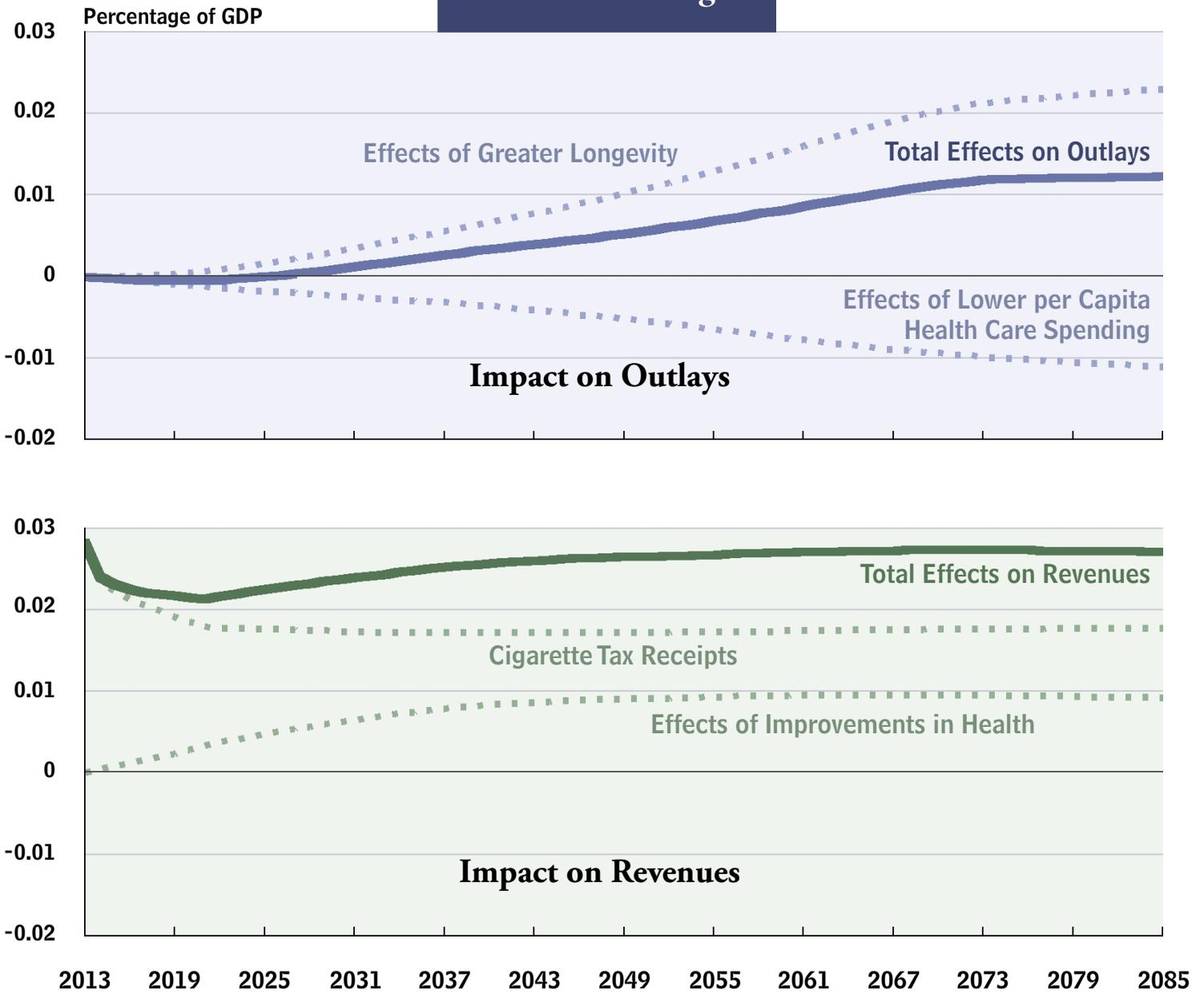


# CBO

## Raising the Excise Tax on Cigarettes: Effects on Health and the Federal Budget



JUNE 2012

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## Notes

Numbers in the text and tables of this report may not add up to totals because of rounding.

The effects on the federal budget deficit reported here refer to the primary deficit, which excludes the impact of interest payments on federal debt.

