Colorectal Cancer Statistics, 2014

Colorectal cancer is the third most common cancer and the third leading cause of cancer death in men and women in the United States. This article provides an overview of colorectal cancer statistics, including the most current data on incidence, survival, and mortality rates and trends. Incidence data were provided by the National Cancer Institute’s Surveillance, Epidemiology, and End Results program and the North American Association of Central Cancer Registries. Mortality data were provided by the National Center for Health Statistics. In 2014, an estimated 71,830 men and 65,000 women will be diagnosed with colorectal cancer and 26,270 men and 24,040 women will die of the disease. Greater than one-third of all deaths (29% in men and 43% in women) will occur in individuals aged 80 years and older. There is substantial variation in tumor location by age. For example, 26% of colorectal cancers in women aged younger than 50 years occur in the proximal colon, compared with 56% of cases in women aged 80 years and older. Incidence and death rates are highest in blacks and lowest in Asians/Pacific Islanders; among males during 2006 through 2010, death rates in blacks (29.4 per 100,000 population) were more than double those in Asians/Pacific Islanders (13.1) and 50% higher than those in non-Hispanic whites (19.2). Overall, incidence rates decreased by approximately 3% per year during the past decade (2001–2010). Notably, the largest drops occurred in adults aged 65 and older. For instance, rates for tumors located in the distal colon decreased by more than 5% per year. In contrast, rates increased during this time period among adults younger than 50 years. Colorectal cancer death rates declined by approximately 2% per year during the 1990s and by approximately 3% per year during the past decade. Progress in reducing colorectal cancer death rates can be accelerated by improving access to and use of screening and standard treatment in all populations.

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

Introduction
Colorectal cancer was the most common cause of cancer death in the United States in the late 1940s and early 1950s. Today, it is the third leading cause of cancer death in both men and women, in part because of historical changes in risk factors (e.g., decreased smoking and red meat consumption and increased use of aspirin), the introduction and dissemination of early detection tests, and improvements in treatment. In this article, we provide a comprehensive overview of current colorectal cancer statistics in the United States, including the estimated numbers of new cases and deaths in men and women in 2014 by age group, incidence rates and trends by age and anatomic subsite, survival and mortality rates and trends, disparities in cancer occurrence by race/ethnicity and geographic area, and screening prevalence nationally and by state.

Materials and Methods
Data Sources
Mortality data from 1930 to 2010 were obtained from the Centers for Disease Control and Prevention’s (CDC’s) National Center for Health Statistics (NCHS). Population-based cancer incidence data in the United States are collected by the National Cancer Institute’s (NCI’s) Surveillance, Epidemiology, and End Results (SEER) program, as well as the CDC’s National Program of Cancer Registries. Long-term (1975-2010) incidence and survival trends overall and for blacks and whites were based on data from the 9 oldest SEER areas (Connecticut, Iowa, Hawaii, New Mexico, Utah, and the metropolitan areas of Atlanta, Detroit, San Francisco-Oakland, and Seattle-Puget Sound), representing approximately 10% of the US population. The SEER 13 data, which allow for stratification by race and ethnicity because of the additional registration of cases from Alaska Natives, Los Angeles county, San Jose-Monterey, and rural Georgia, were the source for long-term (1992-2010) trends.

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among Asian/Pacific Islanders (APIs) and Hispanics. Long-term trends are not shown for American Indians/Alaska Natives due to sparse data. The total SEER catchment area (with the addition of greater California, greater Georgia, Kentucky, Louisiana, and New Jersey) achieves 28% population coverage and was the source for cancer stage distribution and stage-specific survival. Combined SEER and National Program of Cancer Registries data, as provided by the North American Association of Central Cancer Registries (NAACCR) in the CiNA Analytic File, was the source for the projection of colorectal cancer cases in 2014, distributions by age and subsite, current incidence rates (2006-2010), and short-term incidence trends (2001-2010).

Colorectal cancer screening prevalence data at the state level were obtained from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) public use data tapes. The BRFSS is a survey coordinated by the CDC and conducted by individual state health departments that is designed 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 reach to include households without landline telephone service (ie, cellular service only). Therefore, BRFSS estimates for 2011 and later should not be compared with earlier estimates.

