The American Cancer Society Challenge Goal to Reduce US Cancer Mortality by 50% Between 1990 and 2015: Results and Reflections

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Abstract: In 1996, the Board of Directors of the American Cancer Society (ACS) challenged the United States to reduce what looked to be possible peak cancer mortality in 1990 by 50% by the year 2015. This analysis examines the trends in cancer mortality across this 25-year challenge period from 1990 to 2015. In 2015, cancer death rates were 26% lower than in 1990 (32% lower among men and 22% lower among women). The 50% reduction goal was more fully met for the cancer sites for which there was enactment of effective approaches for prevention, early detection, and/or treatment. Among men, mortality rates dropped for lung cancer by 45%, for colorectal cancer by 47%, and for prostate cancer by 53%. Among women, mortality rates dropped for lung cancer by 8%, for colorectal cancer by 44%, and for breast cancer by 39%. Declines in the death rates of all other cancer sites were substantially smaller (13% among men and 17% among women). The major factors that accounted for these favorable trends were progress in tobacco control and improvements in early detection and treatment. As we embark on new national cancer goals, this recent past experience should teach us that curing the cancer problem will require 2 sets of actions: making new discoveries in cancer therapeutics and more completely applying those discoveries in cancer prevention we have already made. CA Cancer J Clin 2016;66:359-369. © 2016 American Cancer Society.

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Introduction

In 1996, the American Cancer Society (ACS) Board of Directors set an ambitious challenge goal for the country: to halve what was thought to be a possible peak cancer mortality rate in 1990 by the year 2015. That ambitious goal was set after their recognition that there was an apparent beginning of what would likely be a persistent down-turn in cancer mortality rates in the United States because of favorable trends in tobacco cessation, cancer screening, and cancer treatment. In this report, we summarize the trends in cancer mortality that occurred from 1990 to 2015 and discuss the factors that have contributed to both successes and failures in reaching that goal. Then, we reflect on the process of goal-setting, with an eye toward helping to make future national cancer goals more successful.

Trends in Cancer Mortality and Risk Factors

Across all cancer sites, the decline in mortality rates from 1990 to 2015 was 26% for the population of the United States (32% among men and 22% among women) (Table 1). Cancer mortality rates declined over the 25-year period for lung cancer (45% among men and 8% among women), colorectal cancer (47% among men and 44% among women), breast cancer (39% among women), and prostate cancer (53% among men). Declines for all other cancers apart from the 4 leading cancer sites were substantially smaller (13% among men and 17% among women).

To put the 25-year cancer mortality trends from 1990 to 2015 into a broader historical perspective, the longer 85-year trends from 1930 to 2015 are shown by sex in Figure 1 for the 4 leading cancer sites and for all cancer sites combined. The downward trend in lung cancer began among men in about 1990, as did the downward trends for prostate cancer among men and breast cancer among women. The downward trends in colorectal cancer mortality began much earlier, in about

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TABLE 1. Age-Adjusted Cancer Death Rates in the United States in 5-Year Intervals From 1990 to 2015, for the 4 Leading Cancer Sites That Together Account for About One-Half of All Cancer Deaths in the United States, and for All Other Cancer Sites, by Sex*

| SEX AND CANCER SITE | AGE-ADJUSTED MORTALITY RATE PER 100,000 |
|---------------------|----------------------------------------|
|                     | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | % CHANGE, 1990–2015 |
| Men                 |      |      |      |      |      |      |                      |
| Lung cancer         | 90.6 | 84.4 | 76.5 | 69.5 | 60.1 | 50.1 | −45                  |
| Prostate cancer     | 38.6 | 37.3 | 30.4 | 25.4 | 21.8 | 18.1 | −53                  |
| Colorectal cancer   | 30.8 | 27.7 | 25.1 | 21.2 | 18.8 | 16.4 | −47                  |
| All other cancers   | 119.9| 119.2| 116.5| 112  | 108.2| 104.7| −13                  |
| All cancers         | 279.8| 268.5| 248.5| 228.1| 208.8| 189.2| −32                  |
| Women               |      |      |      |      |      |      |                      |
| Lung cancer         | 36.8 | 40.3 | 41.1 | 40.7 | 37.9 | 33.9 | −8                   |
| Breast cancer       | 33.1 | 30.6 | 26.6 | 24.1 | 21.9 | 20.1 | −39                  |
| Colorectal cancer   | 20.6 | 19.1 | 17.5 | 14.8 | 13.0 | 11.6 | −44                  |
| All other cancers   | 84.0 | 83.4 | 81.4 | 76.8 | 72.9 | 69.9 | −17                  |
| All cancers         | 174.7| 173.4| 166.7| 156.5| 145.7| 135.6| −22                  |
| Both sexes          |      |      |      |      |      |      |                      |
| All cancers         | 214.9| 209.9| 198.8| 185.2| 171.8| 158.3| −26                  |

