49	1995-2002	1.9[a]	2002-2005	−1.7	2005-2013	1.3[a]	2013-2016	5.5[a]			2.7[a]	4.4[a]
50 to 64	1995-1998	1.5	1998-2002	−1.9[a]	2002-2005	−6.0[a]	2005-2011	−2.6[a]	2011-2016	2.3[a]	0.1	2.3[a]
≥65	1995-1998	1.4	1998-2002	−3.1[a]	2002-2005	−7.8[a]	2005-2013	−4.2[a]	2013-2016	0.6	−2.6[a]	−0.6
All ages	1995-1998	1.5	1998-2002	−2.5[a]	2002-2005	−7.0[a]	2005-2013	−2.9[a]	2013-2016	2.4[a]	−1.2[a]	1.0
Distant												
Birth to 49	1995-2002	1.8[a]	2002-2005	4.6	2005-2016	2.5[a]					2.5[a]	2.5[a]
50 to 64	1995-2001	−1.5[a]	2001-2005	0.3	2005-2010	−1.6[a]	2010-2014	1.8	2014-2016	−1.6	−0.1	0.1
≥65	1995-2005	−1.9[a]	2005-2016	−2.6[a]							−2.6[a]	−2.6[a]
All ages	1995-2016	−1.1[a]									−1.1[a]	−1.1[a]
Unknown stage												
Birth to 49	1995-2000	4.4[a]	2000-2013	−2.9[a]	2013-2016	8.3					0.7	5.4
50 to 64	1995-2002	−1.1	2002-2005	−9.5	2005-2013	−2.0[a]	2013-2016	7.5[a]			1.1	5.1[a]
≥65	1995-2001	−1.6[a]	2001-2004	−8.8[a]	2004-2013	−4.8[a]	2013-2016	−0.7			−3.5[a]	−1.7
All ages	1995-2001	−1.2	2001-2005	−7.9[a]	2005-2013	−4.0[a]	2013-2016	1.6			−2.2[a]	0.2

Abbreviations: AAPC, average annual percent change over the most recent 5 to 10 data years; APC, annual percent change based on incidence rates age adjusted to the 2000 US standard population.
Note: Trends based on incidence rates were adjusted for delays in case reporting and analyzed using the Joinpoint Regression Program, version 4.7.0.0, allowing up to 4 joinpoints.
[a]The APC or AAPC is significantly different from zero ($P < .05$).
Source: NAACCR, 2019.

Mortality trends

CRC death rates overall have been decreasing since 1947 in women, but only since 1980 in men (Fig. 4). This inconsistency likely reflects sex differences in incidence trends as a result of variable risk factor exposures, although population-based incidence data are unavailable before 1975. Over the past 3 decades, trends are very similar by sex. Declines in mortality through 2000 are attributed to improvements in treatment (12%), changing patterns in CRC risk factors (35%), and screening (53%).[56] Similar to incidence, however, screening has probably played a larger role in more recent trends given the steep increase in colonoscopy during the 2000s.[77] Rapid declines in CRC death rates of approximately 3% per year during the 2000s decelerated to 1.8% per year from 2012 to 2017 (Table 7), perhaps reflecting slower gains in screening uptake and lower rates of first-time testing.[78]

Declines in CRC mortality began earlier and were initially more rapid in whites than in blacks, resulting in a widening racial gap from 1980 to 2005, when death rates were almost 50% higher in blacks (Fig. 7). This pattern reflects differences in incidence trends as well as a slower uptake of CRC screening among blacks.[79] However, within the past decade, the black-white mortality disparity has begun to narrow because rapid declines that occurred during the 2000s (of approximately 3% per year) have slowed in whites but persisted in blacks (Table 7). Death rates have declined more slowly among Hispanics and APIs, by 1.8% per year from 2000/2001 through 2017, but have remained stable since at least 1990 among AI/ANs.

Similar to incidence, CRC mortality patterns vary by age, with rapid decreases in the oldest group tempered by increasing trends in young adults. Over the past 10 data years (2008-2017), death rates declined by 3% per year in individuals aged 65 years and older and by 0.6% per year in individuals aged 50 to 64 years while increasing by 1.3% per year in those younger than 50 years (Table 7). The uptick in young adults, which is most rapid among NHWs (2% per year), began around 2004 and was preceded by declines of 1% to 2% per year since at least 1975.[7] A declining contemporary trend in young adults was limited to black individuals, who also had the steepest mortality reductions among those aged 50 to 64 years (1.5% annually) and those aged 65 years and older (3.5% annually).