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## Summary

**T**he federal government spends roughly \$1 trillion on health care programs each year, so it is easy to imagine that policies that promote a healthier population could have a significant impact on the federal budget. Such policies might include initiatives that discourage smoking or excessive alcohol consumption, that promote better eating habits and physical activity to reduce obesity, or that encourage compliance with medical and dietary regimens for chronic conditions such as diabetes. In this study, the Congressional Budget Office (CBO) analyzes a policy involving smoking—a hypothetical increase of 50 cents per pack in the federal excise tax on cigarettes and small cigars (adjusted each year to keep pace with inflation and, in the long term, with the growth of people’s income)—to demonstrate the complex links between policies that aim to improve health and effects on the federal budget. The emphasis is on estimating the budgetary effects that would result from improvements in the health of the population stemming from the policy.

CBO’s analysis suggests that the illustrative tax increase, and the resulting impact on people’s behavior and health, would increase federal revenues by about \$41 billion and reduce spending by less than \$1 billion through 2021 (the end of the 10-year period covered by CBO’s standard budget estimates when this analysis was conducted). Almost \$38 billion of the additional revenues through 2021 would come from the higher excise tax (including partially offsetting effects on income and payroll taxes), according to estimates by the staff of the Joint Committee on Taxation. Another \$3 billion in revenues would stem from improvements in health, primarily from additional earnings as better health allowed people to work more and be more productive. Spending on the government’s largest health care programs, Medicare and Medicaid, would decline slightly during that period as people’s health improved, and spending on Social Security would increase slightly as more people lived longer.

Those changes would be very small relative to the size of the programs (about 0.01 percent or less of each program’s projected outlays through 2021).

Over the longer term (through 2085 in this analysis), the policy’s effect on people’s longevity would play a growing role, and federal outlays would rise relative to the amounts projected under current law. Those increases would continue to be small, however, compared with the size of the programs involved. The largest total increase over that period would be for Medicare, and even in 2085, its increase would represent less than 0.1 percent of the program’s total projected outlays.

On net, the illustrative policy would reduce federal budget deficits throughout the long-term projection period, primarily because of the additional excise tax receipts. Looking only at the effects of improved health (including greater longevity) on revenues and outlays, those effects would have the net result of reducing deficits for roughly the next 50 years. After that, however, the increase in spending (spurred by greater longevity) would start to exceed the increase in revenues stemming from better health. Whether positive or negative, those health effects on the deficit would always be very small—less than 0.01 percent of the nation’s gross domestic product (GDP)—and they would always be outweighed by the increase in revenues from the higher excise tax (see Summary Table 1). (All of the effects on the federal budget deficit reported in this study refer to the primary deficit, which excludes the impact of interest payments on federal debt.)

If lawmakers were to consider raising the federal excise tax on cigarettes, their decisions would most likely depend on various considerations besides the effects on the federal budget. Those other considerations would probably include the effects of the policy on people’s health and mortality rates, views about the appropriate

**Summary Table 1.**

**Budgetary Effects of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)

	2025	2035	2085
Effects on Outlays <sup>a</sup>			
Medicare	*	0.001	0.007
Medicaid and subsidies through health insurance exchanges	-0.001	-0.001	-0.001
Social Security	0.001	0.002	0.005
Other	*	0.001	0.002
<b>Total</b>	*	<b>0.002</b>	<b>0.012</b>
Effects on Revenues			
Cigarette tax receipts <sup>b</sup>	0.018	0.017	0.018
Effects from improvements in health <sup>c</sup>	0.005	0.007	0.009
<b>Total</b>	<b>0.022</b>	<b>0.025</b>	<b>0.027</b>
<b>Net Decrease (-) in the Deficit<sup>d</sup></b>	<b>-0.023</b>	<b>-0.023</b>	<b>-0.015</b>
<b>Memorandum:</b>			
Net Increase or Decrease (-) in the Deficit from Improvements in Health <sup>e</sup>	-0.005	-0.005	0.003

Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

The budgetary effects shown here are relative to the long-term projections under the extended baseline scenario published in Congressional Budget Office, *CBO's 2011 Long-Term Budget Outlook* (June 2011, corrected February 2012).

\* = between -0.0005 percent and 0.0005 percent.