*Cancer mortality data were obtained for the United States from the National Center for Health Statistics. Death rates were age-adjusted to the year 2000 standard population for each year from 1990 to 2014. The 2015 rates were estimated as a linear extrapolation of the trends from 2010 to 2014 (2009–2013 extrapolation for race/ethnicity-specific groups due to lack of ethnicity-specific denominator data for 2014).
1980 among men and in about 1950 among women. The downward trend in lung cancer among women did not begin until 2005.

Trends in mortality for all cancer sites combined are shown in Table 2 for subgroups defined by sex, age, and race/ethnicity.2-9 Downward trends across all cancer sites were steeper among men (32%) and among African Americans (33%) but were less steep among men ages 80 years and older (10%).

Trends in the major cancer risk factors for the years 1985 through 2013 are shown in Table 3.3-7 Over this time period, there were persistent declines in tobacco use and progress in the use of cancer early detection methods, but there was a persistent increase in the prevalence of obesity, a factor now known to increase incidence and mortality for many cancer sites.10

Discussion

In the year 2015, cancer death rates were about 26% lower in the United States than they were in 1990. Thus, the United States achieved about one-half of the ACS challenge goal to reduce cancer mortality by 50% over that 25-year period. For the leading cancer sites (lung, colorectal, breast, and prostate), we came much closer to achieving the 50% mortality reduction goal. Here, we comment on the factors that have led to these declines in cancer mortality, and we discuss the challenges and opportunities we now face to further reduce cancer mortality into the future.

Lung Cancer

The decline in lung cancer mortality of 45% among men and 8% among women resulted almost entirely from tobacco control. Lung cancer mortality began to decline among men in 1990, but rates increased among women throughout the 1990s before beginning to decline in about 2005. The sex differences in both the timing and the magnitude of declines in lung cancer mortality are because of sex differences in the time course of cigarette marketing, use, and cessation.11 Tobacco use has been on the decline in the United States since the 1960s, but the trajectory of downward trends in cigarette smoking slowed in the 1990s, now leaving about 1 of every 6 American adults as regular cigarette smokers.12 After a period of relatively little change in smoking uptake by youth, a steeper decline in regular cigarette smoking by middle school and high school students has occurred in recent years.13 The 27.5% smoking prevalence among high school students in 1991 had dropped to 9.2% by 2014.14 Although encouraging, this recent decline has been accompanied by an increase in the use of alternative nicotine-delivery products, such as e-cigarettes, for which the balance of benefits versus risks over the long term is unknown.15

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**TABLE 2. Age-Adjusted Cancer Death Rates in the United States in 5-Year Intervals From 1990 to 2015, for All Cancer Sites Combined, by Demographic Factors of Sex, Age, and Race/Ethnicity**

| DEMOGRAPHIC FACTOR | 1990 | 1995 | 2000 | 2005 | 2010 | 2015b | % CHANGE, 1990-2015 |
|--------------------|------|------|------|------|------|-------|---------------------|
| Sex                |      |      |      |      |      |       |                     |
| Male               | 279.8| 268.5| 248.5| 228.1| 208.8| 189.2 | −32                 |
| Female             | 174.7| 173.4| 166.7| 156.5| 145.7| 135.6 | −22                 |
| Age, y             |      |      |      |      |      |       |                     |
| 1-19               | 3.5  | 3.0  | 2.8  | 2.7  | 2.3  | 2.3   | −34                 |
| 20-44              | 25.3 | 23.4 | 21.0 | 19.0 | 17.0 | 16.0  | −37                 |
| 45-64              | 269.0| 246.2| 219.8| 200.0| 182.5| 170.1 | −37                 |
| 65-79              | 986.3| 976.7| 933.2| 859.1| 788.8| 712.7 | −28                 |
| ≥80                | 1596.6| 1647.1| 1640.5| 1595.0| 1529.0| 1430.1| −10                 |
| Race/ethnicity     |      |      |      |      |      |       |                     |
| Whitec             | 210.8| 208.4| 199.3| 187.2| 175  | 162.3 | −23                 |
| Blackc             | 278.4| 272.2| 250.6| 227.5| 206.8| 187.2 | −33                 |
| Hispanic           | 137.4| 139.7| 134.7| 129.6| 119.2| 113.8 | −17                 |
| Asian/Pacific Isla| 134.6| 134.3| 120.1| 114.4| 108.4| 99.7  | −26                 |
| American Indian/Alk| 158.9| 184.9| 169.4| 177.0| 172.3| 164.6 | +4                  |