### TABLE 1. Estimated Numbers* of New Colorectal Cancer Cases and Deaths by Age, United States, 2014

| AGE, YEARS | NEW CASES | DEATHS |
|-----------|-----------|--------|
|           | MALE      | FEMALE | MALE      | FEMALE |
|           | COUNT | %    | COUNT | %    | COUNT | %    | COUNT | %    |
| 00-49     | 7,270 | 10   | 6,250 | 10   | 1,840 | 7    | 1,450 | 6    |
| 50-64     | 22,890 | 32   | 16,570 | 25   | 6,780 | 26   | 4,590 | 19   |
| 65-79     | 27,950 | 39   | 23,050 | 35   | 10,100 | 38   | 7,710 | 32   |
| 80+       | 13,720 | 19   | 19,130 | 29   | 7,550 | 29   | 10,290 | 43   |
| All ages  | 71,830 | 100  | 65,000 | 100  | 26,270 | 100  | 24,040 | 100  |

*Estimates are rounded to the nearest 10.
National colorectal cancer screening prevalence was obtained from the NCHS’ 2010 National Health Interview Survey (NHIS). The NHIS is a centralized survey conducted by the US Census Bureau that is designed to provide national prevalence estimates on health characteristics such as cancer screening behaviors. Data are collected through a computer-assisted personal interview of adults aged 18 years and older.
Projected New Cases and Deaths in 2014

The most recent year for which incidence and mortality data are available lags 3 to 4 years behind the current year due to 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 in order to provide an estimate of the contemporary cancer burden. These estimates are not useful for tracking cancer occurrence over time because they are model-based and because the methodology changes every few years in order to take advantage of improvements in modeling techniques, increased cancer registration coverage, and updated risk factor surveillance. The methods for projecting the total number of new colorectal cancer cases and deaths that will occur in 2014 is described in detail elsewhere. The proportion of cases and deaths by age was calculated by applying the age distributions for NAACCR incidence data and NCHS mortality data during 2006 through 2010 to the overall estimates.

Statistical Analysis

Colorectal cancer cases were classified according to the International Classification of Diseases for Oncology as colon (C18.0-C18.9 and C26.0) or rectum (C19.9 and C20.9). Colon tumors were further designated by location as proximal (C18.0 and C18.2-C18.5), distal (C18.6-C18.7), or other (C18.1, C18.8, C18.9, and C26.0). All incidence and death rates were age-standardized to the 2000 US standard population and expressed per 100,000 persons, as calculated by the NCI’s SEER*Stat software (version 8.1.2). Incidence rates depicting long-term trends (1975-2010) for all races combined were adjusted for delays in reporting. Delay-adjusted rates, which are only available for SEER data, account for the additional time required for the registration of some cases and more accurately reflect cancer trends. The lifetime probability of developing cancer was calculated using the NCI’s DevCan software (version 6.7.0).

Selected Findings

Estimated Cases and Deaths in 2014

In 2014, there are projected to be 136,830 individuals newly diagnosed with colorectal cancer and 50,310
Colorectal cancer deaths in the United States. Approximately 60% of cases and 70% of deaths occur in those aged 65 years and older. Among women, almost 30% of cases and more than 40% of deaths will occur in those aged 80 years and older, compared with approximately 20% of cases and 30% of deaths among men (Table 1).

Cancer Occurrence in the Most Recent Time Period (2006 to 2010)

Incidence and Mortality Rates

The lifetime probability of a colorectal cancer diagnosis is 4.7% in women and 5.0% in men. Incidence and mortality rates are 30% to 40% higher in men than in women overall,
though this disparity varies by age. For example, the male to female incidence rate ratio (IRR) is 1.1 from birth to 49 years, 1.4 for those aged 50 to 79 years, and 1.2 for those 80 years and older. The reasons for higher rates in men are not completely understood, but likely reflect etiologic factors related to complex interactions between sex hormones and risk factor exposures, as well as differences in screening behavior for those aged 50 years and older.17,18

Incidence and mortality rates also vary substantially by race and ethnicity. Among both men and women, rates are highest in blacks and lowest in APIs (Fig. 1).3,7 During 2006 through 2010, colorectal cancer incidence rates in blacks were approximately 25% higher than those in whites and approximately 50% higher than those in APIs. A larger disparity exists for mortality, for which rates in blacks (29.4 per 100,000 population) are approximately 50% higher than those in whites (19.2) and double those in APIs (13.1). Much of this disparity is due to the disproportionately low socioeconomic status in the black community. According to the US Census Bureau, the poverty rate in 2012 was 27.2 in blacks, compared with 9.7 in non-Hispanic whites and 11.7 in Asians.19 Low socioeconomic status is associated with a higher risk of colorectal cancer incidence and death.20,21 A recent study estimated that differences in the prevalence of behavioral risk factors and obesity account for approximately 40% of the socioeconomic disparity in colorectal cancer incidence.22 However, there are other factors contributing to the higher burden in blacks because colorectal cancer death rates are substantially higher in blacks than in whites even within the same socioeconomic gradient.20,23