TABLE 6. Trends in Colorectal Cancer Incidence Rates by Age and Race/Ethnicity (Excluding Appendix), United States, 1995 to 2016

	TREND 1		TREND 2		TREND 3		TREND 4		TREND 5		AAPC	
AGE	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	2007 TO 2016	2012 TO 2016
Non-Hispanic white												
Birth to 49	1995-2016	2.0[a]									2.0[a]	2.0[a]
50 to 64	1995-2000	0.5	2000-2007	−2.3[a]	2007-2011	−3.0[a]	2011-2016	1.3[a]			−0.6[a]	1.3[a]
≥65	1995-1998	0.7	1998-2001	−2.0[a]	2001-2007	−3.6[a]	2007-2010	−5.3[a]	2010-2016	−3.5[a]	−4.1[a]	−3.5[a]
All ages	1995-1998	1.0[a]	1998-2001	−1.3	2001-2008	−3.0[a]	2008-2011	−4.1[a]	2011-2016	−1.3[a]	−2.4[a]	−1.3[a]
Non-Hispanic black												
Birth to 49	1995-2016	0.5[a]									0.5[a]	0.5[a]
50 to 64	1995-2003	0.7	2003-2016	−1.6[a]							−1.6[a]	−1.6[a]
≥65	1995-2003	−0.4	2003-2016	−3.8[a]							−3.8[a]	−3.8[a]
All ages	1995-2003	−0.1	2003-2008	−2.3[a]	2008-2012	−3.5[a]	2012-2016	−1.9[a]			−2.7[a]	−1.9[a]
Asian/Pacific Islander												
Birth to 49	1995-2016	0.4[a]									0.4[a]	0.4[a]
50 to 64	1995-2016	−0.5[a]									−0.5[a]	−0.5[a]
≥65	1995-2002	−1.2[a]	2002-2011	−3.4[a]	2011-2014	−5.7[a]	2014-2016	−1.9			−3.8[a]	−3.8[a]
All ages	1995-2002	−0.9[a]	2002-2016	−2.5[a]							−2.5[a]	−2.5[a]
American Indian/Alaska Native												
Birth to 49	1995-2016	2.2[a]									2.2[a]	2.2[a]
50 to 64	1995-2016	0.6[a]									0.6[a]	0.6[a]
≥65	1995-1998	16.9[a]	1998-2016	−1.9[a]							−1.9[a]	−1.9[a]
All ages	1995-1998	11.9[a]	1998-2016	−0.8[a]							−0.8[a]	−0.8[a]
Hispanic												
Birth to 49	1995-2003	2.2[a]	2003-2014	0.2	2014-2016	5.5					1.3	2.8
50 to 64	1995-1997	7.3	1997-2000	−1.9	2000-2004	1.7	2004-2011	−2.2[a]	2011-2016	1.1	−0.4	1.1
≥65	1995-1998	3.0	1998-2005	−1.9[a]	2005-2016	−3.5[a]					−3.5[a]	−3.5[a]
All ages	1995-1998	3.0[a]	1998-2006	−1.3[a]	2006-2012	−3.2[a]	2012-2016	−0.9			−2.2[a]	−0.9

Abbreviations: AAPC, average annual percent change over the most recent 5 to 10 data years; APC, annual percent change based on incidence rates age adjusted to the 2000 US standard population.
Note: Trends based on incidence rates were adjusted for delays in case reporting and analyzed using the Joinpoint Regression Program, version 4.7.0.0, allowing up to 4 joinpoints.
[a]The APC or AAPC is significantly different from zero ($P < .05$).
Source: NAACCR, 2019.

CRC Screening

As mentioned earlier, CRC incidence and mortality trends partly reflect the uptake of CRC screening. The prevalence of up-to-date screening with any recommended test among individuals aged 50 years and older increased from 38% in 2000 to 66% in 2018 according to data from the NHIS, but varies with age.[11] For example, screening prevalence in 2018 was 61% in individuals aged 50 to 64 years compared with 71% in those aged 65 years and older, with a similar 10-percentage point gap between these age groups in every survey year since 2000. Further age stratification reveals that the lower screening rate in individuals younger than 65 years largely reflects a lag in uptake in those 50 to 54 years, among whom screening prevalence in 2018 was 48% versus 68% in those aged 55 to 64 years.

Other characteristics associated with low screening prevalence include residence in the United States for fewer than 10 years (26%), being uninsured (30%) or insured by Medicaid (53%), and being of Asian descent (55%) (Table 8). In addition, fewer than one-half of individuals who receive care at federally qualified health centers are current for screening.[80] Screening also varies widely by state; prevalence in 2018 ranged from 60% in Wyoming to 76% in Massachusetts in ages ≥50 overall (Fig. 8); from approximately 50% (Alaska, Nevada, Wyoming) to ≥70% (Connecticut, Massachusetts, New Hampshire, Rhode Island) in adults aged 50 to 64 years; and from 66% to 67% (New Mexico, Wyoming) to ≥80% (California, Florida, South Carolina) in those aged 65 years and older (Table 3).