- a. The outlay effects of the tax increase all result from improvements in health (they reflect changes in longevity and per capita health care spending). The effects shown here apply only to mandatory outlays.
- b. An increase in excise taxes reduces revenues from income and payroll taxes; these estimates are net of those reductions.
- c. These effects are on receipts from income and payroll taxes.
- d. Excludes debt-service costs.
- e. Excludes cigarette tax receipts and debt-service costs.

role of the government in influencing behavior, the burdens that the policy might impose on people in different circumstances, and the policy's effects on the budgets of state and local governments. Such other considerations are beyond the scope of this analysis, which addresses only the impact on the federal budget (with related analysis of the effects on health and longevity).

Similarly, if lawmakers considered other policies to promote a healthier population, their decisions would depend on a number of considerations in addition to the budgetary impact. Moreover, the effects of other health-improving policies on the federal budget might differ

substantially from the effects of the increase in the tax on cigarettes analyzed in this report.

**CBO's Analytic Approach**

A policy initiative aimed at improving the health of the population would affect the federal budget through the following links:

- The effects of the policy on people's behavior,
- The impact of changes in behavior on people's health, and

■ The implications of improvements in health for people's health care spending, life expectancy, and earnings. Specifically, better health would tend to reduce annual health care spending per capita—the amount spent on health care per person in a given year, including public, private, and out-of-pocket spending. Better health might also lead to lower mortality rates and greater longevity, thus increasing the size of the population and changing its age distribution. Better health could also affect total earnings, because healthier people might make different decisions about working and might be more productive at work.

To produce comprehensive estimates of how such a policy initiative would affect the federal budget, CBO must assess the magnitude of each of those complex links. That process requires a great deal of analysis by CBO and a significant amount of research by outside analysts on which CBO can draw.

Policies that influence the health of the population could have differing effects on different parts of the budget. Currently, about one-quarter of federal spending goes toward Medicare, Medicaid, and various smaller mandatory health care programs. (A mandatory program is one whose funding is determined by the program's rules and eligibility criteria rather than by annual appropriations from lawmakers.) To the extent that better health reduced annual health care spending per capita, the costs of those mandatory programs might decrease. But to the extent that better health led to greater longevity, the number of beneficiaries—and thus the programs' costs—might increase. Those countervailing effects could vary for different health care programs.

At the same time, improvements in health would increase outlays for programs that pay benefits to retired people—such as the retirement portion of Social Security, which accounts for one-sixth of federal spending (about \$600 billion in 2011)—as greater longevity increased the number of people collecting benefits. Outlays for retirement programs would also be affected if people who were healthier made different decisions about when to retire and to begin collecting benefits. In the case of income support programs, such as programs that pay disability benefits, the effects of better health on outlays would be complicated. Those effects would depend on changes in

the number and age distribution of people entering a program and on changes in the ages at which people left the program or died. Improvements in health would also affect federal revenues, primarily through the impact of changes in earnings on receipts from income and payroll taxes.

This study uses smoking as an example for estimating the overall impact on the federal budget of a hypothetical policy intervention to improve health. Other health-improving policies would have many of the same types of effects on the budget as those described here, but the size of those effects could differ substantially for different policies.

The policy considered in this analysis would raise the federal excise tax on cigarettes and small cigars from \$1.01 per pack to \$1.51 beginning in fiscal year 2013 and would adjust that increase each year for inflation. CBO assumed that in later years, the increase would also be adjusted to keep pace with long-term growth in real (inflation-adjusted) income. Such a policy would increase federal revenues directly by raising receipts from the excise tax (even taking into account reductions in cigarette sales because of the higher price, as well as other offsetting factors that affect revenues).<sup>1</sup> The focus of this study is the additional budgetary effects that would result from the change in people's health, as fewer people smoked and as nonsmokers were exposed to less second-hand smoke.