*Cancer mortality data were obtained for the United States from the National Center for Health Statistics.2 Death rates were age-adjusted to the year 2000 standard population for each year from 1990 to 2014.3 The 2015 rates were estimated as a linear extrapolation of the trends from 2010 to 2014 (2009-2013 extrapolation for race/ethnicity-specific groups due to lack of ethnicity-specific denominator data for 2014).4 This category excludes persons of Hispanic ethnicity. Rates by race/ethnicity-specific groups due to lack of ethnicity-specific denominator data for 2014.5 Data were based on Indian Health Service Contract Health Service Delivery Areas.
Despite the proven effectiveness of organized tobacco control, only a few states have adequately funded tobacco-control programs that meet minimal quality standards. In fact, for the fiscal year 2016, only 5 states are funding their tobacco-control programs at greater than 50% of the levels recommended by the Centers for Disease Control and Prevention. In hindsight, the single most important missed opportunity for cancer prevention throughout the 25-year ACS challenge period may have occurred in the year 1998, when the attorneys general from 46 states struck a deal with US tobacco companies. That deal, the Master Settlement Agreement, specified that, in exchange for cash payments to states from the tobacco companies of about $246 billion over 50 years, the states would halt all legal actions against the tobacco industry. The Master Settlement Agreement instituted several policies that have positively contributed to tobacco control, but it contained no provisions designating the cash payments to be used for state-level tobacco control. Because most states chose to use their tobacco settlement funds for general budget purposes, substantial variation now exists across the states in their application of effective tobacco-control policies. The predictable result of the interstate variation in tobacco control is interstate variation in both tobacco use and lung cancer mortality. For example, in 2013, both tobacco use and lung cancer death rates were over twice as high in Kentucky than in California (adult smoking prevalence, 26.5% vs 12.5%, respectively; age-adjusted lung cancer mortality rate, 69.5 vs 32.1 per 100,000, respectively). The treatment of lung cancer is more effective at early stages, but only a small proportion of lung cancers are currently detected early. In 2011, the National Lung Screening Trial reported a 20% reduction in lung cancer mortality from annual low-dose computed tomographic lung screening after only 3 annual screens for smokers and former smokers ages 55 to 74 years with at least a 30-pack-year history. Many organizations, including the ACS, now recommend offering lung cancer screening to such patients. There has also been recent progress in lung cancer therapeutics. Although continued progress in lung cancer treatment and early detection promises to make future contributions to declining death rates from lung cancer, the biggest impact will come from more effective tobacco control. Because tobacco use remains the single most important preventable cause of cancer death, and because the current interstate variation in tobacco control is costing many lives each day, serious consideration should be given to creating a more coherent and comprehensive national approach to tobacco control in the United States.

Colorectal Cancer
Colorectal cancer mortality rates declined by 47% among men and by 44% among women from 1990 to 2015. Colorectal cancer mortality had been steadily declining for many years before 1990, with longer and steeper declines among women than men. Although the reasons for that difference are not known, factors both in diet (more vegetable intake and less red meat by women) and the use of menopausal hormone treatment (MHT), which has been shown to reduce colorectal cancer risk in women, may be part of the reason. There has been important progress in treatment for advanced colorectal cancer, and several lifestyle factors in addition to dietary factors may have contributed to a reduced risk of colorectal cancer, including being more

### TABLE 3. Trends in the Prevalence of Cancer Risk Factors and Cancer Screening in the Population of the United States, 1980 to 2010, by Sex