Data on CRC screening test use are unavailable for people aged younger than 40 years. Among those aged 45 to 49 years, the prevalence of test use in 2018 in accordance with American Cancer Society screening recommendations (including for diagnostic purposes) was 20.7%.[11] Patterns of CRC test use do not appear to explain the rise in early-onset CRC,[81] particularly in light of the preponderance

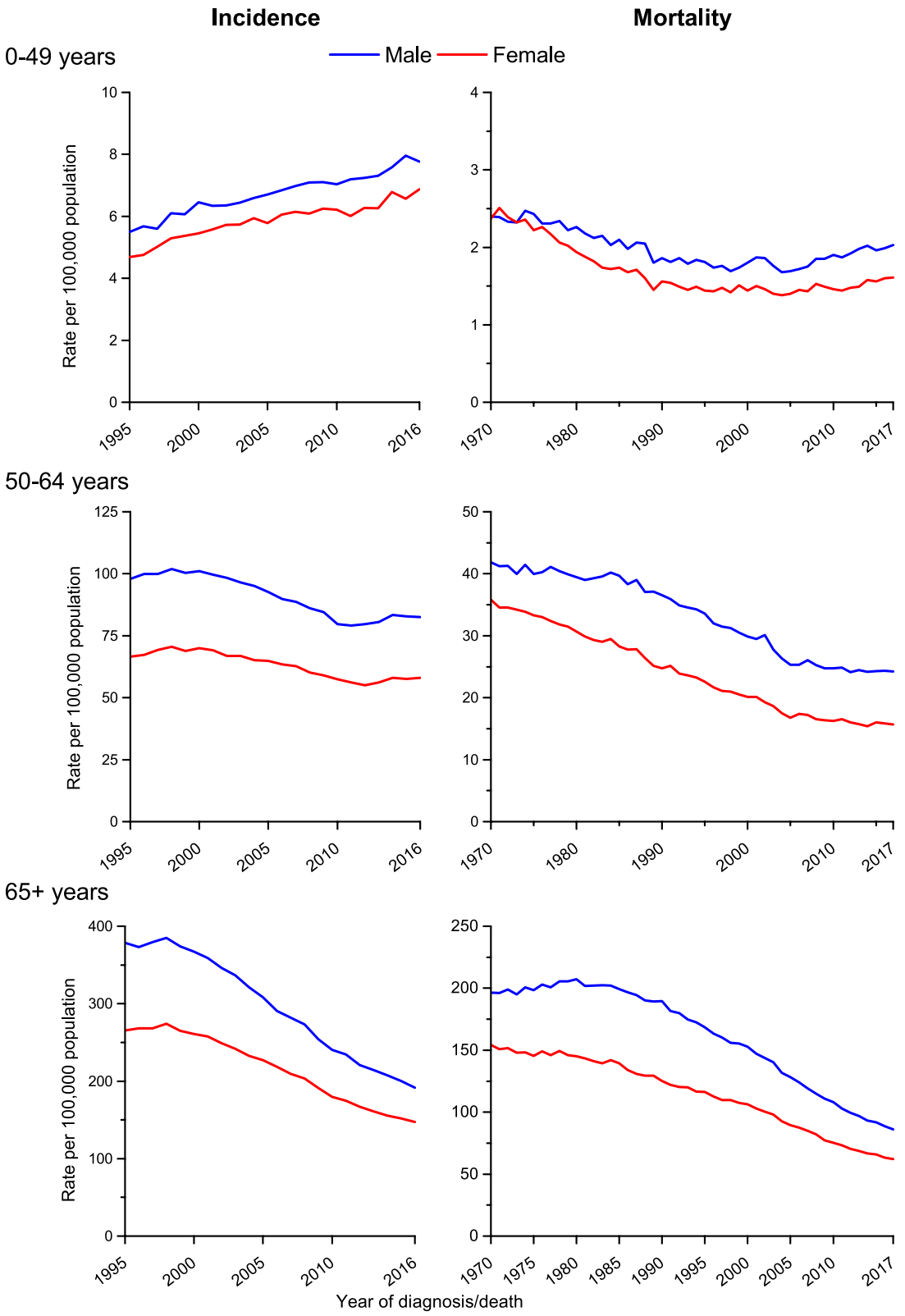

FIGURE 6. Trends in Colorectal Cancer Incidence (1995 to 2016) and Mortality (1970 to 2017) Rates by Age and Sex, United States. Incidence rates exclude the appendix and are age adjusted to the 2000 US standard population and adjusted for reporting delays. Source: Incidence: NAACCR, 2019; Mortality: NCHS, 2019.

