

Annual Report to the Nation on the Status of Cancer, Part II: Progress Toward Healthy People 2020 Objectives for 4 Common Cancers

S. Jane Henley, MSPH ¹; Cheryll C. Thomas, MSPH¹; Denise Riedel Lewis, PhD, MPH ²; Elizabeth M. Ward, PhD³; Farhad Islami, MD, PhD ⁴; Manxia Wu, MD, MPH¹; Hannah K. Weir, PhD ¹; Susan Scott, MPH ²; Recinda L. Sherman, MPH, PhD, CTR³; Jiemin Ma, PhD, MHS ⁴; Betsy A. Kohler, MPH³; Kathleen Cronin, PhD, MPH²; Ahmedin Jemal, DVM, PhD ⁴; Vicki B. Benard, PhD¹; and Lisa C. Richardson, MD, MPH¹

BACKGROUND: The Centers for Disease Control and Prevention, the American Cancer Society, the National Cancer Institute, and the North American Association of Central Cancer Registries collaborate to provide annual updates on cancer occurrence and trends in the United States and to address a special topic of interest. Part I of this report focuses on national cancer statistics, and part 2 characterizes progress in achieving select Healthy People 2020 cancer objectives. **METHODS:** For this report, the authors selected objectives—including death rates, cancer screening, and major risk factors—related to 4 common cancers (lung, colorectal, female breast, and prostate). Baseline values, recent values, and the percentage change from baseline to recent values were examined overall and by select sociodemographic characteristics. Data from national surveillance systems were obtained from the Healthy People 2020 website. **RESULTS:** Targets for death rates were met overall and in most sociodemographic groups, but not among males, blacks, or individuals in rural areas, although these groups did experience larger decreases in rates compared with other groups. During 2007 through 2017, cancer death rates decreased 15% overall, ranging from -4% (rural) to -22% (metropolitan). Targets for breast and colorectal cancer screening were not yet met overall or in any sociodemographic groups except those with the highest educational attainment, whereas lung cancer screening was generally low (<10%). Targets were not yet met overall for cigarette smoking, recent smoking cessation, excessive alcohol use, or obesity but were met for secondhand smoke exposure and physical activity. Some sociodemographic groups did not meet targets or had less improvement than others toward reaching objectives. **CONCLUSIONS:** Monitoring trends in cancer risk factors, screening test use, and mortality can help assess the progress made toward decreasing the cancer burden in the United States. Although many interventions to reduce cancer risk factors and promote healthy behaviors are proven to work, they may not be equitably applied or work well in every community. Implementing cancer prevention and control interventions that are sustainable, focused, and culturally appropriate may boost success in communities with the greatest need, ensuring that all Americans can access a path to long, healthy, cancer-free lives. *Cancer* 2020;0:1-17. © 2020 American Cancer Society.

KEYWORDS: cancer, epidemiology, Healthy People 2020, surveillance.

INTRODUCTION

“If you don’t know where you are going, you’ll end up someplace else.” These words by Yogi Berra highlight the importance of envisioning our future, setting goals to ensure our path, and selecting milestones to measure our progress. One such vision set by the US Department of Health and Human Services is a society in which all people live long, healthy lives.¹ As a pathway to realizing this vision, the national initiative Healthy People specifies 4 overarching health goals: attain high-quality, longer lives free of preventable disease, disability, injury, and premature death; achieve health equity, eliminate disparities, and improve the health of all groups; create social and physical environments that promote good health for all; and promote quality of life, healthy development, and healthy behaviors across all life stages.²

Corresponding Author: S. Jane Henley, MSPH, Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway NE, Mail Stop S107-4, Chamblee, GA 30341-3717 (shenley@cdc.gov).

¹Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia; ²Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Bethesda, Maryland; ³North American Association of Central Cancer Registries, Springfield, Illinois; ⁴Surveillance and Health Services Research, American Cancer Society, Atlanta, Georgia

See editorial and companion article on pages 1-2 and 1-25, this issue.

Elizabeth M. Ward is a consultant to North American Association of Central Cancer Registries.

We gratefully acknowledge the contributions of the state and regional cancer registry staff and health department personnel for their work in collecting the data used in this report. In addition, we thank Rick Firth of Information Management Services, Inc, for assistance in compiling the data used in this report.

The funders had no role in the design of the study; the collection, analysis, or interpretation of the data; the writing of the article; or the decision to submit the article for publication.

The findings and conclusions in this article are those of the authors and do not necessarily represent the official positions of the authors' agencies (the American Cancer Society, the Centers for Disease Control and Prevention, the National Cancer Institute, or the North American Association of Central Cancer Registries).

DOI: 10.1002/cncr.32801, **Received:** December 16, 2019; **Revised:** January 17, 2020; **Accepted:** January 31, 2020, **Published online** Month 00, 2020 in Wiley Online Library (wileyonlinelibrary.com)

Healthy People sets measurable objectives with 10-year targets that guide health promotion and disease prevention efforts in several topic areas. Each topic area is assigned to 1 or more lead agencies; for example, the Centers for Disease Control and Prevention (CDC) and the National Cancer Institute (NCI) jointly lead the development and monitoring of objectives related to cancer outcomes, including cancer screening, with the goal of reducing the number of new cancer cases as well as illness, disability, and death caused by cancer.³

Population-based screening is recommended by the US Preventive Services Task Force (USPSTF) for persons at average risk of breast,⁴ colorectal,⁵ and cervical⁶ cancers and for persons at high risk of lung cancer.⁷ Screening aims to detect these cancers at an early, often treatable stage and, in so doing, reduce mortality. Screening also can detect precancerous colorectal polyps and cervical lesions, which can be treated to prevent progression to cancer and, as a result, reduce incidence. The USPSTF recommends that men talk with their clinician about the benefits and harms of prostate cancer screening with the prostate-specific antigen test to make informed decisions about whether to be screened.⁸

Healthy People topic areas include objectives related to risk factors that increase the risk of multiple diseases, including cancer, such as cigarette smoking, secondhand smoke exposure, excess body weight, physical inactivity, and excessive alcohol use. Cigarette smoking is linked to an increased risk of at least 12 different cancers, including 2 of the most common cancers (lung and colorectal), whereas smoking cessation reduces the risk of developing or dying from cancer.⁹⁻¹¹ Among people diagnosed with cancer (including prostate cancer), smoking cessation improves prognosis, whereas continued smoking worsens prognosis and can lead to subsequent primary cancers.^{9,11} Exposure to secondhand smoke from burning tobacco products can cause sudden infant death syndrome, respiratory infections, ear infections, and asthma attacks in infants and children as well as coronary heart disease, stroke, and lung cancer in adult nonsmokers.^{9,12} Excess body weight, including overweight (a body mass index [BMI], measured as weight in kilograms by the square of height in meters, ≥ 25.0 kg/m²) and obesity (BMI ≥ 30.0 kg/m²), is linked with at least 13 cancers, including colon, rectum, and postmenopausal breast cancers.^{13,14} Independent of body weight, there is strong evidence that being physically active decreases the risk of cancers of the colon, breast (postmenopausal), and endometrium and that undertaking regular vigorous-intensity physical activity

decreases the risk of both premenopausal and postmenopausal breast cancer.^{14,15} Physical activity also improves health-related quality of life and fitness among cancer survivors.¹⁵ Alcohol use can contribute to the development of at least 6 cancers, including cancer of the colon, rectum, and female breast.^{14,16}

Monitoring trends in cancer risk factors, screening test use, incidence, and mortality can help assess the progress made toward decreasing the burden of cancer in the United States.^{17,18} Although trends in cancer incidence can be difficult to interpret because they reflect changes in diagnostic practices and the use of screening tests as well as changes in exposure to risk factors, declines in cancer death rates tend to reflect improvements in primary prevention, early detection, and treatment and are a true indicator of progress.¹⁹

The CDC, the American Cancer Society, the NCI, and the North American Association of Central Cancer Registries collaborate each year to provide updated information about cancer occurrence and trends in the United States and to address a special topic of interest. Part I of this report focuses on national cancer statistics,²⁰ and part II characterizes progress in achieving select Healthy People 2020 objectives related to 4 common cancers (lung, colorectal, female breast, and prostate), including death rates, cancer screening, and risk factors. The progress is examined in this report with a lens on health equity, which is 1 of the Healthy People initiative's overarching goals.

MATERIALS AND METHODS

Healthy People 2020 has more than 1200 objectives, and each measurable objective has a reliable national surveillance system data source, a baseline measure, a target for specific improvements to be achieved by the year 2020, and midcourse review data.² For this report, we selected objectives for disease outcomes, cancer screening, and risk factors related to 4 common cancers (lung, colorectal, female breast, and prostate) that make up about one-half of all new cancer cases and deaths (Table 1). We examined baseline values, recent midcourse review values, and changes from baseline to recent values (measured as the percentage change) overall and by select sociodemographic characteristics. Data were obtained from the Healthy People 2020 website during June 2019.² The website did not include data for lung cancer screening, so these data were obtained from the NCI.¹⁷

Disease Outcomes

Healthy People 2020 uses data from the National Center for Health Statistics National Vital Statistics System²¹ to measure objectives related to lung, colorectal, female

TABLE 1. Healthy People 2020 Objectives Related to Cancer

Objective ^a	Measure ^b	Data Source
Disease outcome		
Reduce the <i>overall</i> cancer death rate (C-1)	Overall cancer deaths per 100,000 population	NVSS
Reduce the <i>lung</i> cancer death rate (C-2)	Lung cancer deaths per 100,000 population	NVSS
Reduce the <i>female breast</i> cancer death rate (C-3)	Female breast cancer deaths per 100,000 population	NVSS
Reduce the <i>colorectal</i> cancer death rate (C-5)	Colorectal cancer deaths per 100,000 population	NVSS
Reduce the <i>prostate</i> cancer death rate (C-7)	Prostate cancer deaths per 100,000 population	NVSS
Cancer screening/counseling		
Increase the proportion of adults who receive a <i>colorectal</i> cancer screening based on the most recent guidelines (C-16)	Proportion of adults aged 50 to 75 y who received a colorectal cancer screening based on the most recent guidelines in 2008 (a blood stool test in the past y, sigmoidoscopy in the past 5 y and a blood stool test in the past 3 y, or a colonoscopy in the past 10 y)	NHIS
Increase the proportion of women who receive a <i>breast</i> cancer screening based on the most recent guidelines (C-17)	Proportion of females aged 50 to 74 y who received a breast cancer screening based on the most recent guidelines in 2008 (a mammogram in the past 2 y)	NHIS
Increase the proportion of men who discuss the advantages and disadvantages of the prostate-specific antigen (PSA) test to screen for <i>prostate</i> cancer with their health care provider (C-19)	Proportion of men aged ≥ 40 y who had discussed the advantages and disadvantages of the PSA test to screen for prostate cancer with their health care provider (a shared decision making discussion)	NHIS
Increase the proportion of adults who receive a <i>lung</i> cancer screening based on the most recent guidelines (no objective)	Proportion of adults aged 55-80 y who have a ≥ 30 pack-year smoking history and currently smoke or quit within the past 15 y who received a lung cancer screening based on the most recent guidelines in 2013 (a low-dose computed tomography chest scan to check for lung cancer in the past y)	NHIS
Cancer risk factors		
Reduce cigarette smoking by adults (TU-1.1)	Proportion of adults aged ≥ 18 y who were current cigarette smokers	NHIS
Increase recent smoking-cessation success by adult smokers (TU-5.1)	Proportion of adults aged ≥ 18 y who successfully stopped smoking within past 6 mo to 1 y	NHIS
Reduce the proportion of adults aged ≥ 18 y exposed to secondhand smoke (TU-11.3)	Proportion of nonsmoking adults aged ≥ 18 y exposed to secondhand smoke, defined as having a serum cotinine level ≥ 0.05 ng/mL and ≤ 10 ng/mL	NHANES
Increase the proportion of adults who meet the objectives for aerobic physical activity and for muscle-strengthening activity (PA-2.4)	Proportion of adults aged ≥ 18 y who met the objectives for aerobic physical activity and for muscle-strengthening activity in 2008 (light or moderate physical activity ≥ 150 minutes per wk, or vigorous physical activity ≥ 75 minutes per wk, or an equivalent combination of moderate and vigorous-intensity activity and physical activities specifically designed to strengthen muscles at least twice per wk)	NHIS
Reduce the proportion of adults who are obese (NWS-9)	Proportion of adults aged ≥ 20 y who are obese (a body mass index [BMI] measured as weight in kilograms by the square of height in meters of ≥ 30.0 kg/m ²)	NHANES
Reduce the proportion of adults who drank excessively in the previous 30 d (SA-15)	Proportion of adults aged ≥ 18 y who reported that they drank excessively in the previous 30 d (drank > 2 drinks per d on average [for men], or > 1 drink per d on average [for women], or ≥ 5 drinks during a single occasion [for men] or ≥ 4 drinks during a single occasion [for women])	National Survey on Drug Use and Health