| RISK FACTOR | 1985  | 1990  | 1995  | 2000  | 2005  | 2010  | 2013  |
|-------------|-------|-------|-------|-------|-------|-------|-------|
| **Women**   |       |       |       |       |       |       |       |
| Current tobacco smoking | 27.9  | 22.9  | 22.7  | 21.1  | 18.3  | 17.5  | 15.5  |
| Obesity     | 16.5  | 25.5  | 26.4  | 33.2  | 35.4  | 35.9  | 36.1  |
| Screening not up to date |       |       | 62.7  | 54.0  | 41.0  | 40.4  |       |
| Colorectal A,C | 77.2  | 73.1  | —     | 62.7  | 54.0  | 41.0  | 40.4  |
| Breast      | 72.7  | 50.2  | 39.1  | 26.3  | 31.8  | 31.2  | 30.9  |
| **Men**     |       |       |       |       |       |       |       |
| Current tobacco smoking | 32.2  | 28.0  | 26.5  | 25.2  | 23.4  | 21.2  | 20.5  |
| Obesity     | 12.3  | 20.2  | 30.6  | 27.5  | 32.7  | 34.6  | 33.5  |
| Screening not up-to-date |       |       | 61.8  | 51.6  | 38.9  | 39.9  |       |
| Colorectal A,C | 79.7  | 74.6  | —     | 61.8  | 51.6  | 38.9  | 39.9  |

aData are from the National Health Interview Survey. bData for 1985 are from the National Health and Nutrition Examination surveys, data for 1990 and 2000 through 2013 are from National Health and Nutrition Examination surveys. cThe 1987 data are shown as 1985, and 1992 data are shown as 1990.
physically active, not smoking, and using nonsteroidal anti-inflammatory drugs. Because obesity increases colorectal cancer risk, it is very likely that, without the obesity epidemic, the colorectal cancer mortality declines over the last 25 years would have been even steeper. The pace of colorectal cancer mortality reduction will be increased in the future, when the obesity epidemic is reversed.

The single most effective strategy to prevent deaths from colorectal cancer is to prevent the disease by the identification and removal of colorectal adenomas. Rates of endoscopic screening of the colorectum (especially colonoscopy) have increased substantially over the past 25 years. That increase is due to a historic shift in social normalization of talking about the colon. That social change resulted from efforts by many organizations and individuals, including network television personality Katie Couric, whose screening messaging after her husband’s death from colorectal cancer in 1998 created a measurable increase in colonoscopy rates during an era in which many other efforts were also underway. Expanded coverage of colonoscopy by Medicare in 2001 and increasing coverage by other insurers then reduced financial barriers to colorectal cancer screening, leading to particularly large increases in colonoscopy screening rates during the 2000s. Regular stool testing with methods sensitive for blood or for DNA with mutations or abnormal methylation, followed by colonoscopy for those testing positive, can also reduce colorectal cancer mortality. Nonetheless, about 40% of US adults ages 50 years and older still are not up to date for colorectal screening. The current campaign to assure 80% of the US population is properly screened for colorectal cancer by 2018 (the “80 by 2018” campaign) can further drive colorectal cancer mortality downward into the future. Despite this overall progress, substantial racial and geographic disparities continue to exist for colorectal cancer mortality, with blacks having about 35% higher colorectal cancer death rates in 2013 than whites, and persons residing in the lower Mississippi Delta having 40% higher death rates than the remainder of the United States, differences caused by a combination of inequalities in prevention, early detection, and treatment.

Breast Cancer

The 39% decline in breast cancer death rates among women over the 25-year challenge period was a result of the combined effects of increasing mammography and improved treatment. Mammography rates increased steeply during an era in which many other efforts were also underway. Insurers then reduced financial barriers to colorectal cancer screening, leading to particularly large increases in colonoscopy screening rates during the 2000s. Other treatment advances over this 25-year challenge period have included approaches to therapy that minimize side effects of treatment, including sampling sentinel lymph nodes for biopsy, thus substantially reducing the problem of lymphedema of the arm, and the use of molecular profiling of tumors, providing better prognostic information to allow more selective use of adjuvant chemotherapy. Although such advances have not had major impacts on cancer mortality, they have substantially improved other clinical outcomes among women treated for breast cancer.

The favorable breast cancer mortality trends between 1990 and 2015 occurred in an era after unfavorable trends were observed in both MHT use and obesity, 2 major risk factors for breast cancer. The sudden reduction in MHT use after publication of the Women’s Health Initiative trial findings in 2001 helped to reduce the impact of MHT on breast cancer incidence and mortality. The prevalence of MHT use among US women ages 50 to 59 years dropped from about 38% in 1999 to 2000 to 7% by 2009 and 2010. The World Cancer Research Fund estimates that one-third of breast cancers could be prevented by healthy behaviors, including engaging in regular physical activity, not drinking alcohol, and preventing obesity, and that obesity now accounts for about 17% of breast cancers in the United States. It is encouraging to see that the obesity epidemic in the United States has been slowing in recent years, as stopping the headwind of obesity will contribute to future reductions in breast cancer mortality. Since 1990, breast cancer mortality rates have declined among both white and black women, but the decline has been substantially steeper for white women, resulting in black women having about 39% higher breast cancer mortality in 2013. The black-white mortality disparity has
steadily grown rather than declined during the 25-year ACS challenge goal period. Efforts to eliminate this disparity will require additional research to understand the biological causes of the black-white differences in breast cancer as well as additional efforts to remedy the social causes that present barriers to primary prevention, high-quality breast cancer screening, and treatment.