While cancer registry data are generally reported for broad racial and ethnic groups, it is important to recognize that the burden of colorectal cancer also varies greatly within these subpopulations. For example, AI/ANs living in Alaska have more than double the incidence rate of their counterparts living in New Mexico (8.71 per 100,000 population vs 31.2, respectively).7 Similarly, Pinheiro et al found that among male Hispanics in Florida, colorectal cancer incidence rates during 1999 to 2001 ranged from 33.0 per 100,000 population in Mexicans to 79.5 in Puerto Ricans.24 These differences echo the dramatic worldwide variation in the colorectal cancer burden, which is highest in economically developed countries, and primarily reflect differences in environmental exposures.25

Colorectal cancer rates vary widely within the United States as well. Table 2 shows annual, age-standardized colorectal cancer incidence and death rates by state and race/ethnicity. Although state sex patterns for incidence are similar, there is much larger variation among men than women. For example, in whites, the lowest rates are in the District of Columbia and the highest are in Kentucky for both sexes; however, rates range from 30.5 to 63.7 in men (IRR, 2.1; 95% confidence interval [CI], 1.7-2.5) and from 29.4 to 45.6 in women (IRR, 1.6; 95% CI, 1.3-1.9). Geographic patterns of colorectal cancer mortality are generally similar for blacks and whites based on those states for which there are a sufficient number of deaths to calculate rates. However, as previously noted, rates are substantially higher among blacks. For example, the highest age-adjusted state mortality rates for black men are over 50% higher than those for white men.

Subsite Distribution
Colorectal cancers vary in terms of risk factors and clinical and biological characteristics based on their location within the colon or rectum, suggesting distinct etiologies and carcinogenic mechanisms.26-28 As Table 3 indicates, the most common tumor location is the proximal colon (42%), followed by the rectum (28%).7 However, the subsite distribution varies by sex. Compared with men, women have a higher percentage of proximal tumors (46% vs 38%) and a

FIGURE 4. Long-Term Trends in Colorectal Cancer Incidence (1975-2010) and Mortality (1930-2010) Rates* by Sex, United States.

*Rates are age adjusted to the 2000 US standard population. Incidence rates were adjusted for delays in reporting. Due to changes in International Classification of Diseases coding for mortality, the death rate numerator includes the small intestine. Sources: Incidence: Surveillance, Epidemiology, and End Results (SEER) program.4 Mortality: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2010, National Center for Health Statistics, Centers for Disease Control and Prevention. Death rates from 1975 through 2010 were provided by the SEER program.
There are also differences in subsite distribution by age at diagnosis, with a notable increase in proximal tumors and decrease in rectal tumors with advancing age (Fig. 2). For example, 56% of colorectal cancers in women aged 80 years and older are in the proximal colon, compared with 26% in those aged younger than 50 years. Consequently, the median age at diagnosis for rectal cancer is younger (63 years in men and 65 years in women) than that for colon cancer (69 years and 73 years, respectively).

**TABLE 5. Trends in Colorectal Cancer Incidence Rates by Age and Subsite, United States, 2001 to 2010**

| Subsite       | YEARS | APC   | YEARS | APC   | 2006-2010 AAPC |
|---------------|-------|-------|-------|-------|----------------|
| Proximal colon|       |       |       |       |                |
| 0-49 years    | 2001–2010 | -0.2  |       |       |                |
| 50-64 years   | 2001–2010 | -2.8* |       |       |                |
| 65+ years     | 2001–2008 | -2.7* | 2008–2010 | -6.7* | -4.7*          |
| Distal colon  |       |       |       |       |                |
| 0-49 years    | 2001–2010 | 1.3*  |       |       | 1.3*           |
| 50-64 years   | 2001–2008 | -2.3* | 2008–2010 | -7.0* | -4.7*          |
| 65+ years     | 2001–2008 | -5.2* | 2008–2010 | -9.5* | -7.4*          |
| Rectum        |       |       |       |       |                |
| 0-49 years    | 2001–2010 | 1.8*  |       |       | 1.8*           |
| 50-64 years   | 2001–2010 | -1.5* |       |       | -1.5*          |
| 65+ years     | 2001–2010 | -4.3* |       |       | -4.3*          |
| Other         |       |       |       |       |                |
| 0-49 years    | 2001–2010 | 0.8   |       |       | 0.8            |
| 50-64 years   | 2001–2010 | -1.4* |       |       | -1.4*          |
| 65+ years     | 2001–2010 | -4.0* |       |       | -4.0*          |
| Total colorectum|     |       |       |       |                |
| 0-49 years    | 2001–2010 | 1.1*  |       |       | 1.1*           |
| 50-64 years   | 2001–2008 | -2.0* | 2008–2010 | -4.4* | -3.2*          |
| 65+ years     | 2001–2008 | -3.6* | 2008–2010 | -7.2* | -5.4*          |