Abbreviations: C, Cancer; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; NVSS, National Vital Statistics System; NWS, Nutrition and Weight Status; PA, Physical Activity; SA, Substance Abuse; TU, Tobacco Use.

^aThe topic area and number of each Healthy People 2020 objective is indicated in parentheses.

^bMeasures were age adjusted to the year 2000 standard population.

breast, and prostate cancer death rates. Data from 2007 were used as a baseline, and recent data were from 2017. We calculated the number and proportion that different cancer sites made up of total cancer deaths in 2017.

Cancer Screening

Healthy People 2020 uses data from the National Health Interview Survey (NHIS)²² to measure objectives related to lung, colorectal, breast, and prostate cancer screening, consistent with age and screening interval recommendations (Table 1). Data from 2008 were used as a baseline for colorectal cancer screening uptake, breast cancer

screening uptake, and prostate cancer screening discussions, and data from 2010 were used as a baseline for lung cancer screening uptake. Recent data were from 2015.

Cancer Risk Factors

Objectives related to cigarette smoking (including smoking cessation), secondhand smoke exposure, alcohol use, physical activity and excess body weight were selected for this report because these risk factors account for a high proportion of potentially avoidable cancers.²³

Healthy People 2020 uses data from the NHIS to measure objectives about current cigarette smoking,

recent smoking-cessation success, and physical activity, with baseline measures from 2008 and recent data from 2017.

Data from the National Health and Nutrition Examination Survey (NHANES)²⁴ were used to measure objectives about secondhand smoke exposure and obesity ($\text{BMI} \geq 30 \text{ kg/m}^2$), with baseline measures from 2005 to 2008. Recent data were from 2011 to 2014 for secondhand smoke exposure and from 2013 to 2016 for obesity.

Data from the National Survey on Drug Use and Health were used to measure objectives about excessive alcohol use, with baseline measures from 2008 and recent data from 2016.

Sociodemographic Characteristics

This report presents baseline and recent values overall and by select sociodemographic characteristics, including sex (male or female), race-ethnicity, geographic location, health insurance status, and educational attainment. Categories for race and ethnicity in this report varied by type of data source, and not all available categories were included in the report. This report presents results for respondents in the National Vital Statistics System by race categorized as white, black or African American (black), Asian or Pacific Islander (API), or American Indian/Alaska Native (AIAN); by ethnicity as Hispanic or Latino (Hispanic) or not Hispanic; respondents in the NHIS categorized as white only (ie, persons who reported only 1 racial group, regardless of ethnicity), black only, AIAN only, Asian only, or Hispanic; respondents in the NHANES categorized as non-Hispanic white only, non-Hispanic black only, or Mexican American; and respondents in the National Survey on Drug Use and Health categorized as white only, black only, AIAN only, Asian only, or Hispanic. Geographic location was classified as metropolitan/urban or nonmetropolitan/rural, as defined by the Office of Management and Budget.²⁵

Respondents aged <65 years were categorized, at the time of survey, as having private health insurance, public health insurance, or being uninsured. Educational attainment was presented for respondents aged ≥ 25 years in the NHIS as less than high school, high school graduate, 4-year college degree, or advanced degree and, in the NHANES, as less than high school, high school graduate (including General Educational Development high school equivalency diploma [GED]), or college graduate or above (not all available categories were included in this report).

Measures were age adjusted to the year 2000 standard population. Data for other sociodemographic characteristics were available but were not included in this report.

Target Assessment

Each Healthy People 2020 target specified a target-setting method, such as projection/trend analysis, minimal statistical significance, or percentage improvement. Although Healthy People 2020 target values and target-setting methods (for example, 10% improvement) are intended for the overall population, we also examined whether they were met in each sociodemographic group. Examining the percentage change in rates is another way to gauge progress, particularly for groups whose baseline values had improved but had not improved enough to meet the target or for groups whose baseline values had already met the target and were still improving. In the figures included in this report, Healthy People 2020 targets are indicated by black dotted lines; the baseline value is indicated as a white circle, and the most recent estimate is indicated as a colored circle (blue for death rates, purple for screening, and green for risk factors) if the target was met and as a red circle if the target was not met. The percentage change from the baseline value to the most recent estimate is indicated as a blue, purple, or green bar if the percentage improvement target was met (or if the percentage change was in the indicated direction, when a percentage improvement target was not specified) and as a red bar if the percentage improvement target was not met (or if the percentage change was not in the indicated direction, when a percentage improvement target was not specified).

RESULTS

In 2017, approximately 600,000 cancer deaths occurred in the United States. Among females, the 3 most common causes of cancer death were lung, breast, and colorectal cancers, whereas, among males, the 3 most common were lung, prostate, and colorectal cancers. Overall, 24% of cancer deaths were from lung cancers, 9% were from colorectal cancers, 7% were from female breast cancers, and 5% were from prostate cancers; together, these 4 cancers accounted for almost one-half of all cancer deaths (Figure 1). Pancreatic cancer accounted for 7% of cancer deaths and was the fourth most common cause of cancer death among both females and males. The next 3 most common cancers were liver and intrahepatic bile duct cancer, leukemia, and non-Hodgkin lymphoma; all other cancer types individually accounted for <3% of cancer deaths.

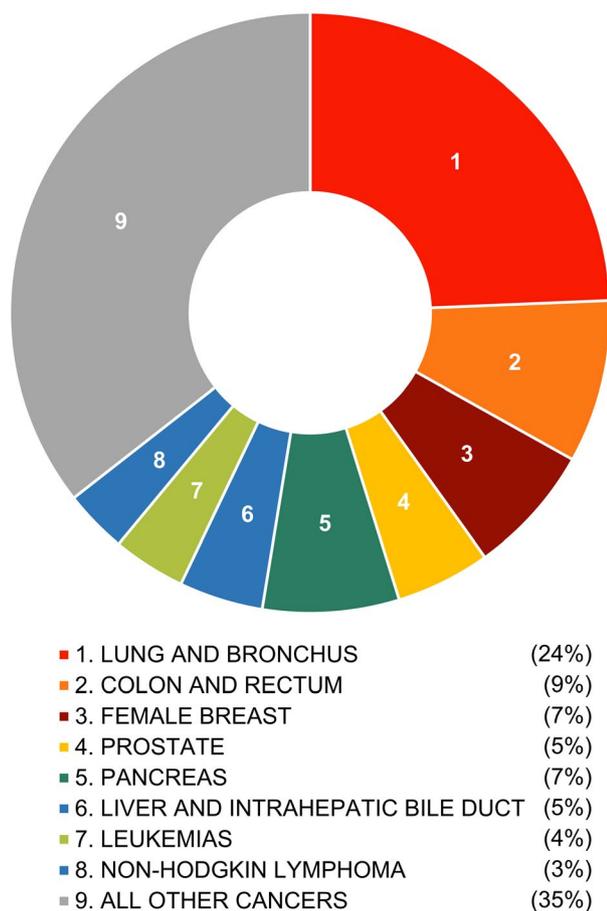


Figure 1. The distribution of cancer deaths is illustrated by cancer type for both sexes, all ages, and all races/ethnicities combined—United States, 2017.

The target death rate (161.4 deaths per 100,000 persons) for all cancers combined was met overall and in most sociodemographic groups. Although the target was not yet met in males, blacks, or people in rural areas, these groups did experience larger decreases in rates compared with other groups (Figure 2A). From 2007 to 2017, cancer death rates decreased 15% overall, and the percentage improvement goal (–10%) was met in many, but not all, sociodemographic groups, ranging from –4% (rural) to –22% (metropolitan).

The target lung cancer death rate (45.5 deaths per 100,000 persons) was met overall and in each sociodemographic group (Figure 2B). From 2007 to 2017, lung cancer death rates decreased 28% overall, ranging from –21% (rural) to –32% (males). Lung cancer screening of adults at high risk was low (approximately 6% overall); however, it increased from 2010 to 2015 in most groups except Hispanics and in those who had less than or more than a high school education (Figure 3A).

The target colorectal cancer death rate (14.5 deaths per 100,000 persons) was met overall and in several socio-demographic groups, but not in males, blacks, or people in rural areas (Figure 2C). From 2007 to 2017, colorectal cancer death rates decreased 19% overall, with the largest decrease among blacks (–24%) and the smallest decrease among AIANs (–9%). Colorectal cancer screening did not reach the target (70.5%) in any group except those with advanced educational degrees. However, screening uptake increased from 52.1% in 2008 to 62.4% in 2017, and uptake increased by $\geq 35\%$ in some groups (AIAN, Hispanic, and uninsured) (Figure 3B).

The target female breast cancer death rate (20.7 deaths per 100,000 persons) was met overall and in most groups except black women (26.9 deaths per 100,000) (Figure 2D). From 2008 to 2015, breast cancer screening increased slightly among Hispanic women but declined among other groups, declining $>10\%$ in some groups, including Asians, women in rural areas, and those with public or no health insurance (Figure 3C). The target for breast cancer screening (81.1%) was not yet met in any group except those with advanced educational degrees. Breast cancer screening uptake was lowest among uninsured women (35.4%).

The target prostate cancer death rate (21.8 deaths per 100,000 persons) was met overall and in most groups (Figure 2E). The target was not met in black men (35.8 deaths per 100,000), although they experienced the largest decrease (–34%) in rates. The objective for prostate cancer screening was to increase the proportion of men who had discussed prostate cancer screening with their clinician to 15.9%, which was met overall (16.7%) and in all race-ethnic groups except Asian men, men in metropolitan areas, and men with a college or advanced educational degree (Figure 3D).