Like virtually all CBO analyses of the budgetary impact of a proposed policy change, this study measures the effects of the change relative to what is projected to happen under current law. In the case of smoking, CBO

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1. Excise taxes reduce the base for income and payroll taxes because they are a business expense for companies required to pay them. That additional expense results in decreases in taxable income somewhere in the economy (depending on whether companies pass the expense on to their workers or their customers), which produces a loss of government revenues from income and payroll taxes that partly offsets the revenues collected from the excise taxes themselves. For more details, see Congressional Budget Office, *The Role of the 25 Percent Revenue Offset in Estimating the Budgetary Effects of Legislation* (January 2009), and Joint Committee on Taxation, *The Income and Payroll Tax Offset to Changes in Excise Tax Revenues*, JCX-59-11 (December 23, 2011). Throughout this study, any references to changes in excise tax receipts are net of those associated losses in income and payroll tax receipts.

expects that the percentage of U.S. adults who smoke—which has fallen by roughly half in the past 50 years—will continue to decline, although at a slower pace than in recent decades. Specifically, CBO projects that under current law, the prevalence of smoking in the United States will decrease from roughly 19 percent of adults in 2010 to roughly 15 percent by about 2035, before leveling off near that percentage for the long term.

Such declines in smoking rates are at least partly attributable to the many reports that have been issued since the mid-1960s about the harmful effects of smoking on health and to the various antismoking initiatives that have been carried out at all levels of government. Those initiatives include increases in federal and state excise taxes on tobacco, bans on smoking in public places, limits on tobacco advertising, and numerous educational initiatives. The estimates presented in this analysis reflect the further changes in smoking behavior and health projected to occur under the hypothetical increase in the federal excise tax.

This analysis is more thorough in its assessment of budgetary effects than previous CBO cost estimates of policies that would reduce smoking. In the past few years, CBO estimated that several proposed policies to discourage smoking would decrease federal outlays for Medicaid by reducing the number of low-birth-weight babies (who have higher-than-average health care costs) born to women enrolled in Medicaid. (Versions of those policies have since been enacted.) This analysis of the budgetary impact of an antismoking policy is more comprehensive than such cost estimates in several respects:

- It includes new estimates of effects on annual health care spending per capita and on longevity,
- It considers the effects on a wider range of federal programs and revenue sources than are included in traditional cost estimates,
- It provides estimates for the longer term as well as for the 10-year period typically considered in budget estimates, and
- It does not make the assumption, usually made in cost estimates, that the proposed policy would have no impact on GDP.

## Effects of an Increase in the Cigarette Tax on People's Behavior

The first broad step in assessing the budgetary impact of a policy to promote health is determining how the policy will affect behavior. In the example considered here, the issue is how an inflation-adjusted increase of 50 cents per pack in the federal excise tax on cigarettes and small cigars would affect smoking. That tax increase—along with price changes by manufacturers in response to the policy—would raise the price that consumers would pay for cigarettes by about 10 percent, on average, nationwide.

Fairly extensive research has been done about how the consumption of cigarettes changes in response to changes in the price (including tax) that smokers or would-be smokers face. Studies suggest that teenagers respond most strongly to higher cigarette prices and that such responsiveness declines with people's age. On the basis of that research, CBO estimates that a few years after the hypothetical tax increase took effect, the number of 12- to 17-year-olds who smoked cigarettes would be about 5 percent lower than it would be otherwise, the number of 18-year-old smokers would be 4.5 percent lower, the number of 19- to 39-year-old smokers would be almost 4 percent lower, and the number of smokers age 40 or older would be about 1.5 percent lower. In later years, the main effect of the tax increase on behavior would be to keep more young people from starting to smoke. For example, CBO estimates that in 2021, 4.3 percent fewer 18- to 24-year-olds would be smokers than under current law. Over time, those reductions in the number of teenagers and young adults who took up smoking would translate into a lower percentage of adults who smoked than under current law.

The link between cigarette prices and people's behavior is often described by an "elasticity," which quantifies the percentage change in the number of people who smoke, or in the number of cigarettes smoked, in response to a 1 percent increase in price. CBO's estimates of changes in the number of smokers are based on an average elasticity of almost -0.3—meaning that a 1 percent rise in the price of cigarettes results in roughly a 0.3 percent decline in the number of smokers. The total reduction in cigarette consumption from such a price increase is significantly greater than 0.3 percent, according to past research, because it reflects both the decrease in the number of

people who smoke and a decrease in the average number of cigarettes consumed by people who continue to smoke.