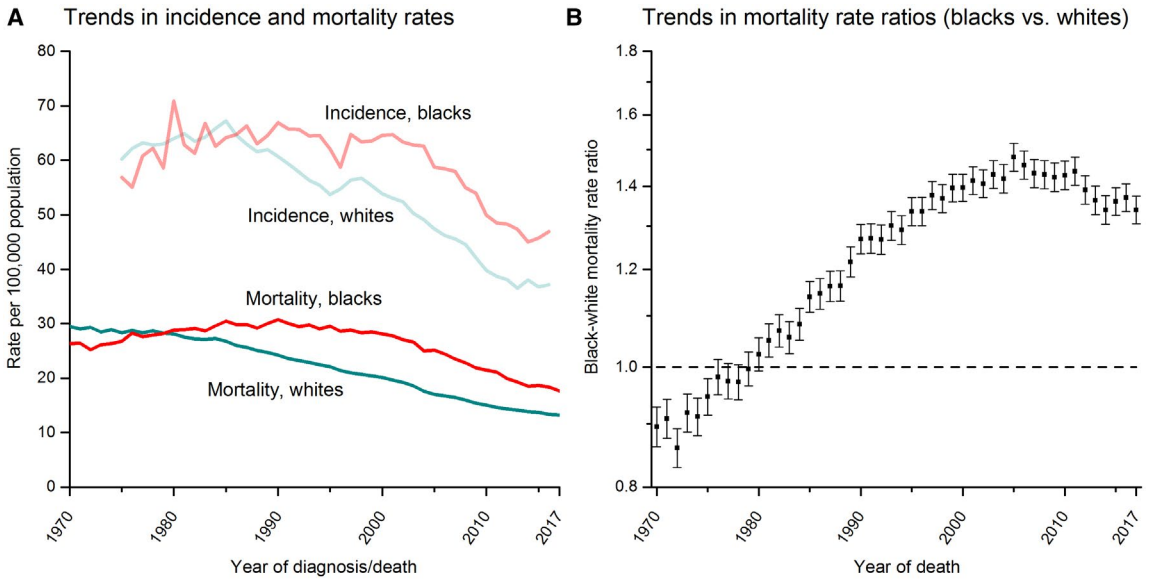

FIGURE 7. Trends in Colorectal Cancer Incidence (1975 to 2016) and Mortality Rates and Rate Ratios (1970 to 2017) by Race, United States. Incidence rates exclude the appendix and are age adjusted to the 2000 US standard population and adjusted for reporting delays. White and black race are not mutually exclusive from Hispanic ethnicity. Error bars indicate 95% confidence limits. The reference group for mortality rate ratios is whites. Source: Incidence: SEER Program, 2019; Mortality: NCHS, 2019.

of advanced-stage disease diagnoses highlighted herein and reported elsewhere.[62] Past-year colonoscopy use in adults aged 40 to 44 years remained steady at 3% during 2000 through 2018, whereas prevalence in those aged 45 to 49 years declined from 9% in 2000 to 6% during 2010 through 2013, and then increased to 8% in 2018.[11,81] The recent uptick may partly reflect new CRC screening recommendations from the American Cancer Society in 2018 that lowered the age to begin screening for those at average risk from 50 to 45 years.[82,83] Screening is recommended to begin by age 40 years in individuals at elevated risk because of a family history of adenomas or CRC in a first-degree relative; however, one study found that fewer than 40% of those aged 40 to 49 years with a family history had been screened.[84]

Survival and Stage Distribution

As of January 1, 2019, there were more than 1.5 million Americans living with a history of CRC.[85] Stage at diagnosis is the most important predictor of survival. The 5-year relative survival rate for CRC ranges from 90% for patients diagnosed with localized disease to 14% for those diagnosed with distant-stage disease (Fig. 9). Probably because of the earlier appearance of symptoms, rectal cancer is diagnosed at a localized stage slightly more often than colon cancer (38% vs 36%), partly explaining the higher overall 5-year survival (67% vs 63%). Other factors associated with advanced stage include low socioeconomic status, black race, and young age.[86,87]

Disparities by race/ethnicity

Of all racial/ethnic groups, black patients are the most likely to be diagnosed with distant-stage CRC (25% vs 20% of NHWs and APIs) and also have the lowest overall 5-year survival rate (60% vs 68% among APIs and 66% among NHWs) (Figs. 9 and 10). These disparities are largely driven by socioeconomic inequalities that result in differences in access to early detection and the receipt of timely, high-quality treatment.[87,88] Access to care is directly related to stage at diagnosis, which plays the largest role in racial/ethnic survival disparities.[89] A recent nationwide study found that greater than one-half of the black-white survival disparity is explained by differences in insurance status, and one-quarter is because of differences in tumor characteristics (eg, grade, anatomic location).[40] Notably, when CRC is diagnosed at a localized stage, 5-year survival is comparable (range, 89%-92%) across racial/ethnic groups (Fig. 9). Similarly, time to treatment after diagnosis and time to recurrence after receipt of adjuvant chemotherapy are similar in black and white patients who are treated in an equal-access setting, although overall survival is shorter among blacks, suggesting the influence of factors other than treatment, such as comorbidities.[90,91] Thus, equity in care across the cancer continuum, from prevention to early detection, clinical trial participation and individualized treatment, is necessary to eliminate racial disparities.[92]