Although cigarette smoking among adults decreased from 2008 to 2017 in all groups, the target (12%) was not yet met overall or in most groups (Figure 4A). Exceptions were Asians and those with a college or advanced degree, who had already met the target in 2008, and Hispanics and those with private insurance, who met the target by 2017. People in rural areas, those with public or no health insurance, and those with less than a high school education had the highest smoking prevalence as well as the smallest percentage improvement ($<17\%$).

The target for recent smoking cessation was not yet met overall (8%) or in many groups; exceptions were females, Asians, Hispanics, those in metropolitan areas, those with private insurance, and those with a college or advanced degree (Figure 4B). Although

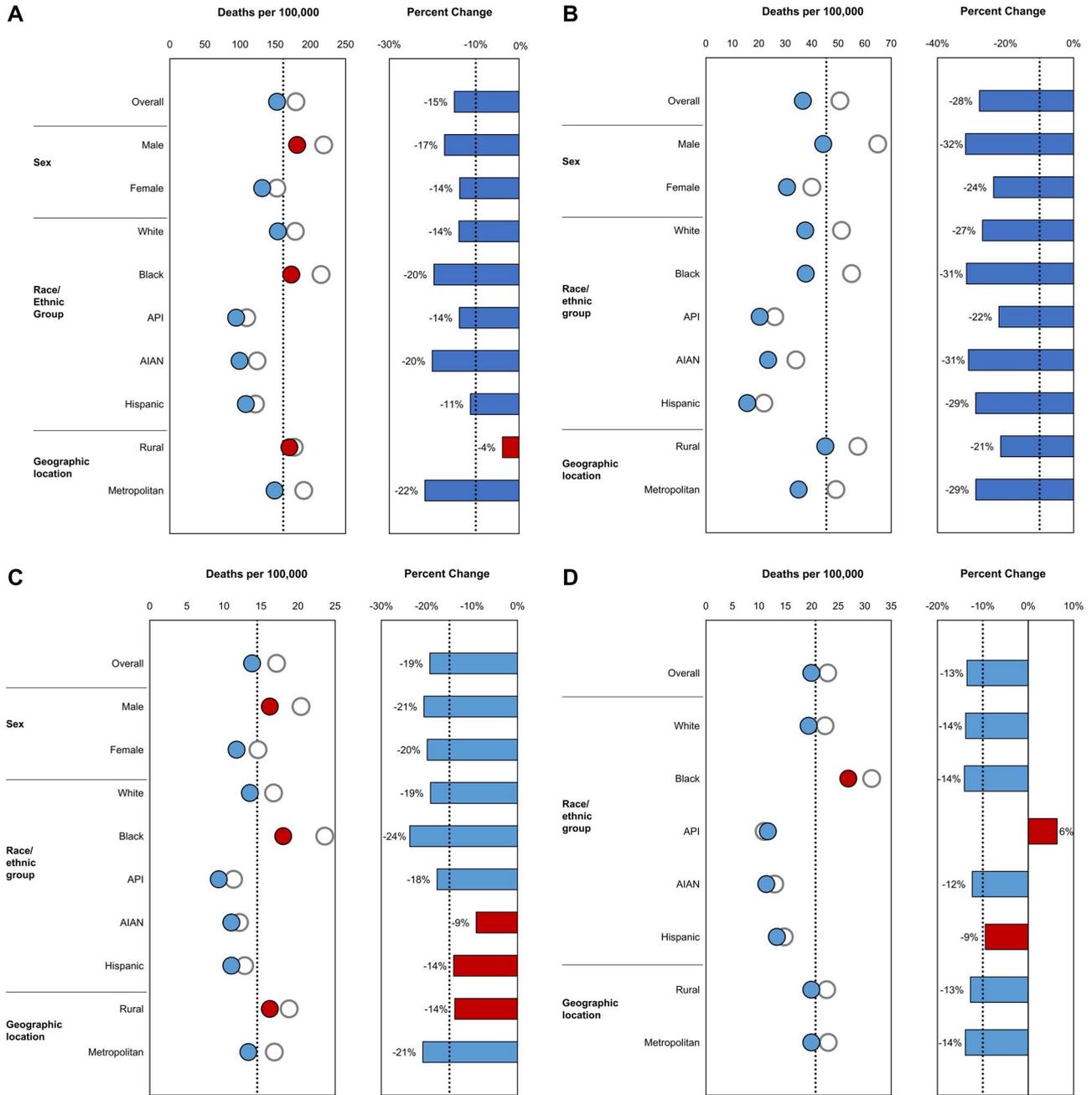


Figure 2. Healthy People 2020 objectives related to cancer death rates are illustrated. Data are from the National Vital Statistics System, baseline values are from 2007, and the most recent estimates are from 2017. Healthy People 2020 targets are indicated by black dotted lines. The baseline value is indicated as a white circle, and the most recent estimate is indicated as a blue circle if the target was met and as a red circle if the target was not met. The percentage change from the baseline value to the most recent estimate is indicated as a blue bar if the percentage improvement target was met and as a red bar if the percentage improvement target was not met. The Healthy People 2020 targets are: (A) reduce overall cancer deaths per 100,000 population from 179.3 in 2007 to 161.4 in 2020, a 10% improvement; (B) reduce lung cancer deaths per 100,000 population from 50.6 in 2007 to 45.5 in 2020, a 10% improvement; (C) reduce colorectal cancer deaths per 100,000 population from 17.1 in 2007 to 14.5 in 2020, a 15% improvement; (D) reduce female breast cancer deaths per 100,000 female population from 23.0 in 2007 to 20.7 in 2020, a 10% improvement; and (E) reduce prostate cancer deaths per 100,000 male population from 24.2 in 2007 to 21.8 in 2020, a 10% improvement. AIAN indicates American Indian/Alaska Native; API, Asian or Pacific Islander.

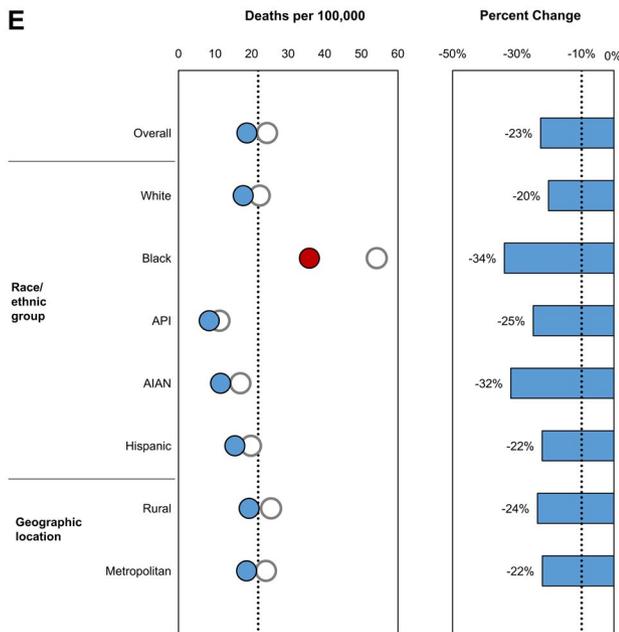


Figure 2. *Continued.*

blacks and those with no health insurance did not meet the smoking cessation target, the proportion who successfully quit in these groups increased >110% from 2008 to 2017. In contrast, whereas those with a college or advanced degree met the smoking cessation target in 2008 and 2017, the proportion decreased from 2008 to 2017.

Between the periods 2005 to 2008 and 2011 to 2014, exposure to secondhand smoke decreased 39% overall, reaching the target (33.8%) in most groups; exceptions were blacks (43%) and those with public health insurance (36%), although exposure in those groups did decrease >10% (Figure 4C). Individuals with a college degree had the lowest proportion exposed to secondhand smoke and had already met the target in 2005 to 2008, as had Mexican Americans.

The proportion of adults who drank alcohol excessively changed <10% during 2008 through 2016 among most groups, with the exception of AIANs (–10%) (Figure 4D). Most groups did not yet meet the target for reducing excessive alcohol use (25.4%); exceptions were females, Asians, those in rural areas, those with less than a high school education, and those with an advanced educational degree.

The objective for obesity was to reduce the proportion of adults who have obesity to 30.5%; however, the prevalence of obesity increased among all groups

between the periods 2005 to 2008 and 2013 to 2016 (Figure 4E). From 2013 to 2016, 39% of all adults had obesity.

The proportion of adults who met physical activity guidelines increased from 2008 to 2017 in all groups, and many groups met the target (20.1%) (Figure 4F). Exceptions were Hispanics, those in rural areas, those with public or no health insurance, and those with a high school degree or less; however, each of these groups exceeded a 10 percentage-point improvement.

DISCUSSION

In the past few decades, advances in cancer research have led to great improvements in the prevention, early detection, and treatment of cancer. This progress has been reflected in a continuous decline in overall cancer death rates and gradual increases in cancer survival.²⁶⁻²⁹ However, cancer death rates have not declined at the same pace for all cancer types or in all sociodemographic groups, indicating that communities in the United States have not benefited equally from initiatives to reduce the cancer burden. This report describes disparities in cancer risk factors and the use of cancer screening tests that, if not effectively addressed, may result in persistent and widening disparities in cancer mortality over time. The discussion focuses on interventions to promote healthy behaviors and environments.

Tobacco

Since the inception of Healthy People, cigarette smoking has remained a priority area for the nation and is a leading health indicator—a high-priority topic area with actionable steps.² Active cigarette smoking accounts for approximately 80% of the estimated 143,000 lung cancer deaths occurring each year, representing the largest number of preventable cancer deaths in the United States.^{9,23} The report shows that, between 2007 and 2017, lung cancer death rates in the United States decreased by 28% overall and by at least 21% in each of the sociodemographic groups, far exceeding the 10% Healthy People 2020 target. This favorable trend reflects improvements in diagnosis and treatment as well as the steep decline in smoking prevalence over the past several decades,^{30,31} which is partly because of the broad implementation of proven, population-based tobacco-control measures and increased awareness of the health hazards of cigarette smoking.⁹ The long-term health consequences of marijuana and novel tobacco products, such as e-cigarettes, are not yet well understood, but continued surveillance