The estimates of health and budgetary effects in this study focus on the first of those components—the reduction in the number of smokers and the resulting decline in people’s exposure to secondhand smoke. The health effects on smokers who reduced their cigarette consumption but did not quit would be negligible, CBO assumed. That assumption was made because research into whether reducing the number of cigarettes smoked improves health is inconclusive—partly because evidence suggests that such smokers are apt to smoke each cigarette more intensively than they did before.

## Effects on Health, Health Care Spending, and Longevity

Numerous studies have concluded that reducing the number of smokers would improve health and increase longevity. Smoking has been shown to cause or worsen an array of medical problems—including cardiovascular diseases, various types of cancer, bronchitis, and reproductive health problems—and to contribute to early death. People who quit smoking see some improvements in their health fairly quickly, but many of the ill effects of smoking can take years to go away, and some may never entirely disappear. Because research evidence suggests that it takes time for the health of a former smoker (as measured by such things as cardiovascular efficiency and incidence of various cancers) to begin to resemble the health of someone who never smoked, CBO built a “health response lag” into its estimates. Research evidence also implies that the biggest gains in health from a policy to discourage smoking would come from preventing some young adults from ever starting to smoke. As time elapsed after the policy change, more and more age groups would include a subset of people who never took up smoking because of the policy. For all of those reasons, the effects of the policy on the overall health of the population would take many years to reach their full extent.

CBO used data from several sources to estimate the extent to which smoking affects the average amount spent by all sources on a person’s health care in a given year. Those estimates of smoking’s impact on annual health care spending per capita were combined with CBO’s estimates of smoking’s impact on mortality rates

to produce estimates of the effects of smoking on total health care spending from all sources.

### Annual per Capita Spending on Health Care

CBO used linked data from two large national surveys—the Medical Expenditure Panel Survey, produced by the Agency for Healthcare Research and Quality, and the National Health Interview Survey, produced by the Centers for Disease Control and Prevention—to estimate the effects of smoking on annual health care spending per capita. The linked dataset provided information about each respondent’s smoking history, health care spending, and other important characteristics, including age, sex, race or ethnicity, education level, marital status, income, geographic location, health insurance coverage, alcohol consumption, categories of body mass index, and measures of attitudes about risk and about the need for medical care in the event of an illness.

After analyzing those data and considering the research findings of others, CBO estimated the extent to which annual health care spending per capita would be lower if people who otherwise would have smoked either quit or never started smoking as a result of a policy intervention. That estimate came from comparing health care spending for smokers and nonsmokers. Such comparisons are complicated because, on average, smokers and nonsmokers differ in ways other than smoking—such as in education, race or ethnicity, insurance coverage, location, and alcohol consumption—that can affect their health care costs. When considering a policy that would change smoking behavior, therefore, it is important to compare current smokers with people who have never smoked but who otherwise resemble smokers—because the policy may alter smoking behavior but not necessarily the other characteristics that can affect someone’s health and health care spending.

CBO used regression analysis to separate the effects of smoking from the effects of other personal characteristics that are correlated with smoking but that exert their own influence on annual health care spending per capita. In general, the effects of smoking on per capita spending are smaller when the analysis adjusts for those other characteristics than when it simply compares average health care spending for smokers and nonsmokers.

CBO estimated that people who have never smoked but who otherwise resemble smokers have lower annual

health care spending per capita than current or former smokers do: about \$1,000 (or 16 percent) lower for people in the 45–64 age range; about \$1,100 (or 12 percent) lower for people in the 65–74 age range; and about \$1,300 (or 11 percent) lower for people age 75 or older. (Those dollar amounts are in 2008 dollars.) The estimated dollar differences are smaller for people under age 45, both because younger people tend to have better health in general and because younger smokers have had less time for smoking-related health problems to develop. Among 18- to 24-year-olds, annual health care spending per capita is about \$200 (or 11 percent) lower for nonsmokers who otherwise resemble smokers than for current or former smokers; among 25- to 44-year-olds, the difference in annual spending is about \$400 (or 13 percent).

On the basis of those differences, CBO estimated that roughly 7 percent of the nation’s total annual health care spending (for noninstitutionalized adults) is attributable to smoking.<sup>2</sup> That figure is consistent with the range of results from other research studies. Some of those studies built up their analyses using evidence and calculations of the costs of specific diseases associated with smoking. Other studies followed a method more like the one that CBO used for this analysis: comparing annual spending for people with different histories of smoking and statistically controlling for other personal characteristics that can affect health care spending.