Abbreviations: APC, annual percent change based on incidence rates age adjusted to the 2000 US standard population; AAPC, average annual percent change over the most recent 5 data years. *The APC or AAPC is significantly different from zero (p < .05). Source: North American Association of Central Cancer Registries CiNA analytic file, 1995 to 2010. Trends based on 42 states with high-quality data during 2001 through 2010, analyzed by the Joinpoint Regression Program, version 4.0.4, allowing up to 2 joinpoints.
Survival and Stage Distribution

Colorectal cancer survival rates do not vary substantially by sex, so data are presented for both sexes combined. The 5-year relative survival rate for patients diagnosed from 2003 to 2009 (all followed through 2010) was 64.9% (Table 4).29 Survival declines to 58.1% at 10 years after diagnosis, though this estimate does not reflect recent improvements in early detection and treatment because it is based on patients diagnosed as far back as 1997. Overall 5-year survival is slightly higher for rectal (66.5%) than for colon (64.2%) cancer; however, this likely reflects the higher percentage of rectal tumors diagnosed at a localized stage (44% vs 38%) because stage-specific survival is similar. Patients aged younger than 65 years have higher 5-year survival rates than those 65 years and older (68.9% vs 62.0%). Curiously, however, this advantage is confined to tumors in the distal colon and rectum; the 5-year survival rate for patients with proximal tumors is the same (approximately 65%) for each age group.

Only 40% of patients with colorectal cancer are diagnosed when the disease is at a local stage, for which the 5-year survival rate is 90.3% (Table 4). Survival declines to 70.4% and 12.5% for patients diagnosed with regional and distant-stage disease, respectively.29 Although non-Hispanic whites are the most likely to be diagnosed at a localized stage, APIs have the highest overall 5-year survival rates (Fig. 3).6 Blacks have the lowest survival for all localized stage, APIs have the highest overall 5-year survival.

Hispanic whites are the most likely to be diagnosed at a localized stage, whereas APIs have the highest overall 5-year survival rates.6 However, this likely reflects the higher percentage of rectal tumors diagnosed at a localized stage (44% vs 38%) because stage-specific survival is similar. Patients aged younger than 65 years have higher 5-year survival rates than those 65 years and older (68.9% vs 62.0%). Curiously, however, this advantage is confined to tumors in the distal colon and rectum; the 5-year survival rate for patients with proximal tumors is the same (approximately 65%) for each age group.

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Temporal Trends
Incidence

Colorectal cancer incidence rates increased from 1975 through the mid-1980s in both men and women, but have since decreased with the exception of a slight unexplained interruption from 1996 to 1998 (Fig. 4).4 A similar uptick occurred in Canada around this time. There has been speculation that the short-term increase reflects the sudden rise in population folate levels that occurred during the late 1990s following public health measures to reduce the incidence of neural tube defects through mandatory folic acid fortification of uncooked cereal grains.44 This hypothesis is based on findings that folic acid, the form of folate used in supplements and fortification, promotes carcinogenesis.55,46 However, a recent analysis of data from the American Cancer Society Cancer Prevention Study II Nutrition Cohort found no evidence that fortification or supplementation increases colorectal cancer risk; moreover, the study confirmed the inverse association between total dietary folate and colorectal cancer reported by earlier prospective studies.47,48

During the past decade (2001 to 2010), overall incidence rates decreased by an average of 3.4% per year. However, trends vary substantially by age (Fig. 5).7 Rates declined by 3.9% per year among adults aged 50 years and older, for a total drop of 30%. In contrast, rates increased by 1.1% per year among men and women aged younger than 50 years. This increase was confined to tumors in the distal colon