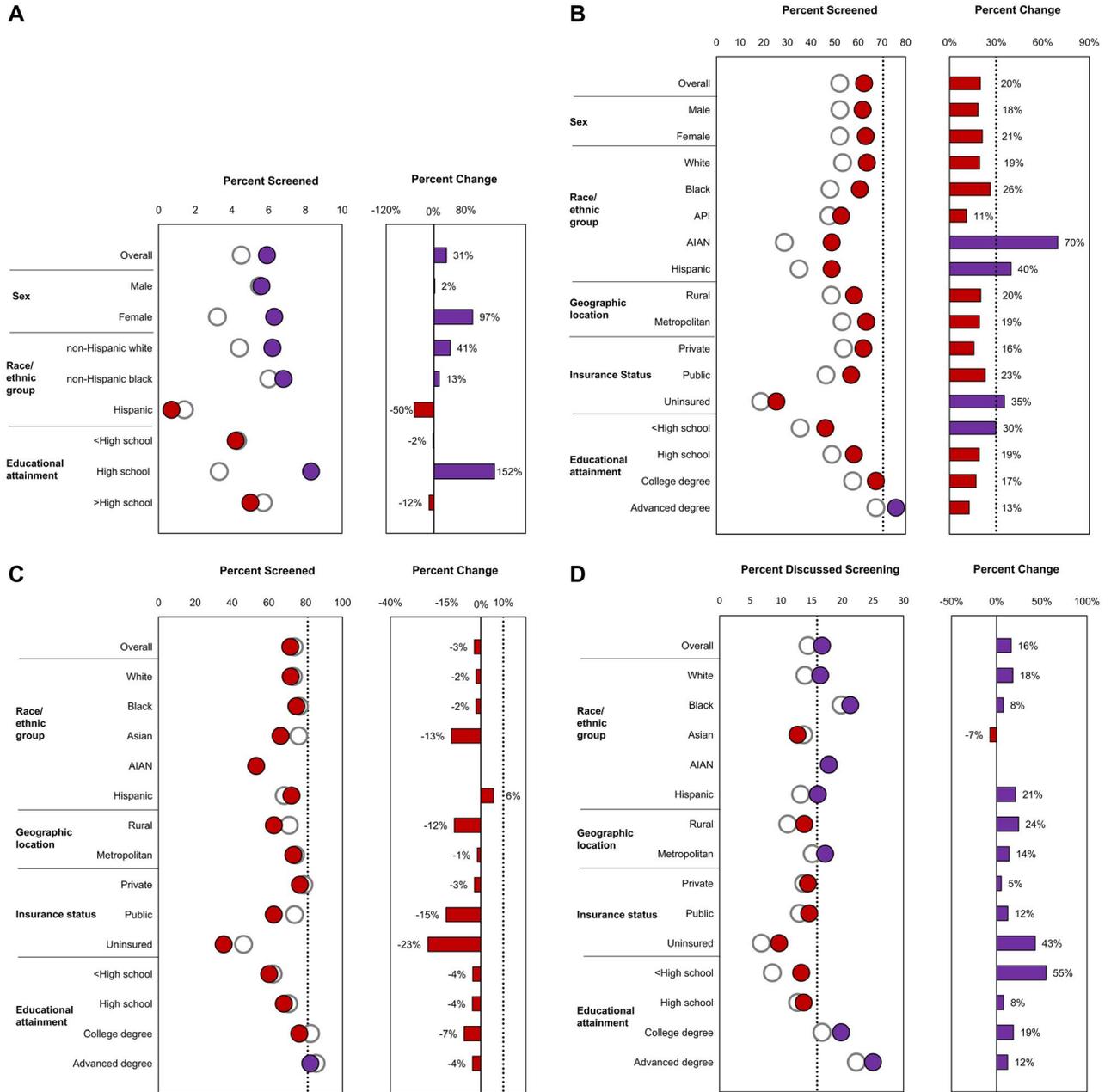


Figure 3. Healthy People 2020 objectives related to cancer screening are illustrated. Data are from the National Health Interview Survey; baseline values are from 2008 (except for lung cancer screening estimates, which are from 2010), and most recent estimates are from 2015. Healthy People 2020 targets are indicated by black dotted lines. The baseline value is indicated as a white circle, and the most recent estimate is indicated as a purple circle if the target was met and as a red circle if the target was not met. The percentage change from the baseline value to the most recent estimate is indicated as a purple bar if the percentage improvement target was met (or if the percentage change was in the indicated direction when a percentage improvement target was not specified) and as a red bar if the percentage improvement target was not met (or if the percentage change was not in the indicated direction when a percentage improvement target was not specified). The Healthy People 2020 targets are: (A) increase the proportion of adults aged 55 to 80 years at high risk of lung cancer based on smoking history who receive lung cancer screening based on the most recent US Preventive Services Task Force (USPSTF) recommendations (note that targets are not indicated because lung cancer screening was not included as a Healthy People 2020 objective); (B) increase the proportion of adults aged 50 to 75 years who receive colorectal cancer screening based on the most recent USPSTF recommendations from 52.1% in 2008 to 70.5% in 2020, a 30% improvement; (C) increase the proportion of women aged 50 to 74 years who receive breast cancer screening based on the most recent USPSTF recommendations from 73.7% in 2008 to 81.1% in 2020, a 10% improvement; and (D) increase the proportion of men aged ≥ 40 years who discuss the advantages and disadvantages of the prostate-specific antigen test to screen for prostate cancer with their health care provider from 14.4% in 2010 to 15.9% in 2020. AIAN indicates American Indian/Alaska Native; API, Asian or Pacific Islander.

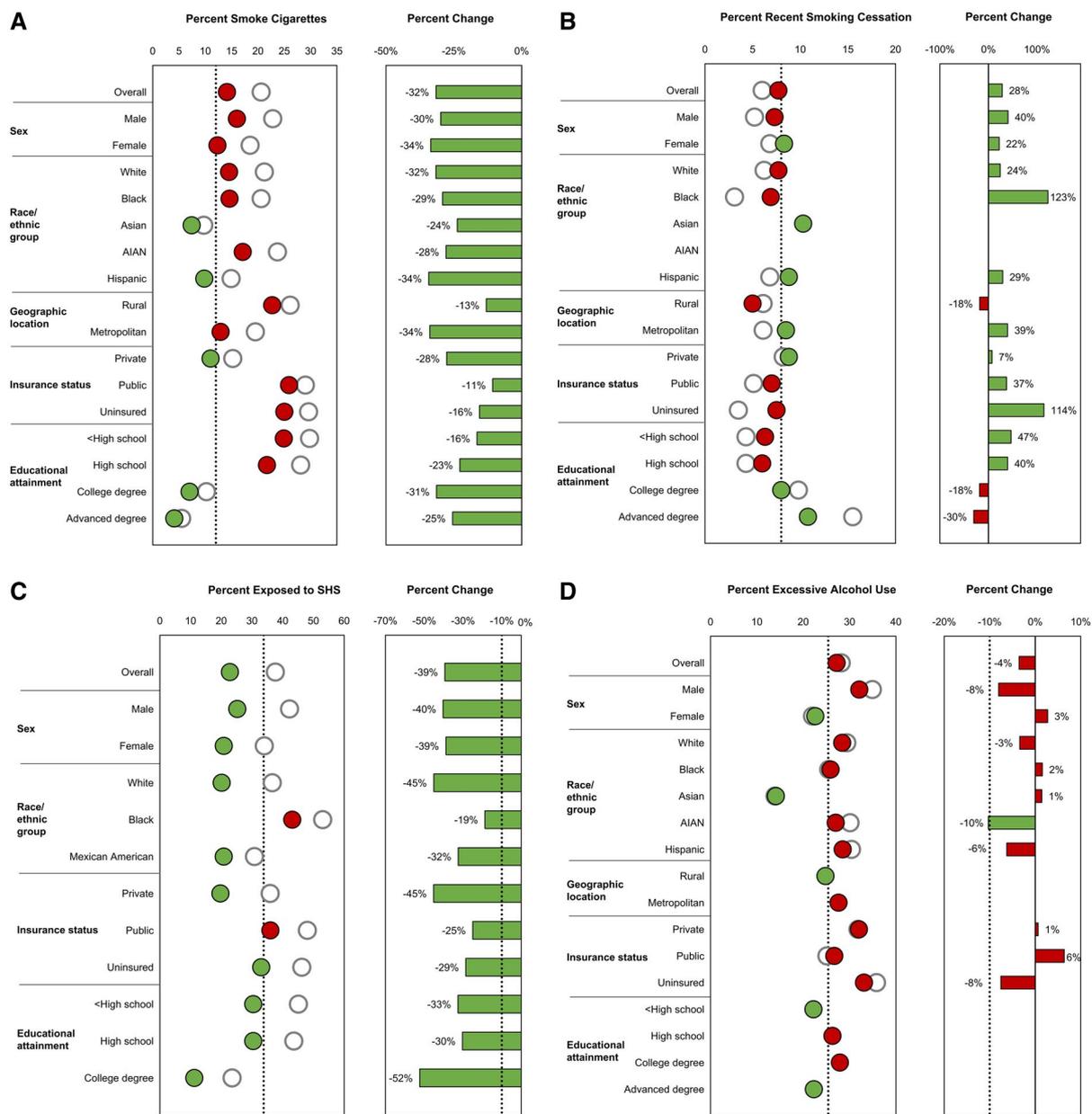


Figure 4. Healthy People 2020 objectives related to cancer risk factors are illustrated. Healthy People 2020 targets are indicated by black dotted lines. The baseline value is indicated as a white circle, and the most recent estimate is indicated as a green circle if the target was met and as a red circle if the target was not met. The percentage change from the baseline value to the most recent estimate is indicated as a green bar if the percentage improvement target was met (or if the percentage change was in the indicated direction when a percentage improvement target was not specified) and as a red bar if the percentage improvement target was not met (or if the percentage change was not in the indicated direction when a percentage improvement target was not specified). The Healthy People 2020 targets are: (A) reduce adult cigarette smoking prevalence from 20.6% in 2008 to 12.0% in 2020 (data are from the National Health Interview Survey; most recent estimates are from 2017); (B) increase recent smoking-cessation success among adult smokers from 6.0% in 2008 to 8.0% in 2020, a 2 percentage point improvement (data are from the National Health Interview Survey; most recent estimates are from 2017); (C) reduce the proportion of adults aged ≥ 18 years who are exposed to secondhand smoke from 37.6% in 2005 to 2008 to 33.8% in 2020, a 10% improvement (data are from the National Health and Nutrition Examination Survey; most recent estimates are from 2011-2014); (D) reduce the proportion of adults who drank alcohol excessively in the previous 30 days from 28.2% in 2008 to 25.4% in 2020, a 10% improvement (data are from the National Survey on Drug Use and Health; most recent estimates are from 2016; note that baseline values were not available by educational attainment); (E) reduce the proportion of adults who have obesity from 33.9% in 2005 to 2008 to 30.5% in 2020, a 10% improvement (data are from the National Health and Nutrition Examination Survey; most recent estimates are from 2013-2016); and (F) increase the proportion of adults who meet the objectives for aerobic physical activity and for muscle-strengthening activity from 18.2% in 2008 to 20.1% in 2020, a 10% improvement (data are from the National Health Interview Survey; most recent estimates are from 2017). AIAN indicates American Indian/Alaska Native; SHS, secondhand smoke.