### Longevity

CBO employed a similar approach to assess the effects of smoking on mortality rates and thus on life expectancy. The analysis used data from the National Health Interview Survey linked with death certificate records from the National Death Index, enabling CBO to determine whether a survey respondent had died. Similar to the way CBO produced the statistical estimates of the effects of smoking on annual per capita health care spending, the agency used regression analysis of mortality rates to separate the effects of smoking from the effects of other personal characteristics.

2. That number is based on the share of the population that has a history of smoking (either current or former smokers), which is about half of all adults, and the difference in per capita health care spending between people with a history of smoking and otherwise similar nonsmokers, which varies from 11 percent to 16 percent depending on age group.

Mortality rates are generally higher for current and former smokers than for people who have never smoked but who otherwise resemble smokers. Between the ages of 25 and 74, current and former smokers are 1.8 to 2 times as likely to die in a given year as people who have never smoked but who have the other characteristics of smokers.

In terms of longevity, smoking appears to decrease someone’s life expectancy at age 30, 45, or 60 by about 5 to 6 years. That estimate comes from comparing people with a typical history of smoking (a category that reflects the probability that a person will quit smoking at some point in his or her life) with people who have never smoked but who have the other characteristics of smokers. (The difference in life expectancy is even greater if the analysis does not control for those other characteristics but simply compares typical smokers with people who have never smoked.)

Differences between smokers and otherwise similar nonsmokers in the probability of surviving to age 70 and beyond are especially large. Because mortality rates are very low at young ages, even being twice as likely to die in a given year does not translate into much difference in the probability of surviving to middle age. However, because the probability of surviving to a particular age depends on the cumulation of previous year-to-year mortality rates, and because mortality rates only begin to rise sharply at older ages, smoking causes a particularly large difference in the probability of surviving past age 70. For instance, if one compares a 30-year-old who has a typical history of smoking with an otherwise similar 30-year-old who has never smoked, the smoker is 98 percent as likely as the nonsmoker to live to age 45, 95 percent as likely to live to age 55, and 91 percent as likely to live to age 65—but only 80 percent as likely to reach age 75.

Those differences imply that the greatest increase in the population from a policy that reduces smoking will occur in the over-65 age group—an implication that has substantial consequences for the policy’s long-term impact on the federal budget. The “longevity effect” (in which a reduction in smoking decreases mortality rates and increases life expectancy) will be most likely to drive up the costs of federal programs that are aimed at older people, because it is at those ages that the reduction in smoking will result in the most additional people staying alive. Of course, the higher costs for such programs must

be netted against the savings in annual health care spending per capita and the effects on revenues from income and payroll taxes to calculate the total effect of the improvements in health on the federal budget.

### Effects Found Among Recent Quitters

The increases in annual health care spending per capita and mortality rates caused by smoking are not limited to current smokers. People who stopped smoking in the previous 10 years, and especially those who quit in the past 5 years, have even higher annual per capita health care spending and mortality rates than do current smokers of the same age and with the same other characteristics (such as education and race). That result has been found by other researchers as well. In the judgment of CBO and others, that result does not imply that quitting leads to higher health care spending or mortality. Instead, a more likely explanation is that some quitters stop smoking in response to a serious illness, and the effects of such illnesses on health care spending and mortality are evident in the data. CBO's methodology accounts for that effect in estimating the changes in per capita health care spending and mortality rates that would result from the illustrative policy examined in this analysis.

### Effects on Labor Earnings

Smoking can affect a person's earnings and hence the amount of federal revenues collected from income and payroll taxes. A policy—such as an increase in the cigarette tax—that reduced the number of smokers could influence earnings in various ways. For example, decreasing the number of people who smoked would result in more people in better health, which in turn could affect their decisions about whether and when to join the labor force and when to retire. In addition, better health could improve employees' earnings while in the workforce by causing them to have fewer absences from work, to be more effective while on the job, or to work for more hours.