**Prostate Cancer**

The 53% decline in prostate cancer mortality between 1990 and 2015 makes prostate cancer the only cancer site for which the ACS challenge goal was reached. Therefore, it is unfortunate that we must conclude that the reasons for this decline are less certain than the reasons for declines in the other cancer sites. This 25-year challenge period corresponded with several simultaneous changes, including the introduction of prostate-specific antigen (PSA) screening in the United States, changes in coding causes of death, the use of PSA for assessing early stages of clinical cancer progression, and the increasing use of antihormonal treatments for advanced stage prostate cancer.

The impact of PSA screening on prostate cancer mortality in the United States is unclear. PSA was approved for clinical use as a diagnostic and prognostic marker in 1986. PSA has never been officially approved for asymptomatic screening, but it began to be used for that purpose in about 1988. Although “common sense” suggested that, with increased detection of asymptomatic disease, there should have been mortality benefits from PSA screening, the findings of randomized, controlled trials have not consistently supported that idea. The European Randomized Study of Screening for Prostate Cancer (ERSPC) demonstrated a 21% prostate cancer mortality benefit from annual PSA screening, but that trial had structural differences in treatments between the randomized arms. Even if 21% is a valid estimate of the PSA screening benefit for prostate cancer mortality, it is important to note that the difference in prostate cancer mortality between the screened and control groups in the ERSPC did not emerge until after 10 years. That delay is too long to support the idea that the advent of PSA screening seen in the United States in the early 1990s (about 5% in 1990 and 30% in 1995) could explain the initial steep phase of decline in prostate cancer mortality in the United States from 1990 to 2000 as a PSA screening effect. The American PSA screening trial (the Prostate, Lung, Colon, and Ovary [PLCO] trial) found no mortality benefit from annual PSA screening. The main weakness of the PLCO PSA trial was substantial contamination by PSA screening in the control arm. Despite that contamination, the expected screening effect on prostate cancer incidence was seen; however, after 13 years of follow-up, there were 9% more deaths from prostate cancer in the screened arm of the trial, suggesting little if any benefit from PSA screening. The proportion of men being screened with PSA is declining in the United States, principally because of the ACS recommendation against PSA screening in the absence of shared decision making and a recommendation for no PSA screening at all by the United States Preventive Services Task Force (USPSTF). The balance of benefits and harms of PSA screening may favorably change in the future if methods can be developed to better distinguish small prostate cancers that are likely to progress from those that are likely to remain indolent.

Changes in coding the underlying cause of death on death certificates in the early years after the availability of PSA for screening and diagnostics might have had a greater effect on both the up-slope and the down-slope of the peak in prostate cancer deaths seen near the beginning of the 25-year challenge period. Also complicating the interpretation of mortality trends is the use of PSA testing to monitor for disease progression after initial treatment, with the result of trends for earlier intervention with antihormonal therapies. Antihormonal therapies can produce both benefits of suppressing prostate cancer growth but also harms of increased mortality from cardiovascular causes. Both of those effects would contribute to downward trends in prostate cancer-specific death rates as use of that treatment increased. Other prostate cancer therapies improved over the 25-year challenge period, including the increasing use of radical prostatectomy for first-course treatment and the development of radiation therapies that could deliver higher doses to the prostate with lower doses to surrounding tissues.