Disparities by age

Patients with CRC who are aged younger than 50 years have higher 5-year relative survival rates than their older counterparts for every stage of diagnosis (Fig. 9); however, overall survival among patients younger than 50 years (68%) is similar to that in those 50 to 64 years (69%) because of a later stage at diagnosis (Fig. 10). Approximately 26% of

TABLE 7. Trends in Colorectal Cancer Mortality Rates by Age and Race/Ethnicity, United States, 1990 to 2017

	TREND 1		TREND 2		TREND 3		TREND 4		AAPC	
AGE	YEARS	APC	YEARS	APC	YEARS	APC	YEARS	APC	2008 TO 2017	2013 TO 2017
All races combined										
Birth to 49	1990-1998	−0.9[a]	1998-2001	2.2	2001-2004	−2.8	2004-2017	1.3[a]	1.3[a]	1.3[a]
50 to 64	1990-2002	−2.0[a]	2002-2005	−4.2[a]	2005-2017	−0.6[a]			−0.6[a]	−0.6[a]
≥65	1990-2001	−1.8[a]	2001-2012	−3.4[a]	2012-2017	−2.6[a]			−3.0[a]	−2.6[a]
All ages	1990-2002	−1.8[a]	2002-2005	−3.7[a]	2005-2012	−2.6[a]	2012-2017	−1.8[a]	−2.1[a]	−1.8[a]
Non-Hispanic white										
Birth to 49	1990-2005	−0.2	2005-2017	2.0[a]					2.0[a]	2.0[a]
50 to 64	1990-2002	−2.1[a]	2002-2005	−4.7[a]	2005-2017	−0.4[a]			−0.4[a]	−0.4[a]
≥65	1990-2001	−1.8[a]	2001-2011	−3.5[a]	2011-2017	−2.4[a]			−2.9[a]	−2.4[a]
All ages	1990-2002	−1.8[a]	2002-2005	−3.9[a]	2005-2012	−2.5[a]	2012-2017	−1.6[a]	−2.0[a]	−1.6[a]
Non-Hispanic black										
Birth to 49	1990-2017	−0.6[a]							−0.6[a]	−0.6[a]
50 to 64	1990-2017	−1.5[a]							−1.5[a]	−1.5[a]
≥65	1990-2002	−0.8[a]	2002-2017	−3.5[a]					−3.5[a]	−3.5[a]
All ages	1990-2001	−0.6[a]	2001-2017	−2.8[a]					−2.8[a]	−2.8[a]
Asian/Pacific Islander										
Birth to 49	1990-2017	−0.2							−0.2	−0.2
50 to 64	1990-2005	−2.1[a]	2005-2017	0.1					0.1	0.1
≥65	1990-2010	−1.8[a]	2010-2017	−3.7[a]					−3.3[a]	−3.7[a]
All ages	1990-2017	−1.8[a]							−1.8[a]	−1.8[a]
American Indian/Alaska Native										
Birth to 49	1990-2017	1.6[a]							1.6[a]	1.6[a]
50 to 64	1990-2017	0.4							0.4	0.4
≥65	1990-2017	−0.5							−0.5	−0.5
All ages	1990-2017	−0.2							−0.2	−0.2
Hispanic										
Birth to 49	1990-2004	−0.8	2004-2017	1.4[a]					1.4[a]	1.4[a]
50 to 64	1990-2017	−0.8[a]							−0.8[a]	−0.8[a]
≥65	1990-2002	0.3	2002-2017	−2.4[a]					−2.4[a]	−2.4[a]
All ages	1990-2001	0.2	2001-2017	−1.8[a]					−1.8[a]	−1.8[a]

Abbreviations: AAPC, average annual percent change over the most recent 5 to 10 data years; APC, annual percent change based on incidence rates age adjusted to the 2000 US standard population.
Note: Trends based on incidence rates were adjusted for delays in case reporting and analyzed using the Joinpoint Regression Program, version 4.7.0.0, allowing up to 4 joinpoints.
[a]The APC or AAPC is significantly different from zero ($P < .05$).
Source: NCHS, 2019.