CBO used the Census Bureau's Current Population Survey (CPS) and its special Tobacco Use Supplement to explore the connections between a person's history of smoking and his or her earnings (including such factors as labor force participation, retirement, and hourly wages). The CPS collects data on people's earnings and other income, employment status, and other social and demographic characteristics; the Tobacco Use

Supplement provides information about their history of smoking. (CBO also conducted a more limited analysis using data from the University of Michigan's Health and Retirement Study.)

CBO's analysis indicates that smoking results in lower earnings than would otherwise occur. Specifically, CBO concluded that because of smoking, average earnings are 4 percent lower for 18- to 34-year-olds who smoke than for otherwise similar nonsmokers. The percentage difference rises to between 5 percent and 7 percent for 35- to 74-year-olds. Smoking appears to reduce the likelihood of having a job and to decrease average wages per hour. However, smoking appears to have no effect on, or to slightly increase, the hours that people work when they are employed. Like all of the estimates in this study, those precise numeric conclusions about the effects of smoking on earnings are subject to significant uncertainty.

The estimates above are smaller than the gap in earnings measured from the CPS data when comparing smokers with nonsmokers who have similar measured characteristics, because CBO believes that a portion of that gap results from differences between smokers and nonsmokers in attributes that are not measured by surveys, such as willpower, self-confidence, and quality of education. In CBO's judgment, differences in such unmeasured characteristics can have a marked effect on earnings, although they are less likely to affect health care spending or longevity.

### Effects on the Federal Budget

To estimate the budgetary impact of a policy that would reduce smoking, CBO developed a model to follow cohorts of smokers and people who would have been smokers in the absence of the policy. The model keeps track of cohorts as they age and compares the annual per capita health care spending and earnings they would be expected to have under current law with the health care spending and earnings projected for them under a policy in which the federal excise tax on cigarettes and small cigars would be 50 cents higher per pack in 2013 and adjusted for inflation thereafter (and for income growth over the longer term). CBO assumed that it would take one year for the tax increase to have its full impact on the smoking behavior of people who were already smokers. However, it would take many more years for the policy to have its full impact on health—and thus on annual health

care spending per capita and mortality rates—for people who quit because of the policy.

The model accounts for other effects of the policy as well. Using results from the analyses described earlier, it incorporates the different mortality rates that would occur as some people who would otherwise have continued to smoke quit because of the higher cigarette price resulting from the tax increase. The model also accounts for young people who would have started smoking under current law but never do because of the higher price. Their health care spending per capita, earnings, and mortality are projected under current law, in which they take up smoking, and under the higher-tax policy, in which they never smoke. In addition, the model takes into account the fact that some smokers will eventually quit on their own under current law, even without an increase in the excise tax. (Assumptions about such quitting are based on the experience of cohorts of smokers observed in recent data and are consistent with CBO’s assumptions about the future prevalence of smoking by different age groups under current law.)

After calculating the policy’s effects on health care spending per capita and on the number of people alive at each age, CBO used those results to estimate changes in enrollment and spending for the various mandatory programs in the federal budget whose outlays would be affected by the policy and then summed the effects to calculate total changes in federal outlays by year.<sup>3</sup> At the same time, CBO calculated how higher earnings for people who did not smoke because of the policy, and an increase in the number of people who survived to have earnings, would translate into changes in total earnings each year—and thus into changes in annual revenues from income and payroll taxes. The revenue estimates also account for the additional excise tax receipts that would be collected because of the increase in the cigarette

tax. The net result of the changes in outlays and the changes in revenues is the total budgetary effect of the policy for a given year.

### Impact on the Population

By discouraging people from smoking, the excise tax increase would improve the average health of the population. By 2021, almost 1.4 million adults would have quit rather than smoking until death, quit earlier than they would have otherwise, or not started smoking because of the policy—among them about 10,000 adults who would not otherwise have survived to that year.<sup>4</sup> (CBO projects that almost 43 million adults will be smokers in 2021 under current law.)

Over time, the policy’s impact on the average health and longevity of the population would grow because of the continuing improvement in health for people who stopped smoking, the decline in the share of people who took up smoking as teenagers or young adults, and the cumulative effects of lower mortality rates. CBO estimates that by 2035, about 63,000 additional adults would be alive because of the higher cigarette tax. And by 2085, over 3 million adults would be nonsmokers specifically because of the policy, including about 200,000 who would otherwise have died earlier. (By comparison, about 57 million adults are projected to be smokers in 2085 under current law.)