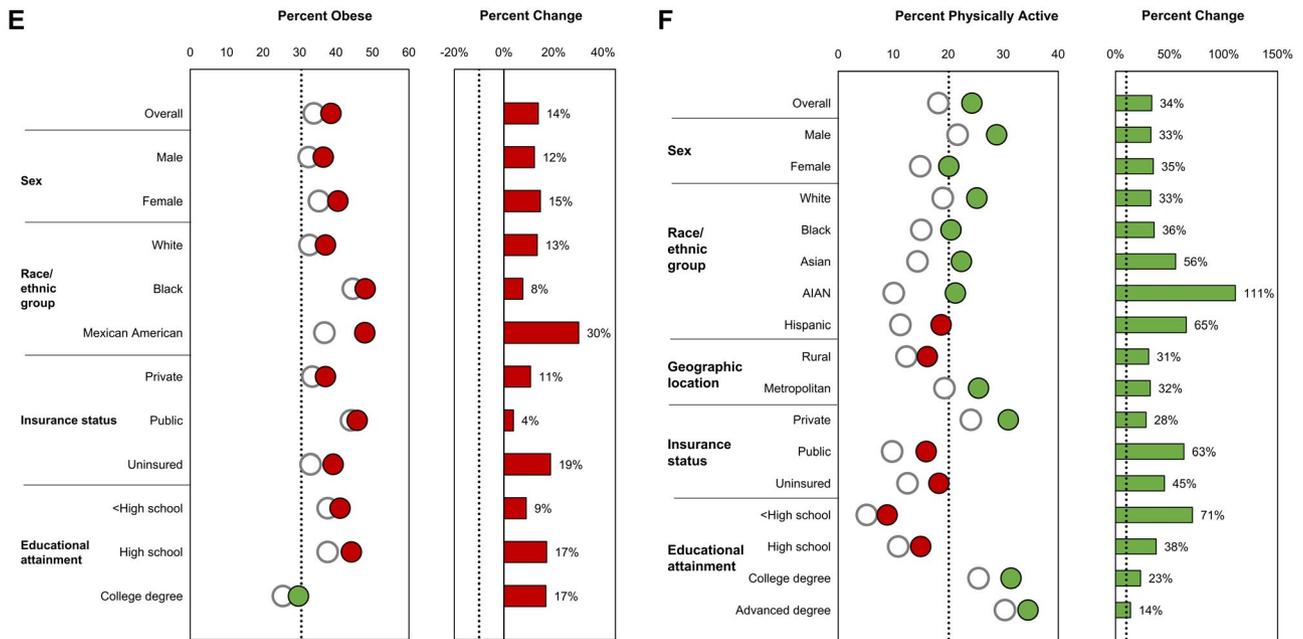


Figure 4. Continued.

of cancer and other diseases may help provide insight into the health effects of using such products.³¹

Although considerable progress in decreasing tobacco use has been made,³² our report shows that the overarching Healthy People 2020 targets for reducing adult smoking and increasing recent smoking cessation have not yet been achieved in all sociodemographic groups. Disparities in smoking prevalence can be reduced by ensuring that tobacco-control policies reach and affect all population groups equally³³ and by implementing focused interventions in high-burden groups. For example, the US Food and Drug Administration’s (FDA’s) The Real Cost campaign uses extensive research to develop effective outreach strategies and messaging to reach susceptible youth audiences.^{34,35} Population-based tobacco-control strategies include increasing the unit price of tobacco, regulation of all tobacco products, increasing the minimum purchasing age for tobacco products to 21 years, and lowering nicotine levels in combustible tobacco products to nonaddictive levels.^{9,36,37} Achieving geographic health equity also depends on ensuring adequate funding for and capacity of state tobacco-control programs.³⁶

Tobacco dependence is a chronic, relapsing condition that often requires repeated intervention and long-term support.³⁸ Individual, group, and telephone cessation counseling and FDA-approved cessation

medications are effective in increasing quit rates; the combination of counseling and medication is even more effective than either treatment alone.^{38,39} Barriers to accessing these treatments include lack of health insurance, insurance that does not cover these treatments, and coverage barriers that make it difficult to access covered treatments (eg, copayments, prior authorization, and limits on coverage for annual or lifetime cessation attempts).⁴⁰ Comprehensive coverage of proven cessation treatments with no or minimal barriers can increase the number of people who use cessation treatments and succeed in quitting.³⁸ Promoting cessation efforts among groups with high smoking prevalence⁴¹ or low quit rates⁴² can reduce disparities. For example, the CDC supports a consortium of national organizations to reduce tobacco use in populations that experience tobacco-related health disparities.⁴³ National media campaigns, such as the CDC’s Tips From Former Smokers (Tips[®]), are an important population-level strategy that can reach the overall population of people who smoke as well as specific population groups, such as those living with mental health conditions.⁴⁴ Implementing health system changes, such as offering evidence-based smoking-cessation treatment to every patient who uses tobacco at every medical encounter, engaging all care team members in tobacco treatment delivery, or referring patients to a dedicated

tobacco-cessation counselor, can facilitate the treatment and follow-up of patients.³⁸ To identify feasible approaches for providing smoking-cessation services in a variety of clinical settings, the NCI awarded 6 grants to support research on the design and implementation of smoking-cessation interventions in lung cancer screening settings.⁴⁵ The NCI also funds 42 NCI-designated cancer centers as part of the Cancer Center Cessation Initiative to integrate smoking-cessation treatment into oncology care.⁴⁶ In addition, standardizing the clinical assessment of tobacco use and incorporating these fields into electronic health records can help identify patients who would benefit from tobacco use and dependence treatment.⁴⁷

Recent studies estimate that from 4400 to 7330 lung cancer deaths each year among never-smokers in the United States can be attributed to secondhand smoke exposure.^{23,48} Our report shows that secondhand smoke exposure fell in the past decade, continuing declines beginning in the late 1980s, when almost 90% of the US population was exposed.⁴⁹ Much of this decline can be attributed to decreases in smoking prevalence and to policies that prohibit smoking in indoor workplaces and public places, including restaurants and bars.⁴⁹ However, a substantial number of people who do not smoke continue to be exposed to secondhand smoke (58 million nonsmokers in 2013-2014).⁴⁹ Furthermore, considerable disparities in secondhand smoke exposure persist among several groups, defined by age, income, education, race, geography, home ownership, and other factors.⁴⁹⁻⁵¹ For example, during 2013 through 2014, the proportion of nonsmokers exposed to secondhand smoke was 22% among nonsmoking adults compared with 38% among children aged 3 to 11 years, and it was 19% among those who owned their home compared with 39% among those who rented.⁴⁹ In part to reduce secondhand smoke exposure among public housing residents, including 700,000 children, the US Department of Housing and Urban Development adopted a rule requiring public housing authorities to make their residential units, indoor common areas, and administrative offices smoke-free by July 30, 2018.⁵²

Studies have found that smoke-free policies are not equally applied in outdoor places⁵³ or workplaces,⁵⁴ which may contribute to disparities; for example, although 80% of US indoor workers were covered by a workplace smoke-free policy, this proportion was lower among younger workers, males, Hispanics, and those with less education or income or who lived in the South.⁵⁵ Enhancing equitable implementation of

comprehensive smoke-free strategies in all workplaces, public places, homes, and vehicles can reduce secondhand smoke exposure.

Weight Status, Physical Activity, and Alcohol Use

Excess body weight has been associated with increased risk for many chronic diseases, including at least 13 types of cancer, some of which are common types—colorectal, postmenopausal breast, and advanced-stage prostate cancer.¹³ Research found that excess weight is correlated with poorer survival among patients with breast, prostate, or colorectal cancer.⁵⁶⁻⁵⁸ Approximately 8% of cancer cases and 7% of cancer deaths in the United States are attributable to excess body weight.²³ Although the Healthy People 2020 objective was to reduce adult obesity prevalence, prevalence increased 14% between the periods 2003 to 2008 (33.9%) and 2013 to 2018 (38.6%), with substantial disparities by race-ethnicity, sex, and socioeconomic status. Today, more than two-thirds of American adults are overweight or have obesity, and 18.5% of children and adolescents have obesity.³⁰ A recent study found that incidence rates for one-half of the obesity-related cancer types are increasing in young adults in the United States, with steeper increases in progressively younger ages and successively younger generations.⁵⁹ The effect of the current obesity epidemic could potentially halt or reverse the progress achieved in cancer incidence and mortality reduction.⁶⁰

Obesity is a complex problem caused by interactions among genetic background, individual behavior, and social and environmental factors, and increases in obesity have been observed in all sociodemographic groups. A multifaceted approach can curb the obesity epidemic, which requires decision-makers, state and local organizations, business and community leaders, schools, child care and health care professionals, and individuals working together to create an environment that supports healthy behaviors.⁶¹ Some evidence-based community strategies include making healthy food more accessible and affordable to communities, helping individuals recognize and make healthy food and beverage choices, creating safe communities that support physical activity, and encouraging communities to identify their assets and barriers to creating behavioral and environmental changes. Other recommended strategies include supporting organizational policies and programs that promote breastfeeding, promote early child care and school education on physical activity, limit sedentary activities among children and youth,

support health services and clinical interventions to screen for obesity, and refer patients to comprehensive, intensive weight loss interventions.^{62,63} Although obesity exceeded the Healthy People 2020 target in all but 1 sociodemographic group, the highest prevalence of obesity was among blacks, Mexican Americans, individuals with public health insurance, and those who had not completed a college degree. Multifactorial interventions focused on these populations may help achieve equity in obesity prevention.

Independent of obesity, approximately 3% of new cancer cases in the United States (46,300 cases in 2014) have been attributed to insufficient physical activity.²³ The proportion of adults who met federal guidelines for aerobic physical activity and muscle-strengthening activity increased from 2008 to 2017 in all groups, and all groups met the target (20.1%) except Hispanics, those in rural areas, those with public or no health insurance, and those with a high school education or less. However, 4 in 5 adults in the United States do not get enough physical activity, indicating that all communities would benefit from behavioral interventions and environmental changes that support physical activity.

Barriers to physical activity include lack of time, inconvenience, functional limitations, and safety issues. To create social and physical environments that promote physical activity, the Community Preventive Services Task Force recommends strategies that address these barriers.⁶⁴ For example, land use policies can include design components such as increased lighting and traffic-calming approaches that increase physical safety and support more walking and bicycling. The Rural Health Information Hub offers examples of how recommended strategies can be adapted to work in rural areas.⁶⁵ The CDC's National Comprehensive Cancer Control Program helps support environmental approaches that promote physical activity options in communities.⁶⁶ In a recent analysis of state cancer plans, all programs recognized the important role of physical activity in cancer prevention, and most plans included goals and strategies to address physical activity changes.⁶⁷ In addition, the disparity in physical activity by educational attainment indicates that improving health literacy and tailoring communication messages may be one way to decrease this disparity.⁶⁸

Excessive alcohol use contributes to many acute and chronic conditions and has long been included as a Healthy People focus area.² The most recent objectives are based on heavy drinking (>2 drinks per day on average for men or >1 drink per day on average for

women) and binge drinking (≥ 5 drinks during a single occasion for men or ≥ 4 drinks during a single occasion for women). Similar to the data presented here, recent trends using data from the Behavioral Risk Factor Surveillance System indicate that, although there has been no change in the proportion of adults who report consuming 1 drink in the past 30 days, there have been increases in heavy drinking and binge drinking, with greater increases in women than in men.⁶⁹ The >30% prevalence of excessive alcohol use among most sociodemographic groups suggests that greater application of evidence-based interventions could be broadly beneficial. It is estimated that alcohol use contributes to 6% of incident cancers and 4% of cancer deaths—third only to cigarette smoking and excess body weight—and risk increases with greater consumption.²³ Evidence-based interventions for the general population have been shown to reduce excessive alcohol use,⁶⁴ and data suggest that tailored interventions could help groups such as AIANs.⁷⁰ Alcohol screening and brief intervention are effective in reducing excessive alcohol use⁷¹ and can be expanded to settings beyond primary care offices, such as community health centers.⁷² Studies suggest that both effective state alcohol-control policies and alcohol screening and brief intervention are underused, and increasing their application may reduce the prevalence of heavy and binge drinking across population groups and in high-risk populations.^{73,74}