CRCs are diagnosed at a distant stage among patients aged younger than 50 years, compared with 23% in those aged 50 to 64 years and 19% among those aged 65 years and older. However, those aged 65 years and older have the lowest survival rates because the advantage of earlier diagnosis is outweighed by age-related disadvantages, such as comorbidities. Older individuals are less likely than their younger counterparts to receive any aggressive treatment, including surgery and recommended adjuvant or neoadjuvant therapies.[93,94]

Trends

The 5-year relative survival rate for CRC has increased from 50% in the mid-1970s to 64% during 2009 through 2015.[6] These gains reflect improvements in treatment,[94] advances in imaging techniques (eg, positron emission tomography) that improve staging,[95,96] and earlier detection through screening.[97,98] Despite the rapid uptake of screening since 2000, however, the proportion of cases diagnosed at a localized stage has only increased slightly, from 34% in the mid-1990s to 36% during 2012 through 2016,[3] because colonoscopy predominantly prevents cancer through the removal of slow-growing premalignant polyps.[99]

Headway in the treatment of metastatic disease, including improved surgical techniques, increased cancer-directed surgery,[100] advances in the treatment of liver metastases,[101-103] and the development of targeted therapies,[94,104,105] is evident in

TABLE 8. Colorectal Cancer Screening (%), Adults Aged 50 Years and Older, United States, 2018

	STOOL TEST[a]	COLONOSCOPY[b]	UP TO DATE[c]	
	≥50	≥50	≥50	50 TO 75
Overall	11	61	66	67
Sex				
Male	12	62	67	67
Female	10	60	64	66
Age, y				
50 to 64	10	56	61	62
50 to 54	9	42	48	—
55 to 64	10	63	68	—
≥65	12	66	71	77
≥75	10	60	63	—
Race/ethnicity				
White	10	63	68	69
Black	12	60	65	66
Hispanic	15	52	59	59
American Indian/Alaska Native	12	53	59	56
Asian	15	47	55	58
Sexual orientation				
Gay/lesbian	18	68	76	76
Straight	11	61	66	67
Bisexual	25	49	58	[d]
Education				
Less than high school	11	46	52	53
High school diploma	10	57	62	63
Some college	11	62	68	68
College graduate	11	68	73	73
Immigration status				
Born in United States	10	63	68	69
Born in US territory	[d]	76	80	84
In United States <10 y	[d]	20	26	30
In United States ≥10 y	14	49	56	58
Income level				
<100% FPL	12	49	55	57
100 to <200% FPL	12	48	55	57
≥200% FPL	11	65	70	70
Insurance status				
Uninsured	5	26	30	30
Private	9	60	65	65
Medicare or Medicare and Medicaid	14	61	67	73
Private and Medicare	11	71	74	80
Medicaid or other state plan	14	44	53	54

Abbreviation: FPL, federal poverty level.
Note: Estimates do not distinguish between examinations for screening and diagnosis. All estimates except for age and insurance status are age adjusted to the 2000 US standard population.
[a]A stool test consisted of a fecal occult blood test (FOBT) OR a fecal immunochemical test (FIT) within the past year OR an sDNA test within the past 3 years.
[b]Colonoscopy had to be within the past 10 years.
[c]For adults aged 50 years and older, being up to date consisted of FOBT/FIT, sigmoidoscopy, colonoscopy, computed tomography colonography OR an sDNA test within the past 1, 5, 10, 5, and 3 years, respectively. For those aged 50 to 75 years, being up to date consisted of FOBT/FIT, sigmoidoscopy, colonoscopy, computed tomography colonography OR an sDNA test within the past 1, 5, 10, 5, and 3 years, respectively, OR sigmoidoscopy within the past 10 years with FOBT/FIT within the past year.
[d]An estimate is not shown because of instability.
Source: National Health Interview Survey, 2018.

survival gains for these patients in recent decades. For example, the 2-year relative survival rate for patients diagnosed with distant-stage disease increased from 21% during the mid-1990s to 37% during 2009 through 2015, with a larger improvement for rectal cancer (from 22% to 41%) than for colon cancer (from 21% to 36%). Although this progress is evident across race and age,[4]