TABLE 6. Colorectal Cancer Screening Among Adults Aged 50 Years or Older, United States, 2010

| CHARACTERISTIC | FOBT* | ENDOSCOPY† | EITHER FOBT or ENDOSCOPY‡ |
|---------------|-------|------------|--------------------------|
| **Sex**       |       |            |                          |
| Men           | 9.0   | 57.4       | 60.2                     |
| Women         | 8.6   | 55.6       | 58.3                     |
| **Age, years**|       |            |                          |
| 50-64         | 8.0   | 52.3       | 55.2                     |
| 65+           | 9.7   | 61.2       | 63.7                     |
| **Race/ethnicity** |     |            |                          |
| White (non-Hispanic) | 9.2 | 58.5 | 61.5 |
| Black (non-Hispanic) | 8.4 | 53.0 | 55.5 |
| Asian‡        | 6.9   | 44.5       | 45.9                     |
| American Indian/Alaska Native¶ | 6.1 | 46.5 | 48.1 |
| Hispanic/Latino | 5.6 | 45.3 | 47.0 |
| **Education, years** |     |            |                          |
| <11           | 5.8   | 42.1       | 43.9                     |
| 12-13         | 6.8   | 51.9       | 54.2                     |
| 13 to 15      | 11.0  | 59.5       | 63.1                     |
| 16+           | 10.4  | 66.7       | 69.2                     |
| **Health insurance coverage** |     |            |                          |
| Yes           | 9.2   | 59.4       | 62.2                     |
| No            | 1.6   | 17.8       | 18.8                     |
| **Immigration** |     |            |                          |
| Born in US    | 9.2   | 58.0       | 60.9                     |
| Born in US territory | 4.7 | 53.3 | 55.6 |
| In US <10 years | 1.7 | 24.1 | 25.3 |
| In US 10+ years | 6.5 | 46.5 | 48.4 |
| Overall       | 8.8   | 56.4       | 59.1                     |

Abbreviation: FOBT, fecal occult blood test. Percentages are age-adjusted to the 2000 US standard population. Note: The 2010 estimate for endoscopy and combined FOBT/endoscopy are not comparable to estimates from 2008 and prior because of changes in questions assessing endoscopy use. *A home FOBT within the past year. †A sigmoidoscopy within the past 5 years or a colonoscopy within the past 10 years. ‡Either a FOBT within the past year, sigmoidoscopy within the past 5 years, or a colonoscopy within the past 10 years. §Does not include Native Hawaiians or other Pacific Islanders. ¶Estimates should be interpreted with caution because of the small sample sizes. Source: National Health Interview Survey Public Use Data File 2010, National Center for Health Statistics, Centers for Disease Control and Prevention.
(1.3% annually) and rectum (1.8% annually) (Table 5). A similar trend has been reported in Norway. Although the cause of the increase is unknown, the rise in obesity prevalence and the emergence of unfavorable dietary patterns have been implicated. Notably, an association between obesity and rectal cancer has not been established in women and study results are conflicted for men.

Among adults aged 50 years and older, the rate of decline has surged, particularly among those aged 65 years and older, among whom the annual percent decline accelerated.

FIGURE 6. Trends in Colorectal Cancer Incidence and Mortality Rates by Race/Ethnicity and Sex, United States, 1975 to 2010. Trends for American Indians/Alaska Natives not shown due to sparse data. All rates are age adjusted to the 2000 US standard population. *Rates are 2-year moving averages. †Rates are 3-year moving averages. ‡Persons of Hispanic origin may be of any race; death rates exclude deaths from Connecticut, the District of Columbia, Louisiana, Maine, Maryland, Minnesota, Mississippi, New Hampshire, New York, North Dakota, Oklahoma, South Carolina, Vermont, and Virginia due to incomplete ethnicity data. Sources: Incidence: Surveillance, Epidemiology, and End Results (SEER) program. Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention, as provided by the SEER program. 

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from 3.6% during 2001 to 2008 to 7.2% during 2008 to 2010 (Table 5). The dramatic declines in colorectal cancer incidence over the past decade have been attributed to the widespread uptake of colonoscopy screening, which increased from 19% in 2000 to 55% in 2010 among adults aged 50 to 75 years.\textsuperscript{31,55,56} Larger declines among Medicare-eligible seniors likely reflect higher rates of screening because of universal insurance coverage. In 2010, 55% of adults aged 50 to 64 years reported having undergone a recent colorectal cancer screening test, compared with 64% of those aged 65 years and older (Table 6).