The idea of chemoprevention of prostate cancer has been pursued aggressively in the past 25 years. The Prostate Cancer Prevention Trial tested the effect on prostate cancer incidence of finasteride, an antiandrogen therapy that was approved for use to reduce prostatic hyperplasia. Although antiandrogen treatment reduced the incidence of low-grade prostate cancers, it was associated with increased diagnoses of higher grade cancers. Nutritional supplementation with selenium and/or vitamin E was tested for prostate cancer prevention, but neither nutrient was identified as effective for reducing prostate cancer mortality. Whether any other types of nutritional supplements and/or drugs, including aspirin, might reduce the risk for prostate cancer death continues to be actively investigated. The reasons for the long-standing disparity in prostate cancer mortality between black and white men (still over a 2-fold difference in 2013) remain largely unexplained. Until we develop a better understanding of basic prostate cancer etiology, coupled with more effective approaches to chemoprevention or screening, progress in prostate cancer mortality will require better methods to distinguish aggressive from nonaggressive cancers and continued progress in treatment.
Other Cancers

Although mortality rates have been declining substantially in the United States for the 4 sites that together account for about one-half of cancer deaths during this 25-year challenge period (lung, colorectal, breast, and prostate), less progress has been made for the other half of all cancers (a 13% decline among men and a 17% decline among women). The declining prevalence of tobacco use has favorably affected death rates for many of the tobacco-caused cancers apart from lung cancer, and further progress in tobacco control will have favorable effects on mortality from many tobacco-caused cancers in the future. Unfavorable trends in obesity have dampened past gains for the many obesity-related cancer sites, including not only breast and colorectal cancers but also endometrial, kidney, liver, ovary, pancreas, and esophageal cancers, so reducing the obesity epidemic in the United States will have an important impact on future cancer mortality.

It is important to note that gains have not been made for all cancers and that, for some cancer sites, mortality trends have been adverse. Over the past 25 years, mortality from liver cancer has increased by about 60%, which is a greater increase than for any other type of cancer. Higher obesity rates are a contributing factor to this trend, but the biggest factor is the epidemic of chronic hepatitis C infection among “baby boomers” (Americans born between 1945 and 1965). The USPSTF has recommended everyone born in that era be screened for hepatitis C, but most of that population has not yet been tested. New antiviral therapies hold enormous promise to clear chronic hepatitis C infection and thereby reduce liver cancer risk, but access to the most effective antiviral therapies is now limited because of their high cost. As competition and/or new drug policies drive antiviral drug prices lower, more of the 3 million Americans who now carry chronic hepatitis C infection should be able to be screened and, if positive, to access effective antiviral drugs.

Several cancers are known to be caused by infection with certain types of the human papilloma virus (HPV), including virtually all cervical cancers, most anal cancers, and about one-half of all head and neck cancers. Although vaccination for HPV is effective and recommended, only about a one-third of girls and one-fifth of boys in the United States have received a complete series of HPV vaccinations. Increasing HPV vaccination rates to levels comparable to those seen for other childhood vaccinations in the United States will substantially reduce mortality from HPV-related cancers in adults into the future. Mortality rates from pancreas cancer have not declined from 1990 to 2015. Apart from smoking and obesity, we know little about modifiable risk factors for pancreatic cancer, how it might be detected earlier, or how it can be treated.

For the many other cancers for which modifiable risk factors are poorly understood and for which there are no effective prevention strategies or early detection methods, hope for future improvement needs to come from the development of a better understanding of their causes and from better methods for early cancer detection and treatment.

Differences by Sex and Age

Across the 25-year ACS challenge period, declines in cancer mortality were much steeper for men (32%) than for women (22%), resulting in a reduction of the cancer mortality sex disparity over this time period. Those sex differences are largely because of differences in lung cancer trends by sex, coupled with the larger declines in mortality from prostate cancer among men (53%) compared with the declines in mortality from breast cancer among women (39%). Declines over that period were similar by sex for most other cancers.

Declines in cancer mortality were greatest for Americans younger than age 65 years (about 37%), lower for those ages 65 to 74 years (28%), and lowest for those ages 80 years and older (10%). Childhood cancer death rates have been declining largely because of improvements in the treatment of pediatric cancers and participation in clinical trials. Progress has varied considerably by cancer type. There has been significant success in the treatment of retinoblastoma, Hodgkin and non-Hodgkin lymphoma, Wilms tumor, and acute lymphoblastic leukemia; but there has been less success in the treatment of acute myeloid leukemia, Ewing sarcoma, osteosarcoma, rhabdomyosarcoma, neuroblastoma, and central nervous system tumors. The far less favorable trend in cancer mortality at older ages is likely the combined effect of the phenomenon of the compression of mortality into older ages because of treatments that do not cure cancer but only slow its growth, and the tendency to forego both cancer screening and more aggressive treatment as age advances. Many of the newer targeted approaches to cancer therapy are designed to control cancer growth rather than to totally eradicate malignancy. Therefore, we should expect that progress in cancer mortality will continue to be blunted among the elderly in the future. Clearly, some decisions to forego cancer screening or effective cancer therapies in the elderly are reasonable choices due to the presence of comorbid conditions, but the average life expectancy of a 75-year-old person in the United States is now about 12 years.