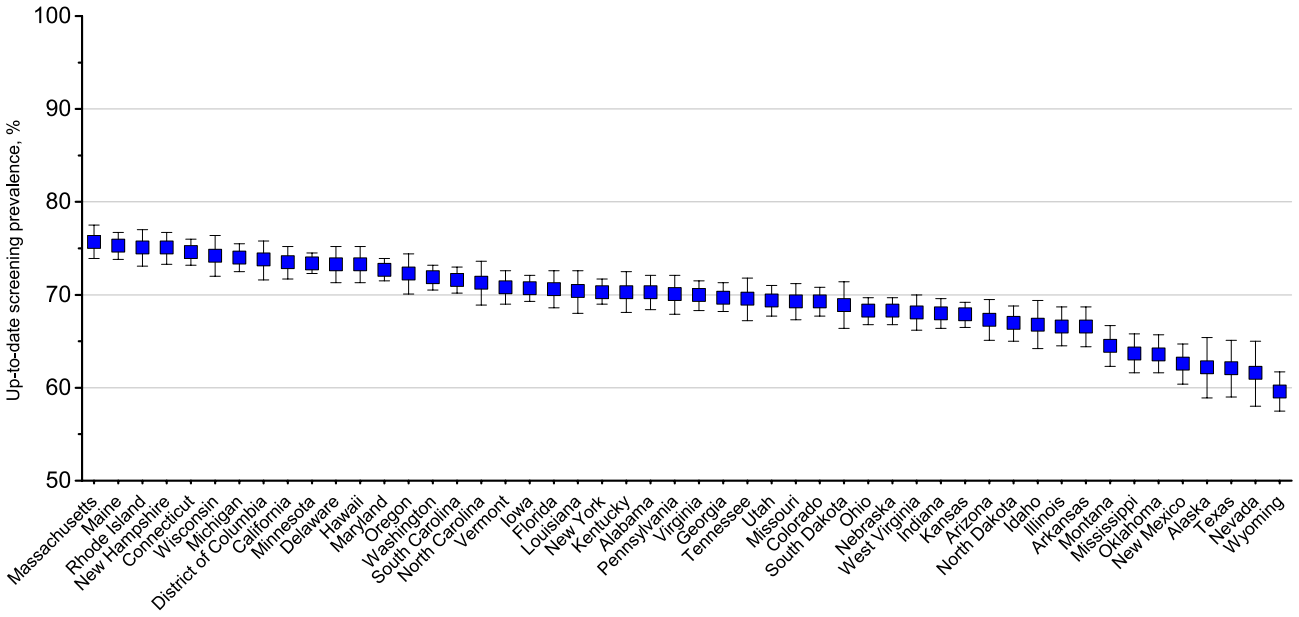

FIGURE 8. Colorectal Cancer Screening (%), Adults Aged 50 Years and Older by State, 2018. Colorectal screening consisted of blood stool test, sigmoidoscopy, or colonoscopy within the past 1, 5, and 10 years, respectively. Prevalence is age adjusted to the 2000 US standard population and does not distinguish between examinations for screening and diagnosis. Source: Behavioral Risk Factors Surveillance System, 2018.

gains continue to be most prominent among patients who are white and nonelderly.[38] Advanced-stage tumors with *KRAS*, *NRAS*, or *BRAF* mutations, as well as proximal tumors, portend a worse prognosis largely because of a lack of response to targeted agents and more aggressive biology.[106,107]

Conclusions

Although overall CRC incidence and mortality continue to decline, this progress is increasingly confined to older age groups. In addition, striking disparities by race and geography persist, with mortality rates among ANs almost 3 times higher than those in NHWs. Greater than one-half of all CRC cases and deaths are attributable to modifiable risk factors, and a substantial proportion could be further prevented through screening and surveillance. Although guideline-compliant screening prevalence reached 66% in 2018 nationally, uptake remains low in many states (eg, Alaska) and among individuals without health insurance, who are