Although incidence patterns among the major racial and ethnic groups have been similar over the past several decades, downturns began earlier and have been the largest among whites (Fig. 6).\textsuperscript{3-5} During the 1970s and most of the 1980s, incidence rates were generally higher in white than black men and similar in white and black women. However, since the late 1980s, rates have consistently been higher in blacks. This crossover likely reflects a combination of greater access to and use of colorectal cancer screening tests among whites, as well as racial differences in trends for colorectal cancer risk factors. A recent study estimated that screening differences account for 42% of the incidence disparity between whites and blacks.\textsuperscript{57} Among both whites and blacks, declines through at least 2004 excluded individuals residing in high-poverty areas.\textsuperscript{58} From 2001 to 2010, incidence rates declined by 2% to 4% per year among non-Hispanic whites, blacks, APIs, and Hispanics and by 1% per year among AI/AN women, but were stable among AI/AN men (Table 7).\textsuperscript{31}

**Mortality**

Colorectal cancer death rates have been decreasing since 1980 in men and since 1947 in women (Fig. 4).\textsuperscript{4} Declines since 1975 have been attributed to improvements in treatment (12%), changing patterns in colorectal cancer risk factors (35%), and screening uptake (53%).\textsuperscript{59} Similar to incidence patterns, mortality rates declined most rapidly within the past decade. From 2001 to 2010, rates decreased by approximately 3% per year in both men and women, compared with declines of approximately 2% per year during the 1990s.\textsuperscript{29} Colorectal cancer death rates decreased among men and women in every major racial/ethnic group during 2001 through 2010 with the exception of AI/ANs, among whom rates were stable (Table 7). The largest declines occurred among non-Hispanic whites and black women.

In the 1960s, colorectal cancer mortality rates were lower in black men and women than in their white counterparts.\textsuperscript{60} A racial crossover occurred around 1970 for women and around 1980 for men, after which rates diverged rapidly over most of the next 3 decades. While rates in blacks were increasing (men) or stable (women) during the 1980s and 1990s, steep declines had begun in whites (Fig. 6). The disparate pattern is likely the product of a complex interplay of social and environmental factors, including the delayed diffusion of information about screening and disparities in the management of care and receipt of treatment.\textsuperscript{38,61} It has been estimated that 54% of the racial disparity in colorectal cancer mortality is due to the combined effects of differences in screening and stage-specific survival.\textsuperscript{57} Large differences in the magnitude of declines in mortality rates for distant-stage disease (5% in blacks vs 33% in whites from 1985 to 2008) appear to be driving the survival differential.\textsuperscript{62} The mortality gap appears to have leveled off in recent years. The black-white mortality rate ratio peaked for women in 2005 at 1.5 and for men in 2006 at 1.6. From 2006 to 2010, annual declines in mortality rates were similar among black and white men (2.6% vs 2.5%) and slightly larger among black than white women (3.3% vs 3.0%).\textsuperscript{29}

Black-white mortality patterns mirror the socioeconomic shift in colorectal cancer that occurred over the last half of the 20th century. In the 1950s, colorectal cancer mortality rates in males in the highest socioeconomic group were 150% higher than those in males in the lowest socioeconomic group.\textsuperscript{63} However, by 2001, this positive gradient had reversed such that rates among the most affluent men were one-half those of the least affluent.\textsuperscript{20} This crossover was also evident in geographic patterns of colorectal cancer over this time period. While rates were highest in the Northeast and lowest in the Southeast during the 1950s and 1960s, today they are highest in the poorer areas of

### TABLE 7. Ten-Year Trends (Average Annual Percent Change) in Colorectal Cancer Incidence and Death Rates by Race/Ethnicity, United States, 2001 to 2010

|              | INCIDENCE |      | MORTALITY |      |
|--------------|-----------|------|-----------|------|
|              | MALE      | FEMALE | MALE      | FEMALE |
| Non-Hispanic white† | -3.9*  | -3.2*  | -3.2*  | -2.9*  |
| Black        | -2.0*  | -2.9*  | -2.4*  | -3.3*  |
| Asian American/Pacific Islander | -2.8*  | -2.2*  | -2.3*  | -1.6*  |
| American Indian/Alaska Native† | -1.4  | -1.3*  | -1.5  | 0.4  |
| Hispanic†  | -2.9*  | -2.8*  | -1.4*  | -2.1*  |
| All race/ethnicities | -3.8*  | -3.2*  | -3.0*  | -3.0*  |

Nonwhite race categories are not mutually exclusive of Hispanic origin. *Average annual percent change is significantly different from zero (p < .05). †Excludes deaths from the District of Columbia, Minnesota, New Hampshire, North Dakota, and South Carolina due to unreliable Hispanic origin data for some years. ‡Data based on Indian Health Service Contract Health Service Delivery Areas. Source: Edwards et al\textsuperscript{31} except data for Non-Hispanic whites and Hispanics, which were calculated using 2001 to 2010 data from the North American Association of Central Cancer Registries CiNA analytic file 1995 to 2010 (incidence), the National Center for Health Statistics (mortality), and the Joinpoint Regression Program (version 4.0.4), allowing up to 2 joinpoints.\textsuperscript{3,7}
Appalachia and the mid-South and lowest in the Northeast. Notably, northeastern states also have among the highest prevalence of colorectal cancer screening (Table 8).