CANCER SCREENING

Because the USPSTF did not recommend lung cancer screening until 2013, an objective was not included in Healthy People 2020 but will be included in Healthy People 2030.⁷⁵ We found that lung cancer screening use among individuals at high risk of lung cancer increased from 2010 to 2015 but was generally very low (<7%) across all groups, suggesting that a multipronged approach may be needed to improve adherence. First, health care systems may be able to improve lung cancer screening implementation using such strategies as: using a multidisciplinary team approach; having a dedicated lung cancer screening coordinator who can handle eligibility determination, shared decision-making, and cessation counseling; using a standardized protocol for lung nodule tracking; and incorporating automated systems to ensure adherence to annual screening.^{76,77} Studies suggest that low referral to lung cancer screening may be improved by educating health care providers about screening recommendations, the recommended screening test (low-dose computed tomography), the

clinical benefits of screening, patient eligibility, screening decision support tools, integrating smoking cessation interventions into screening programs, and Medicare reimbursement.^{78,79} Finally, educating people about the availability of lung cancer screening, its benefits and harms, insurance coverage of screening, and the location of accredited screening facilities may improve public awareness and increase screening utilization by those who could benefit. Identifying and reducing individual-level and system-level barriers to screening and using tailored educational materials may help ensure equity in lung cancer screening.^{80,81}

The target colorectal cancer death rate (14.5 deaths per 100,000 persons) was met overall and in several sociodemographic groups, but not in males, blacks, or people in rural areas. Screening has been shown to be effective in reducing colorectal cancer incidence and death rates.⁵ Overall, colorectal cancer screening increased from 52.1% in 2008 to 62.4% in 2015 but has yet to reach the Healthy People 2020 target (70.5%). In an analysis of 2015 NHIS data by age, the target percentage was reached among Medicare-eligible persons aged 65 to 75 years (71.8%) but not among those aged 50 to 64 years (57.9%).⁸² Our report shows that there was a strong positive association between educational attainment and colorectal cancer screening uptake and that colorectal cancer screening was especially low among those who did not have health insurance. To promote screening among adults who are uninsured or underinsured, the CDC's Colorectal Cancer Control Program⁸³ supports 30 awardees to implement priority interventions shown to be effective by the Community Preventive Services Task Force in increasing colorectal cancer screening. The goal of the National Colorectal Cancer Roundtable, established in 1997 by the American Cancer Society and the CDC, is to increase the use of recommended colorectal screening tests through focused community approaches and coordinated efforts to remove financial, operational, and policy barriers.⁸⁴ A simulation study estimated that 277,000 colorectal cancer cases and 203,000 deaths could be averted by 2030 if screening uptake increased to 80%.⁸⁴ Among persons at higher risk of colorectal cancer because of their family history, earlier and more frequent screening may be recommended, along with testing for inherited cancer syndromes.⁸⁵

Breast cancer trends suggest that a little more than one-third of the recent decrease in breast cancer mortality was because of mammography screening, with the remainder because of treatment advances.⁸⁶ Despite the established benefits of breast cancer screening, the

Healthy People 2020 target (81%) for mammography was not yet met in any group except women with advanced educational degrees, and breast cancer screening overall decreased between 2008 and 2015. Changes in USPSTF breast cancer screening recommendations in 2009, including narrowing the recommended age range to 50 to 74 years and screening every 2 years rather than every 1 or 2 years, may have contributed to the declines in mammography use among women aged 50 to 74 years observed in this report.⁸⁷ Our report shows that mammography use declined >10% in some groups, including Asians, women in rural areas, and those with public or no insurance, indicating that focused intervention may be needed to boost screening uptake in these groups.

The Community Preventive Services Task Force recommends 24 multicomponent interventions to increase breast cancer screening, including education programs, small media, reminders (written, phone calls), patient navigators, provider assessment and feedback, and removal of structural barriers (eg, screening hours, transportation, language translation).⁶⁴ Tailored approaches that take culture and religion into consideration, as well as a role for female leaders similar to that of community health workers, may help increase screening uptake.⁸⁸ We found that mammography screening was lowest among women without health insurance (35%). To improve mammography screening among women who are low-income, uninsured, or underinsured, the CDC's National Breast and Cervical Cancer Early Detection Program provides screening services; however, only a fraction of eligible women are served, so the program is expanding its scope to include population-based strategies to reach more women.⁸⁹ Individuals (men and women) who are at high risk of breast cancer because of their family history may benefit from earlier and more frequent screening, screening with more sophisticated technologies, and genetic testing.⁹⁰ Healthy People 2020 includes an objective to increase the proportion of women with a family history of breast and/or ovarian cancer who receive genetic counseling, but not enough data were available to examine for this report.

As evidence-based recommendations have increased in number and complexity,⁹¹ so has the importance of provider-patient interactions.⁹² Healthy People first included an objective of counseling for prostate cancer screening in 2020.² Despite changes in USPSTF recommendations for prostate cancer screening,⁹³ the clinical considerations have consistently recommended a discussion of benefits and harms of prostate cancer screening and treatment before ordering a prostate-specific antigen

test. Shared decision-making tools that use plain language free of medical jargon, with simple layouts, could decrease health disparities by addressing gaps between groups who are health literate, educated, and of higher socioeconomic status and those who are not.⁹⁴ Some studies have shown that shared decision-making tools can increase knowledge and self-efficacy in the short term, but few tailored resources are available, including for black men, who have higher prostate cancer incidence and mortality than men in other race-ethnicity groups.⁹⁵ Other results have shown that medical-system and practice-level factors may influence shared decision-making processes.⁹⁶

Treatment

Declines in cancer death rates can be attributed in part to the recent rapid developments in and use of targeted therapies, immunotherapies, and precision medicine for several cancer types, including some with historically low survival. A good example is advanced melanoma. For years, little progress had been made—until in 2011, the FDA approved vemurafenib as targeted therapy and ipilimumab as immunotherapy. Now, more than 10 new treatment options have been added. These advances have substantially improved the 3-year survival rates for approximately one-half of patients with late-stage melanoma⁹⁷ and have significantly reduced mortality rates for this group of patients.⁹⁸ In the past several years, significant breakthroughs have also been made in lung cancer treatment, including the use of histologic subtype and molecular testing to individualize treatment selection for patients with non-small-cell lung cancer, which has been shown to improve survival.⁹⁹ However, access to such novel treatments may differ by age, proximity to care or to clinical trials, insurance coverage of treatment, and socioeconomic status.

Although great progress has been made in reducing mortality and improving survival for the most common cancer sites, there is still considerable variation by site. For years, less progress has been made for cancers such as esophagus, liver, and pancreas.²⁶ These sites have few effective treatments available, which underscores the need for innovative therapeutic approaches.

In addition, observed disparities in survival improvement and mortality reduction among race-ethnicity groups and by socioeconomic status may be attributable to disparities in environmental health and in access to timely preventive, early detection, and treatment services.¹⁰⁰ Ensuring equitable access to health care and dissemination of treatment advances may reduce disparities in survival and mortality.

Limitations

Race-ethnicity categories were not consistent across objectives. Targets were not factored into disparities calculations, but we examined and discussed them in this report. This report did not consider all available Healthy People objectives or sociodemographic characteristics.

The data presented in this report provide national estimates for cancer-related Healthy People 2020 objectives for broadly aggregated sociodemographic groups using national-level data. Although such data are useful in measuring progress at the national level, more detailed analysis may identify high-risk populations that would benefit from focused interventions. For example, marked regional variations have been observed in cancer incidence and death rates among AIAN populations and among subgroups of Asian American and Hispanics defined by country of origin and socioeconomic characteristics.¹⁰¹⁻¹⁰³

Conclusion and Public Health Impact

Although interventions to reduce cancer risk factors and promote healthy behaviors and environments have been shown to work, they may need to be equitably applied or adapted to work well in all communities. Implementing cancer prevention and control interventions that are sustainable, focused, and culturally appropriate may boost success in communities with the greatest need, ensuring that all Americans can access a path to long, healthy, cancer-free lives.

FUNDING SUPPORT

This work was supported by the American Cancer Society, the Centers for Disease Control and Prevention, the National Cancer Institute, and the North American Association of Central Cancer Registries. The American Cancer Society is a not-for-profit public health organization that receives support from the public through fundraising and direct contributions. The Society also receives a small portion of support from corporations and industry to support its mission programs and services.

CONFLICT OF INTEREST DISCLOSURES

The authors made no disclosures.

AUTHOR CONTRIBUTIONS

S. Jane Henley: Conceptualization, writing—original draft, writing—review and editing, and visualization. **Cheryll C. Thomas:** Conceptualization, writing—original draft, and writing—review and editing. **Denise Riedel Lewis:** Conceptualization, writing—original draft, and writing—review and editing. **Elizabeth M. Ward:** Conceptualization, writing—original draft, and writing—review and editing. **Farhad Islami:** Conceptualization, writing—original draft, and writing—review and editing. **Manxia Wu:** Conceptualization, writing—original draft, and writing—review and editing. **Hannah K. Weir:** Conceptualization, writing—original draft, and writing—review and editing. **Susan Scott:** Conceptualization, writing—original draft, and writing—review and editing. **Recinda L. Sherman:** Conceptualization, writing—original draft, and writing—review and editing. **Jiemin Ma:**

Conceptualization, writing—original draft, and writing—review and editing. **Betsy A. Kohler:** Conceptualization, writing—original draft, and writing—review and editing. **Kathleen Cronin:** Conceptualization, writing—original draft, and writing—review and editing. **Ahmedin Jamal:** Conceptualization, writing—original draft, and writing—review and editing. **Vicki B. Benard:** Conceptualization, writing—original draft, and writing—review and editing. **Lisa C. Richardson:** Conceptualization and writing—review and editing.