Differences by Race/Ethnicity and Socioeconomic Status

There are interacting economic, social, and biological reasons for cancer mortality disparities by race and ethnicity in the United States. It is encouraging to see that the declines...
in cancer mortality have been steepest among blacks over the 25-year ACS challenge period. As a result, the 1990 disparity of 32% higher cancer mortality among blacks compared with whites was cut to 15% by 2013, largely because of steeper declines in tobacco use and tobacco-associated cancers among black men.66 Nonetheless, substantial black-white disparities persist for colorectal, breast, and prostate cancers.67 Cancer mortality has been historically much lower for Asian Americans and Pacific Islanders, Hispanic Americans, and American Indians and Alaska Natives for reasons that have not been fully understood. Despite their much lower 1990 mortality rate, there were similar proportional declines in cancer mortality for Asian Americans/Pacific Islanders (26%) over the 25-year challenge period, but smaller declines were seen among Hispanic Americans (17%) for reasons that are not clear. The category Asian Americans/Pacific Islanders is used in this report to provide consistency for trend data from 1990 to the present, but this grouping is problematic, as pointed out by the Office of Management and Budget in 1997, because it combines many different populations with different social and health profiles, including quite different patterns of cancer risk.68,69 No declines were seen among American Indians and Alaska Natives from 1990 to 2015, but it is important to note that there was a substantial increase between 1990 and 1995 followed by an 11% decline from 1995 to 2010. These trends are uncertain because of the well documented problems in racial misclassification for both the numerators and the denominators used for American Indian and Alaska Native mortality rates.70 Many Native American populations still have high smoking rates, high rates of obesity and diabetes, and inadequate access to high-quality screening and cancer care. Targeted efforts to address these problems among American Indians and Alaska Natives must be specified in our future national efforts to accelerate progress against cancer.71

Poverty is both a contributor to racial cancer disparities in the United States and also an important cancer risk factor in its own right.72 There are many opportunities to eliminate the economic disparities in cancer in the United States, including increasing efforts to close the economic gaps in tobacco use and obesity and enacting national policies to assure that all Americans have access to effective health care services. Passage of the Affordable Care Act in 2010 increased access to clinical services for cancer prevention, early detection, and treatment for many Americans who, because of poverty or preexisting illnesses, were previously systematically underserved.73–75 This increased access will likely lead to persistent gains in closing the socioeconomic disparities in cancer mortality in the future, although many other barriers remain, including the unequal expansion of Medicaid across states, medical services copays, work leave, and transportation. It is also important that all Americans have access to effective cancer-prevention services. Future progress to better control tobacco and reverse the obesity epidemic will require policy interventions. Continued progress on cancer-related policies is now challenged, however, by the political polarization that has grown in the United States over the past 25 years on many societal questions pertaining to health, such as the Affordable Care Act and the proper role of government in setting policies that influence personal choices regarding cancer risk factors, such as tobacco and unhealthy diet.

**Trends in Cancer Treatment**

The 25-year ACS challenge period has seen substantial advances in our understanding of the basic biology of the more than 200 diseases we call “cancer.” The human genome was first sequenced in 2001.76 That historic accomplishment, and the progressively improving technologies that have allowed us to more completely and affordably interrogate both inherited and tumor genomes, have produced many expectations for cancer breakthroughs that have not yet been satisfied. Clinicians already are using information regarding several inherited mutations that substantially increase cancer risk, including the BRCA1 and BRCA2 variants, several variants associated with increased risk for colorectal cancer, and numerous mutations associated with less common familial cancer syndromes. Although the proportion of cases caused by those variants is small and, thus, have not had substantial effects on population-level cancer mortality trends, those genetic discoveries have been very important for many families. To date, only a small proportion of what seems to be familial risk has been explained by our interrogation of the human genome, but many possibilities exist to creatively apply genetic information to cancer prevention.77 It is increasingly clear that nongenetic factors, such as tobacco, diet, physical activity, and viral infections, are the major drivers of the somatic mutations that result in cancer. In the past 25 years, knowledge of the molecular lesions of various forms of cancers has been used with increasing frequency and success to identify new therapeutic targets, with important progress across many types of cancers. The now classic example is chronic myelogenous leukemia, which was largely a fatal disease before the 2001 discovery of an effective, orally administered, targeted kinase inhibitor.78 Cancer therapeutics are now on the threshold of substantial advancement with our newly discovered abilities to tailor therapies to target specific characteristics of the tumor genome and transcriptome and to intervene to enable the immune system to identify and kill cancer cells.21,79
Reflections on Goal-Setting