**Survival**

As of January 1, 2012, there were almost 1.2 million Americans alive with a history of colorectal cancer, in part due to progress in early detection and treatment. Since the mid-1970s, the 5-year relative survival rate for all stages combined increased from 50.6% to 65.4% for colon cancer and from 48.1% to 67.7% for rectal cancer (Table 9). These gains likely reflect both internal (within stage) and external (toward more localized disease) stage shifts as a result of earlier detection, as well as improvements in treatment.

Regional-stage disease showed the greatest absolute

| TABLE 8. Colorectal Cancer Screening* Prevalence Among Adults Aged 50 Years or Older by Race/Ethnicity and State, United States, 2012 |
|---------------------------------------------|
| STATE | ALL RACES COMBINED | NON-HISPANIC WHITE | NON-HISPANIC BLACK |
|-------|---------------------|---------------------|---------------------|
|       | RANK % 95% CI | RANK % 95% CI | RANK % 95% CI |
| Massachusetts | 1 75.6 1.2 | 1 76.9 1.2 | 13 66.1 6.2 |
| New Hampshire | 2 74.7 1.7 | 4 74.5 1.7 | 7 75.2 1.9 |
| Rhode Island | 3 73.0 2.0 | 2 73.6 1.4 | 9 73.3 2.4 |
| Maine | 4 73.0 1.3 | 7 73.6 1.4 | 4 73.3 2.3 |
| Wisconsin | 5 72.1 2.4 | 8 73.3 2.4 | 4 69.8 6.9 |
| Delaware | 6 72.0 2.2 | 10 72.1 2.3 | 17 64.1 8.0 |
| Connecticut | 7 72.0 1.7 | 5 73.9 1.7 | 11 71.8 1.8 |
| Vermont | 8 71.2 1.8 | 11 71.8 1.8 | 7 - |
| Minnesota | 9 70.7 1.5 | 9 72.1 1.4 | 9 - |
| Maryland | 10 70.4 1.6 | 12 71.4 1.7 | 3 70.8 3.7 |
| New York | 11 69.8 2.2 | 18 69.2 2.2 | 1 75.6 7.5 |
| Michigan | 12 69.3 1.5 | 15 70.5 1.6 | 16 64.5 5.8 |
| Dist. of Columbia | 13 69.2 3.2 | 3 75.0 3.5 | 5 68.8 4.2 |
| California | 14 69.2 1.6 | 6 73.8 1.5 | 2 75.0 6.3 |
| Washington | 15 68.6 1.3 | 13 71.0 1.2 | 7 - |
| North Carolina | 16 68.2 1.5 | 16 69.9 1.6 | 15 66.0 4.0 |
| Florida | 17 68.0 2.1 | 14 70.8 2.1 | 8 67.4 7.0 |
| Virginia | 18 68.0 1.8 | 17 69.5 1.9 | 9 67.2 5.1 |
| Georgia | 19 67.9 2.0 | 19 69.2 2.3 | 14 66.1 4.6 |
| Pennsylvania | 20 67.2 1.3 | 22 68.0 1.3 | 7 67.6 5.2 |
| Iowa | 21 66.9 1.6 | 25 67.4 1.6 | - |
| Utah | 22 66.8 1.5 | 20 68.8 1.5 | - |
| Oregon | 23 65.8 2.1 | 26 67.3 2.1 | - |
| Alabama | 24 65.7 1.7 | 30 65.8 2.0 | 10 67.1 3.8 |
| Kansas | 25 65.7 1.4 | 27 66.8 1.3 | 11 66.6 7.9 |
| Colorado | 26 65.5 1.4 | 23 67.6 1.5 | - |
| South Carolina | 27 65.4 1.5 | 24 67.5 1.8 | 24 59.9 3.6 |
| Tennessee | 28 65.0 2.0 | 28 66.3 2.0 | 25 57.8 6.8 |
| Hawaii | 29 64.8 2.3 | 21 68.3 3.3 | - |
| Missouri | 30 64.6 2.1 | 32 64.8 2.2 | 18 63.9 7.6 |
| Ohio | 31 64.0 1.5 | 36 63.8 1.5 | 12 66.2 5.6 |
| South Dakota | 32 63.8 2.5 | 31 64.7 2.5 | - |
| Kentucky | 33 63.3 1.7 | 37 63.8 1.8 | 20 60.9 8.2 |
| New Jersey | 34 63.1 1.5 | 34 64.4 1.6 | 19 60.1 4.7 |
| West Virginia | 35 62.9 1.9 | 40 63.0 1.9 | - |
| Illinois | 36 62.5 2.2 | 35 64.3 2.3 | 22 60.4 7.5 |
| Idaho | 37 62.3 2.5 | 39 63.1 2.6 | - |
| Nebraska | 38 62.1 1.2 | 38 63.5 1.2 | 26 65.9 9.3 |
| Louisiana | 39 61.4 1.9 | 33 64.7 2.2 | 28 55.7 4.0 |
| Indiana | 40 60.9 1.7 | 45 61.7 1.8 | 23 60.0 6.6 |
| Texas | 41 60.1 2.0 | 29 65.9 2.2 | 6 68.7 6.5 |
| North Dakota | 42 59.8 2.2 | 47 60.8 2.2 | - |
| Oklahoma | 43 59.8 1.7 | 46 60.9 1.9 | 21 60.8 8.0 |
| Arizona | 44 59.7 2.3 | 41 62.7 2.4 | - |
| Nevada | 45 59.3 2.9 | 44 62.4 3.0 | - |
| Arkansas | 46 59.0 2.2 | 48 59.9 2.4 | 27 56.9 7.0 |
| Mississippi | 47 58.8 1.8 | 42 62.6 2.1 | 29 50.9 3.6 |
| New Mexico | 48 58.8 1.7 | 43 62.5 2.0 | - |
| Montana | 49 57.5 1.7 | 49 58.7 1.8 | - |
| Alaska | 50 57.2 2.9 | 50 58.3 3.3 | - |
| Wyoming | 51 57.1 2.3 | 51 57.9 2.4 | - |