REFERENCES

- Koh HK, Blakey CR, Roper AY. Healthy People 2020: a report card on the health of the nation. *JAMA*. 2014;311:2475-2476. doi:10.1001/jama.2014.6446
- US Department of Health and Human Services (DHHS). Healthy People 2020. Office of Disease Prevention and Health Promotion, DHHS; 2019; Accessed January 17, 2020. <https://www.healthypeople.gov/2020/topics-objectives>
- Brown ML, Klabunde CN, Cronin KA, White MC, Richardson LC, McNeel TS. Challenges in meeting Healthy People 2020 objectives for cancer-related preventive services, National Health Interview Survey, 2008 and 2010. *Prev Chronic Dis*. 2014;11:E29. doi:10.5888/pcd11.130174
- Siu AL. Screening for breast cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2016;164:279-296. doi:10.7326/M15-2886
- Bibbins-Domingo K, Grossman DC, Curry SJ, et al. Screening for colorectal cancer: US Preventive Services Task Force recommendation statement. *JAMA*. 2016;315:2564-2575. doi:10.1001/jama.2016.5989
- US Preventive Services Task Force. Screening for cervical cancer: US Preventive Services Task Force recommendation statement. *JAMA*. 2018;320:674-686. doi:10.1001/jama.2018.10897
- Moyer VA. Screening for lung cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2014;160:330-338. doi:10.7326/m13-2771
- Moyer VA. Screening for prostate cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2012;157:120-134. doi:10.7326/0003-4819-157-2-201207170-00459
- US Department of Health and Human Services. 2014 Surgeon General's Report: The Health Consequences of Smoking—50 Years of Progress. Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, US Department of Health and Human Services; 2014. Accessed January 17, 2020. https://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm
- International Agency for Research on Cancer (IARC) Working Group on the Evaluation of Carcinogenic Risk to Humans, eds. Personal Habits and Indoor Combustion. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 100E. IARC; 2012.
- International Agency for Research on Cancer (IARC). IARC Handbooks of Cancer Prevention: Tobacco Control, Vol. 11. Reversal of Risk After Quitting Smoking. IARC; 2007. Accessed January 17, 2020. <https://publications.iarc.fr/Book-And-Report-Series/Iarc-Handbooks-Of-Cancer-Prevention/Tobacco-Control-Reversal-Of-Risk-After-Quitting-Smoking-2007>
- International Agency for Research on Cancer (IARC). Working Group on the Evaluation of Carcinogenic Risks to Humans. Tobacco Smoke and Involuntary Smoking. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 83. World Health Organization, IARC; 2004.
- Lauby-Secretan B, Scoccianti C, Loomis D, Grosse Y, Bianchini F, Straif K. Body fatness and cancer—viewpoint of the IARC Working Group. *N Engl J Med*. 2016;375:794-798. doi:10.1056/NEJMs1606602
- World Cancer Research Fund/American Institute for Cancer Research. Diet, Nutrition, Physical Activity and Cancer: A Global Perspective. Continuous Update Project Expert Report 2018. World Cancer Research Fund; 2018.
- US Department of Health and Human Services (DHHS). Physical Activity Guidelines for Americans, 2nd ed. DHHS; 2018.
- International Agency for Research on Cancer (IARC) Working Group on the Evaluation of Carcinogenic Risk to Humans. Consumption of alcoholic beverages. In: IARC Working Group, eds. Personal Habits and Indoor Combustion. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 100E. IARC; 2012:373-472.
- National Cancer Institute. Cancer Trends Progress Report. National Institutes of Health, National Cancer Institute; 2019.
- Weir HK, Thompson TD, Soman A, Moller B, Leadbetter S, White MC. Meeting the Healthy People 2020 objectives to reduce cancer mortality. *Prev Chronic Dis*. 2015;12:E104. doi:10.5888/pcd12.140482
- Measurement of progress against cancer. Extramural Committee to Assess Measures of Progress Against Cancer. *J Natl Cancer Inst*. 1990;82:825-835.
- Henley SJ, Ward E, Ma J, et al. Annual report to the nation on the status of cancer, part I: national cancer statistics. *Cancer*. 2000;000:000-000. doi:10.1002/cncr.32802
- National Center for Health Statistics (NCHS). National Vital Statistics System. Mortality Data NCHS; 2019. Accessed January 17, 2020. <https://www.cdc.gov/nchs/nvss/deaths.htm>
- National Center for Health Statistics (NCHS). National Health Interview Survey, 2015. NHIS data, questionnaires and related documentation. NCHS; 2019. Accessed January 17, 2020. https://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm
- Islami F, Goding Sauer A, Miller KD, et al. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. *CA Cancer J Clin*. 2018;68:31-54. doi:10.3322/caac.21440
- National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Data. NCHS; 2019. Accessed January 17, 2020. <https://www.cdc.gov/nchs/nhanes/default.aspx>
- Office of Management and Budget (OMB), Executive Office of the President. OMB Bulletin No. 13-01. Revised Delineations of Metropolitan Statistical Areas, Micropolitan Statistical Areas, and Combined Statistical Areas, and Guidance on Uses of the Delineations of These Areas. OMB; 2013. Accessed January 17, 2020. <https://obamawhitehouse.archives.gov/sites/default/files/omb/bulletins/2013/b-13-01.pdf>
- Ward E, Sherman RL, Henley SJ, et al. Annual report to the nation on the status of cancer, 1999-2015, featuring cancer in men and women ages 20-49. *J Natl Cancer Inst*. 2019;111:1279-1297. doi:10.1093/jnci/djz106
- US Cancer Statistics (USCS) Working Group. United States Cancer Statistics Data Visualizations Tool, based on November 2018 submission data (1999-2016). US Department of Health and Human Services, Centers for Disease Control and Prevention, National Cancer Institute; 2019. Accessed January 17, 2020. www.cdc.gov/cancer/dataviz
- Howlander N, Noone AM, Krapcho M, et al. SEER Cancer Statistics Review (CSR) 1975-2016. National Cancer Institute; 2019. Accessed January 17, 2020. https://seer.cancer.gov/csr/1975_2016/
- Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. *CA Cancer J Clin*. 2019;69:7-34. doi:10.3322/caac.21551
- National Center for Health Statistics (NCHS). Health, United States, 2017: With Special Feature on Mortality. NCHS; 2018. Accessed January 17, 2020. <https://www.cdc.gov/nchs/data/health/us/17.pdf>
- Schabath MB, Cote ML. Cancer progress and priorities: lung cancer. *Cancer Epidemiol Biomarkers Prev*. 2019;28:1563-1579. doi:10.1158/1055-9965.Epi-19-0221
- Wang TW, Asman K, Gentzke AS, et al. Tobacco product use among adults—United States, 2017. *MMWR Morb Mortal Wkly Rep*. 2018;67:1225-1232. doi:10.15585/mmwr.mm6744a2
- Garrett BE, Dube SR, Babb S, McAfee T. Addressing the social determinants of health to reduce tobacco-related disparities. *Nicotine Tob Res*. 2015;17:892-897. doi:10.1093/ntr/ntu266
- US Food and Drug Administration (FDA). The Real Cost Campaign. FDA; 2019. Accessed January 17, 2020. <https://www.fda.gov/tobacco-products/public-health-education-campaigns/real-cost-campaign>
- Duke JC, MacMonegle AJ, Nonnemaker JM, et al. Impact of the real cost media campaign on youth smoking initiation. *Am J Prev Med*. 2019;57:645-651. doi:10.1016/j.amepre.2019.06.011

36. Centers for Disease Control and Prevention (CDC). State Tobacco Activities Tracking and Evaluation (STATE) System. CDC; 2019. Accessed January 17, 2020. <https://www.cdc.gov/statesystem/>
37. US Food and Drug Administration (FDA). FDA's Comprehensive Plan for Tobacco and Nicotine Regulation. FDA; 2019. Accessed January 17, 2020. <https://www.fda.gov/tobacco-products/ctp-newsroom/fdas-comprehensive-plan-tobacco-and-nicotine-regulation>
38. US Department of Health and Human Services. Treating Tobacco Use and Dependence: 2008 Update. Agency for Healthcare Research and Quality; 2008. Accessed January 17, 2020. <https://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/index.html>
39. US Preventive Services Task Force. Behavioral and pharmacotherapy interventions for tobacco smoking cessation in adults, including pregnant women: US Preventive Services Task Force recommendation statement. *Ann Intern Med.* 2015;163:622-634. doi:10.7326/M15-2023
40. DiGiulio A, Jump Z, Yu A, et al. State Medicaid coverage for tobacco cessation treatments and barriers to accessing treatments—United States, 2015-2017. *MMWR Morb Mortal Wkly Rep.* 2018;67:390-395. doi:10.15585/mmwr.mm6713a3
41. Jamal A, Phillips E, Gentzke AS, et al. Current cigarette smoking among adults—United States, 2016. *MMWR Morb Mortal Wkly Rep.* 2018;67:53-59. doi:10.15585/mmwr.mm6702a1
42. Babb S, Malarcher A, Schauer G, Asman K, Jamal A. Quitting smoking among adults—United States, 2000-2015. *MMWR Morb Mortal Wkly Rep.* 2017;65:1457-1464. doi:10.15585/mmwr.mm6552a1
43. Office on Smoking and Health, Centers for Disease Control and Prevention (CDC). Networking2Save: CDC's National Network Approach to Preventing and Controlling Tobacco-Related Cancers in Special Populations. CDC; 2019. Accessed January 17, 2020. <https://www.cdc.gov/tobacco/about/foa/national-networks-nofol/coop-agreement/index.html>
44. Prochaska JJ, Gates EF, Davis KC, Gutierrez K, Prutzman Y, Rodes R. The 2016 Tips From Former Smokers® Campaign: associations with quit intentions and quit attempts among smokers with and without mental health conditions. *Nicotine Tob Res.* 2019;21:576-583. doi:10.1093/ntr/nty241
45. Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute (NCI). Smoking Cessation at Lung Examination: The SCALE Collaboration. NCI; 2018. Accessed January 17, 2020. <https://cancercontrol.cancer.gov/brp/tcrb/scale-collaboration.html>
46. Croyle RT, Morgan GD, Fiore MC. Addressing a core gap in cancer care—the NCI Moonshot program to help oncology patients stop smoking. *N Engl J Med.* 2019;380:512-515. doi:10.1056/NEJMp1813913
47. Land SR, Marcus PM. Cancer screening and diagnosis: opportunities for smoking cessation intervention. *J Clin Oncol.* 2015;33:1631-1632. doi:10.1200/jco.2015.61.2077
48. Max W, Sung HY, Shi Y. Deaths from secondhand smoke exposure in the United States: economic implications. *Am J Public Health.* 2012;102:2173-2180. doi:10.2105/ajph.2012.300805
49. Tsai J, Homa DM, Gentzke AS, et al. Exposure to secondhand smoke among nonsmokers—United States, 1988-2014. *MMWR Morb Mortal Wkly Rep.* 2018;67:1342-1346. doi:10.15585/mmwr.mm6748a3
50. Gan WQ, Mannino DM, Jemal A. Socioeconomic disparities in secondhand smoke exposure among US never-smoking adults: the National Health and Nutrition Examination Survey 1988-2010. *Tob Control.* 2015;24:568-573. doi:10.1136/tobaccocontrol-2014-051660
51. King BA, Homa DM, Dube SR, Babb SD. Exposure to secondhand smoke and attitudes toward smoke-free workplaces among employed US adults: findings from the National Adult Tobacco Survey. *Nicotine Tob Res.* 2014;16:1307-1318. doi:10.1093/ntr/ntu069
52. US Department of Housing and Urban Development, Office of the Assistant Secretary for Public and Indian Housing. 24 CFR parts 965-966. [Docket No. FR 5597-F-03] RIN 2577-AC97. Instituting smoke-free public housing. Final rule. *Fed Regist.* 2016;81:87430-87444.
53. Lowrie C, Pearson AL, Thomson G. Inequities in coverage of smoke-free outdoor space policies within the United States: school grounds and playgrounds. *BMC Public Health.* 2018;18:736. doi:10.1186/s12889-018-5602-7
54. Babb S, Liu B, Kenemer B, et al. Changes in self-reported smoke-free workplace policy coverage among employed adults—United States, 2003 and 2010-2011. *Nicotine Tob Res.* 2018;20:1327-1335. doi:10.1093/ntr/ntx202
55. Syamlal G, King BA, Mazurek JM. Workplace smoke-free policies and cessation programs among US working adults. *Am J Prev Med.* 2019;56:548-562. doi:10.1016/j.amepre.2018.10.030
56. Vidal AC, Howard LE, Sun SX, et al. Obesity and prostate cancer-specific mortality after radical prostatectomy: results from the Shared Equal Access Regional Cancer Hospital (SEARCH) database. *Prostate Cancer Prostatic Dis.* 2017;20:72-78. doi:10.1038/pcan.2016.47
57. Chan DS, Vieira AR, Aune D, et al. Body mass index and survival in women with breast cancer—systematic literature review and meta-analysis of 82 follow-up studies. *Ann Oncol.* 2014;25:1901-1914. doi:10.1093/annonc/mdu042
58. Maskarinec G, Harmon BE, Little MA, et al. Excess body weight and colorectal cancer survival: the multiethnic cohort. *Cancer Causes Control.* 2015;26:1709-1718. doi:10.1007/s10552-015-0664-7
59. Sung H, Siegel RL, Rosenberg PS, Jemal A. Emerging cancer trends among young adults in the USA: analysis of a population-based cancer registry. *Lancet Public Health.* 2019;4:e137-e147. doi:10.1016/s2468-2667(18)30267-6
60. Steele CB, Thomas CC, Henley SJ, et al. Vital signs: trends in incidence of cancers associated with overweight and obesity—United States, 2005-2014. *MMWR Morb Mortal Wkly Rep.* 2017;66:1052-1058. doi:10.15585/mmwr.mm6639e1
61. Ehemann C, Henley SJ, Ballard-Barbash R, et al. Annual report to the nation on the status of cancer, 1975-2008, featuring cancers associated with excess weight and lack of sufficient physical activity. *Cancer.* 2012;118:2338-2366. doi:10.1002/cncr.27514
62. National Academies of Sciences, Engineering, and Medicine. A Health Equity Approach to Obesity Efforts: Proceedings of a Workshop in Brief. The National Academies Press; 2019.
63. Khan LK, Sobush K, Keener D, et al. Recommended community strategies and measurements to prevent obesity in the United States. *MMWR Recomm Rep.* 2009;58(RR-7):1-26.
64. Community Preventive Services Task Force (CPSTF). The Guide to Community Preventive Services. CPSTF; 2019. Accessed January 17, 2020. <https://www.thecommunityguide.org/>
65. Rural Health Information Hub (RHInhub). Rural Health Information Hub. RHInhub; 2019. Accessed January 17, 2020. <https://www.ruralhealthinfo.org/>
66. Centers for Disease Control and Prevention (CDC). National Comprehensive Cancer Control Program (NCCCP). CDC; 2019. Accessed January 17, 2020. <http://www.cdc.gov/cancer/ncccp/>
67. Puckett M, Neri A, Underwood JM, Stewart SL. Nutrition and physical activity strategies for cancer prevention in current National Comprehensive Cancer Control Program plans. *J Community Health.* 2016;41:1013-1020. doi:10.1007/s10900-016-0184-8
68. Davis TC, Williams MV, Marin E, Parker RM, Glass J. Health literacy and cancer communication. *CA Cancer J Clin.* 2002;52:134-149. doi:10.1002/canjclin.52.3.134
69. Dwyer-Lindgren L, Flaxman AD, Ng M, Hansen GM, Murray CJL, Mokdad AH. Drinking patterns in US counties from 2002 to 2012. *Am J Public Health.* 2015;105:1120-1127. doi:10.2105/AJPH.2014.302313
70. Patterson Silver Wolf Adely Unegy Waya DA, Duran B, Dulmus CN, Manning AR. Alcohol screening and brief intervention as standard practice: working with the American Indian/Native Alaskan populations. *J Hum Behav Soc Environ.* 2014;24:399-407. doi:10.1080/10911359.2014.875340
71. Centers for Disease Control and Prevention (CDC). Planning and Implementing Screening and Brief Intervention for Risky Alcohol Use: a Step-by-Step Guide for Primary Care Practices. National Center on Birth Defects and Developmental Disabilities, CDC; 2014. Accessed January 17, 2020. <http://www.cdc.gov/ncbddd/fasd/documents/alcoholbsiimplementationguide.pdf>
72. Mulia N, Schmidt LA, Ye Y, Greenfield TK. Preventing disparities in alcohol screening and brief intervention: the need to move beyond primary care. *Alcohol Clin Exp Res.* 2011;35:1557-1560. doi:10.1111/j.1530-0277.2011.01501.x