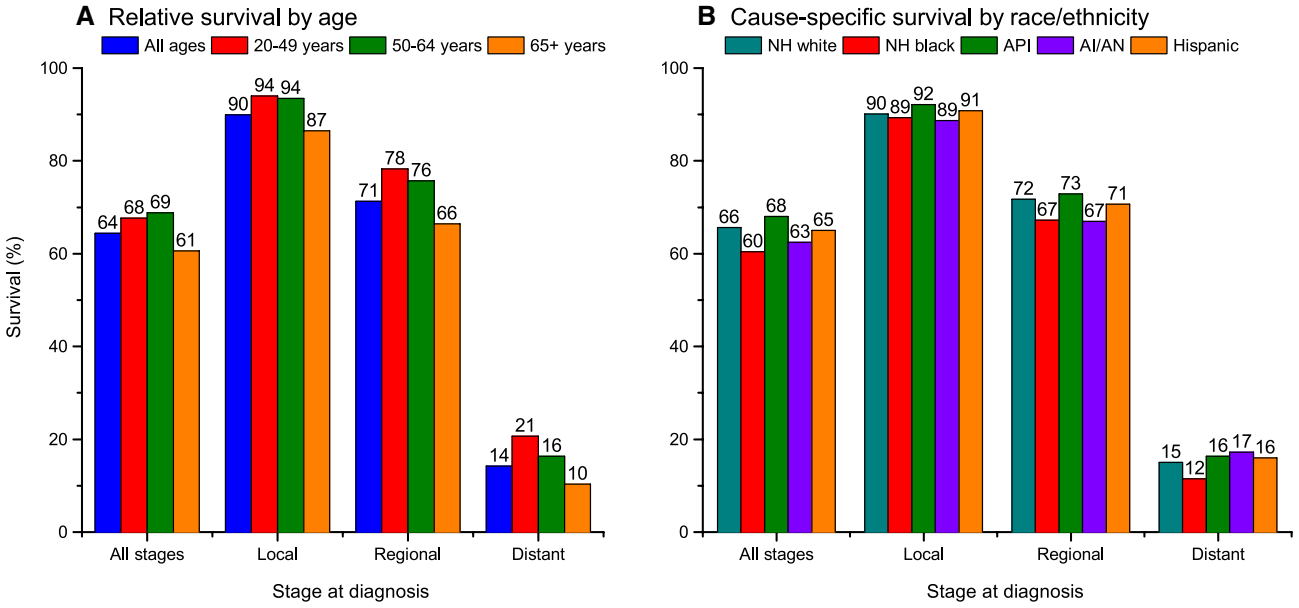

FIGURE 9. Colorectal Cancer 5-Year Survival (%) by Age and Race/Ethnicity, 2009 to 2015. Cause-specific survival rates are the probability of not dying from colorectal cancer within 5 years of diagnosis. Rates are based on cases diagnosed from 2009 to 2015, all followed through 2016. Rates for the American Indian/Alaska Native (AI/AN) population are based on small case numbers, particularly for distant-stage disease. API indicates Asian/Pacific Islander; NH, non-Hispanic. Source: SEER, 2019.

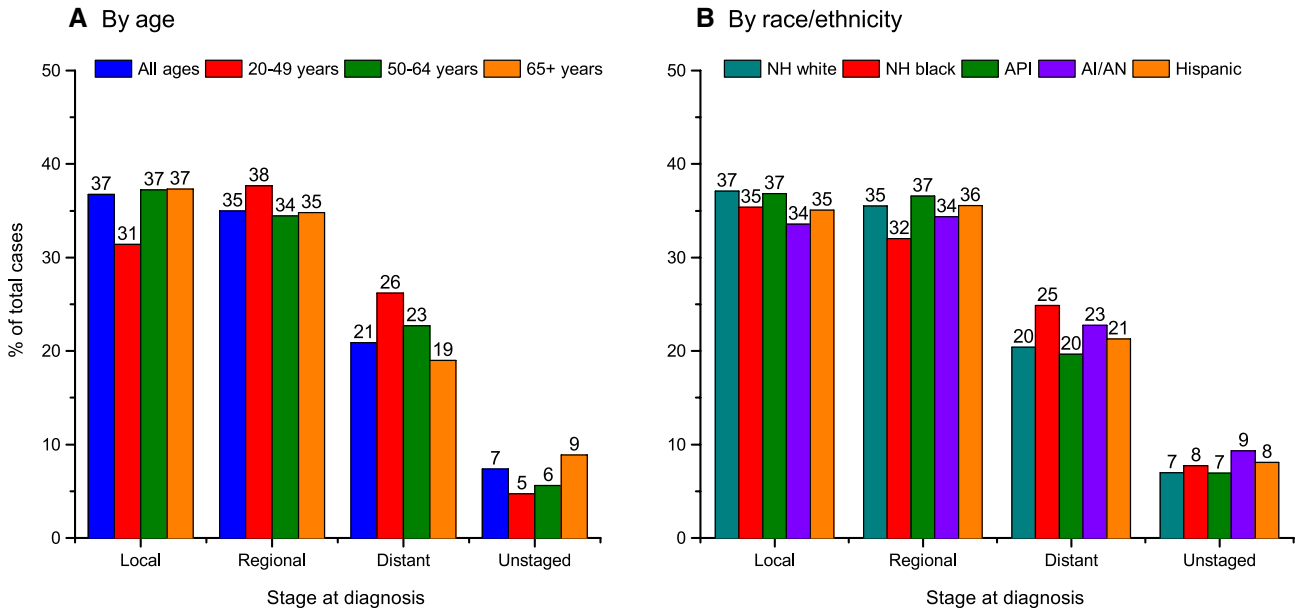

FIGURE 10. Colorectal Cancer Stage Distribution (%) by Age and Race/Ethnicity, 2012 to 2016. AI/AN indicates American Indian/Alaska Native; API, Asian/Pacific Islander; NH, non-Hispanic. Source: NAACCR, 2019.

aged 45 to 54 years, or who have a family history of the disease. Reducing CRC inequalities and furthering progress could be achieved by incentivizing healthier lifestyles and ensuring equitable access to high-quality health care for all individuals, especially those in rural and other low-resource areas. In addition, research is needed to elucidate causes for the rising CRC incidence in young and middle-aged adults and to advance treatment options for patients who have tumor subtypes without effective therapies. ■

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