The first challenge goal for a 50% reduction in cancer mortality for the United States was issued in 1986 by the leadership of the National Cancer Institute (NCI) for the 20-year period from 1980 to 2000. Almost immediately, it was clear the NCI challenge goal would not be reached (it was determined later that the reduction from 1980 to 2000 was about 4%). Therefore, the announcement by the ACS a decade later of its own challenge goal for a 50% reduction was met with understandable skepticism. In 2003, the Director of the NCI doubled-down on the ACS goal by asserting that it would be possible, with adequate NCI funding, to eliminate deaths and suffering from cancer by the year 2015. Because there was no obvious pathway to that goal, it was never adopted by any organization. On January 12, 2016, President Obama announced within his State of the Union address a new national goal—to cure cancer: “You know, last year, Vice President Biden said that, with a new moon shot, America can cure cancer. So tonight, I’m announcing a new national effort to get it done. And because he’s gone to the mat for all of us on so many issues over the past 40 years, I’m putting Joe in charge of mission control. For the loved ones we’ve all lost, for the family we can still save, let’s make America the country that cures cancer once and for all.”

There are 4 lessons we can now take from our past experiences with national goal setting for cancer: lessons on realism, pathways, surveillance, and leadership. First, goals need to be realistic. The best goals are those that stretch the limits of what might actually be achieved by renewed efforts. There is a sweet spot in goal setting between projecting what will likely happen regardless of renewed efforts (setting the bar too low) and creating unrealistic challenges that tend to paralyze us (setting the bar too high). Second, goals need to be accompanied by a clear path to success. Whether that path is defined by better ways to apply the methods we already have or by investing in meaningful discoveries that could plausibly soon be made, it is helpful for everyone to understand what types of actions might define a path to success. Third, goal setting needs to be followed by monitoring, surveillance, and clear communication about progress. In the early phase of the 25-year ACS challenge period, based only on estimates of the future impact on mortality from changes in cancer risk factors, a group of ACS volunteers and staff predicted that the 25-year decline might be about 21%; and later, based on mortality trend data through 2002, they predicted that the reduction might be about 23%. Each of those earlier analyses concluded with the prediction that the projected declines in cancer mortality could be greater if we would redouble our efforts to more fully apply methods we already knew. The fourth lesson on goal setting is that effective leadership is essential to synergize combined efforts of the many organizations and systems involved in a nationwide effort. From the outset, the ACS made it clear that achieving the national challenge goal of a 50% reduction in cancer mortality would require a broad, multisectoral effort, not only the effort of any single organization. In retrospect, the ACS challenge goal was probably owned and operated more by the ACS itself than by other cancer organizations across the nation.

As we move forward, it will be important to make any new goal, including the President’s “moon shot” goal, become a shared vision that is framed in realism, accompanied by a feasible path to success, publically monitored, and managed by effective leadership. Lessons over the past 25 years also should have taught us that the word “cure” should not mean only medical therapeutics. Curing the cancer problem will certainly require that we discover more effective treatments, but the success of the past 25 years has shown that prevention is also a powerful cure. As we make timely new investments in discovering new cancer treatments, we also need to develop a new national consensus about how social policy can support individual decision making to prevent cancer.

Conclusion

We have now experienced 25 years of historic progress in our commitment to reduce the cancer burden in the United States by 50%. During the 1990 to 2015 ACS challenge period, cancer death rates declined by about 26%. Although we can celebrate the thousands of lives that reduction represents, we should also be humbled by the fact that more lives could have been saved. That the ACS challenge goal to reduce US cancer mortality by 50% over the 25-year period from 1990 to 2015 was only one-half achieved should be seen as a glass half full. This progress should eliminate any historical remnants of cancer fatalism, and it should now stimulate our national imagination about what might be possible to achieve into the future. All sectors of civil society will need to join in efforts to further reduce cancer mortality in the United States, including those focused on the many social determinants of cancer, including income, availability of care, and many other social and environmental factors impacting cancer-reducing policies and programs. How much more progress we will make will depend on the extent to which policy makers and the American public can join together to create systems and incentives to understand cancer better, to reduce several of the known risk factors for cancer, to better diagnose cancer earlier, and to assure that state-of-the-art treatment is available for all.
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