73. McKnight-Eily LR, Okoro CA, Mejia R, et al. Screening for excessive alcohol use and brief counseling of adults—17 states and the District of Columbia, 2014. *MMWR Morb Mortal Wkly Rep.* 2017;66:313-319. doi:10.15585/mmwr.mm6612a1
74. Nelson TF, Xuan Z, Blanchette JG, Heeren TC, Naimi TS. Patterns of change in implementation of state alcohol control policies in the United States, 1999-2011. *Addiction.* 2015;110:59-68. doi:10.1111/add.12706
75. US Department of Health and Human Services (DHHS). Development of the National Health Promotion and Disease Prevention Objectives for 2030. DHHS; 2019. Accessed January 17, 2020. <https://www.healthypeople.gov/2020/About-Healthy-People/Development-Healthy-People-2030>
76. National Academies of Sciences, Engineering, and Medicine. Implementation of Lung Cancer Screening: Proceedings of a Workshop. The National Academies Press; 2017.
77. Kinsinger LS, Anderson C, Kim J, et al. Implementation of lung cancer screening in the Veterans Health Administration. *JAMA Intern Med.* 2017;177:399-406. doi:10.1001/jamainternmed.2016.9022
78. Eberth JM, McDonnell KK, Sercy E, et al. A national survey of primary care physicians: perceptions and practices of low-dose CT lung cancer screening. *Prev Med Rep.* 2018;11:93-99. doi:10.1016/j.pmedr.2018.05.013
79. Raz DJ, Wu GX, Consunji M, et al. Perceptions and utilization of lung cancer screening among primary care physicians. *J Thorac Oncol.* 2016;11:1856-1862. doi:10.1016/j.jtho.2016.06.010
80. Jenkins WD, Matthews AK, Bailey A, et al. Rural areas are disproportionately impacted by smoking and lung cancer. *Prev Med Rep.* 2018;10:200-203. doi:10.1016/j.pmedr.2018.03.011
81. Cardarelli R, Roper KL, Cardarelli K, et al. Identifying community perspectives for a lung cancer screening awareness campaign in Appalachia Kentucky: the Terminate Lung Cancer (TLC) Study. *J Cancer Educ.* 2017;32:125-134. doi:10.1007/s13187-015-0914-0
82. White A, Thompson TD, White MC, et al. Cancer screening test use—United States, 2015. *MMWR Morb Mortal Wkly Rep.* 2017;66:201-206. doi:10.15585/mmwr.mm6608a1
83. Centers for Disease Control and Prevention (CDC). Colorectal Cancer Control Program (CRCCP) CDC; 2019. Accessed January 17, 2020. <http://www.cdc.gov/cancer/crccp/index.htm>
84. Meester RG, Doubeni CA, Zuber AG, et al. Public health impact of achieving 80% colorectal cancer screening rates in the United States by 2018. *Cancer.* 2015;121:2281-2285. doi:10.1002/cncr.29336
85. Levin B, Lieberman DA, McFarland B, et al. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *Gastroenterology.* 2008;134:1570-1595. doi:10.1053/j.gastro.2008.02.002
86. Plevritis SK, Munoz D, Kurian AW, et al. Association of screening and treatment with breast cancer mortality by molecular subtype in US women, 2000-2012. *JAMA.* 2018;319:154-164. doi:10.1001/jama.2017.19130
87. Fedewa SA, de Moor JS, Ward EM, et al. Mammography use and physician recommendation after the 2009 US Preventive Services Task Force breast cancer screening recommendations. *Am J Prev Med.* 2016;50:e123-e131. doi:10.1016/j.amepre.2015.10.010
88. Islam N, Patel S, Brooks-Griffin Q, et al. Understanding barriers and facilitators to breast and cervical cancer screening among Muslim women in New York City: perspectives from key informants. *SM J Community Med.* 2017;3:p11022.
89. Wong FL, Miller JW. Centers for Disease Control and Prevention's National Breast and Cervical Cancer Early Detection Program: increasing access to screening. *J Womens Health (Larchmt).* 2019;28:427-431. doi:10.1089/jwh.2019.7726
90. Smith RA, Andrews KS, Brooks D, et al. Cancer screening in the United States, 2019: a review of current American Cancer Society guidelines and current issues in cancer screening. *CA Cancer J Clin.* 2019;69:184-210. doi:10.3322/caac.21557
91. US Preventive Services Task Force. Published Recommendations. US Preventive Services Task Force; 2019. Accessed January 17, 2020. <https://www.uspreventiveservicestaskforce.org/BrowseRec/Index/browse-recommendations>
92. Peterson EB, Ostroff JS, DuHamel KN, et al. Impact of provider-patient communication on cancer screening adherence: a systematic review. *Prev Med.* 2016;93:96-105. doi:10.1016/j.yjmed.2016.09.034
93. Negoita S, Feuer EJ, Mariotto A, et al. Annual report to the nation on the status of cancer, part II: recent changes in prostate cancer trends and disease characteristics. *Cancer.* 2018;124:2801-2814. doi:10.1002/cncr.31549
94. Durand MA, Carpenter L, Dolan H, et al. Do interventions designed to support shared decision-making reduce health inequalities? A systematic review and meta-analysis. *PLoS One.* 2014;9:e94670. doi:10.1371/journal.pone.0094670
95. Sajid S, Kotwal AA, Dale W. Interventions to improve decision making and reduce racial and ethnic disparities in the management of prostate cancer: a systematic review. *J Gen Intern Med.* 2012;27:1068-1078. doi:10.1007/s11606-012-2086-5
96. Walker DM, McAlearney AS, Sova LN, Lin JJ, Abramson S, Bickell NA. Comparing prostate cancer treatment decision making in a resource-rich and a resource-poor environment: a tale of two hospitals. *J Natl Med Assoc.* 2016;108:211-219. doi:10.1016/j.jnma.2016.08.002
97. Wolchok JD, Chiarion-Sileni V, Gonzalez R, et al. Overall survival with combined nivolumab and ipilimumab in advanced melanoma. *N Engl J Med.* 2017;377:1345-1356. doi:10.1056/NEJMoa1709684
98. Centers for Disease Control and Prevention (CDC). Melanoma Incidence and Mortality, United States—2012-2016, US Cancer Statistics Data Briefs, No. 9. CDC; 2019. Accessed January 17, 2020. <https://www.cdc.gov/cancer/uscs/about/data-briefs/no9-melanoma-incidence-mortality-UnitedStates-2012-2016.htm>
99. Reck M, Rabe KF. Precision diagnosis and treatment for advanced non-small-cell lung cancer. *N Engl J Med.* 2017;377:849-861. doi:10.1056/NEJMra1703413
100. Parikh-Patel A, Morris CR, Kizer KW. Disparities in quality of cancer care: the role of health insurance and population demographics. *Medicine (Baltimore).* 2017;96:e9125. doi:10.1097/md.00000000000009125
101. Espey DK, Wu XC, Swan J, et al. Annual report to the nation on the status of cancer, 1975-2004, featuring cancer in American Indians and Alaska Natives. *Cancer.* 2007;110:2119-2152. doi:10.1002/cncr.23044
102. Gomez SL, Noone AM, Lichtensztajn DY, et al. Cancer incidence trends among Asian American populations in the United States, 1990-2008. *J Natl Cancer Inst.* 2013;105:1096-1110. doi:10.1093/jnci/djt157
103. Martinez Tyson D, Medina-Ramirez P, Flores AM, Siegel R, Aguado Loi C. Unpacking Hispanic ethnicity-cancer mortality differentials among Hispanic subgroups in the United States, 2004-2014. *Front Public Health.* 2018;6:219. doi:10.3389/fpubh.2018.00219