Abbreviation: 95% CI, 95% confidence interval. *Either a fecal occult blood test within the past year or a sigmoidoscopy or colonoscopy within the preceding 10 years. †Sample size insufficient to provide a stable estimate. Source: Behavioral Risk Factor Surveillance System (BRFSS) Public Use Data Tapes. BRFSS 2012 data results should be considered baseline and are not directly comparable to previous years of BRFSS data because of the changes in weighting methodology and the addition of the cell phone sampling frame.
improvement, increasing from 55.2% to 73.0% for colon cancer and from 45.2% to 69.2% for rectal cancer. In the mid-1980s, patients with stage III disease began receiving chemotherapy following curative surgical resection after clinical trials demonstrated that adjuvant chemotherapy reduced the risk of recurrence and improved survival. A study published in 1990 showed that the combination of fluorouracil with levamisole reduced death rates by 33% among patients with stage III colon cancer. Shortly thereafter, a National Institutes of Health expert panel issued a consensus statement recommending this regimen, which has been improved upon over time.

Large strides in survival have also been made for late-stage disease due to advances in resection and radiofrequency ablation of liver metastases, the introduction of new therapies (eg, irinotecan and bevacizumab), and the use of imaging to improve detection of metastatic lesions. In the past 2 decades, 1-year and 2-year relative survival rates for tumors diagnosed at a distant stage increased from 35.9% to 52.6% and from 16.0% to 33.3%, respectively. However, Sineshaw et al. reported that these strides have been confined to whites and Asians, and that black and Hispanic patients with metastatic disease have not experienced recent gains in survival.

Conclusions

While there has been dramatic progress in reducing colorectal cancer incidence and mortality rates over the past decade, striking racial and socioeconomic disparities remain. Vogelaar et al. estimated that increasing the uptake of screening and other known interventions to reduce risk, in combination with expanding the use of chemotherapy to all appropriate patients, has the potential to reduce colorectal cancer mortality rates in the U.S. by 50% by 2020. The state of Delaware demonstrated that racial inequality in colorectal cancer mortality can be eliminated in less than a decade with universal access to screening and treatment. The CDC’s Colorectal Cancer Control Program is attempting to increase screening rates through screening promotion and provision targeted at uninsured and underinsured populations; however, in 2013, only 25 states received funding for this program. Further reductions in the burden of colorectal cancer will require comprehensive implementation of known cancer control interventions across the nation and to all segments of the population, with a particular emphasis on those individuals who are economically disenfranchised.

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