### Budgetary Impact Through 2021

CBO estimates that the illustrative increase in the cigarette tax would have the net effect of reducing federal budget deficits (excluding interest) by a total of about \$42 billion through 2021 (the end of the 10-year window for CBO’s budget estimates at the time this analysis was conducted). Most of the net effect during that period would come from increases in excise tax revenues. Those additional revenues would begin in 2013 and total almost \$38 billion through 2021 (about \$4 billion in 2021 alone). In addition, higher collections of income and payroll taxes from people who were more productive in the workforce or had greater labor force participation because

3. Some federal health care programs have both mandatory and discretionary components. Funding for the discretionary components of a program is determined by annual appropriations (rather than by statutory rules about the program’s eligibility and payments). The spending numbers discussed in this summary include only changes in mandatory spending. Potential changes in discretionary spending for programs that have discretionary components are discussed in Chapter 6. Those changes would be quite small compared with the changes in mandatory spending discussed here.

4. Health would also improve for people who lived with someone who did not smoke as a result of the policy, because those people would not be exposed to secondhand smoke at home. CBO’s estimates of the budgetary effects of the policy include an adjustment to account for the impact of a reduction in exposure to secondhand smoke.

of not smoking would increase revenues by another \$2.9 billion through 2021 (about \$700 million in 2021, or 0.02 percent of total income and payroll tax receipts projected for that year).<sup>5</sup> At the same time, total federal outlays would be slightly reduced—by \$730 million over the 2013–2021 period (\$124 million in 2021)—because of the health effects that would result from the higher cigarette tax.

Focusing specifically on the policy’s health-related budgetary effects (including the increased revenues from higher earnings), the combination of net outlay reductions and net revenue increases resulting from the policy’s impact on health and longevity would reduce deficits by a total of about \$4 billion over the 2013–2021 period (about \$900 million in 2021). Those health-related budgetary effects are about 10 percent of the size of the total increase in excise tax receipts over that period.

The illustrative policy would affect spending for federal programs in different ways, increasing outlays for some programs and decreasing outlays for others. In all cases, however, the changes would be very small relative to the size of the programs.

- Medicaid would see the largest savings over the 2013–2021 period—about \$560 million (\$120 million in 2021, or 0.02 percent of total expected federal outlays for Medicaid in that year). Those figures represent the sum of savings for all of the different types of beneficiaries that Medicaid serves; they also represent the net impact of decreases in annual spending per capita and increases in the number of beneficiaries because of greater longevity. In the first few years of the policy, one of the biggest sources of savings for Medicaid would be better health among pregnant women, infants, and young children.
- Medicare would have the next-largest savings in the near term—about \$250 million over the 2013–2021 period (\$50 million, or 0.006 percent of net Medicare outlays, in 2021). Those savings constitute the net impact of two elements: lower annual spending per capita as the health of former smokers gradually

improved and a greater number of beneficiaries as healthier people lived longer. The first of those elements would be larger than the second throughout the 10-year budget window.

- By contrast, Social Security’s Old-Age and Survivors Insurance program, which pays retirement benefits, would experience the largest net *increase* in costs because of the policy. On net, outlays for Social Security would rise by about \$150 million over the 2013–2021 period (about \$55 million, or 0.005 percent of that program’s outlays, in 2021). Those increases would result from more people living to collect benefits or collecting them for longer periods, although there would be a reduction in benefits paid to the survivors of deceased workers.

The budgetary effects of the increase in the cigarette tax would be small relative to the overall size of the programs involved for several reasons. First, only a small fraction of the people receiving benefits from a program would change their behavior as a result of the tax increase. For example, in the case of Medicare, CBO estimates that about 1.5 percent of the smokers who would be over age 65 between 2013 and 2021 would quit because of the policy. Because smokers make up about 10 percent of Medicare’s population, only 0.15 percent of the program’s beneficiaries would change their behavior in a way that improved their health. Second, it takes time for a former smoker to recover from the damage done while smoking. CBO estimates that annual per capita health care spending is roughly 10 percent higher for a smoker than for an otherwise similar person in that age group who has never smoked. The reduction in annual health care spending for someone who quit smoking immediately because of the tax increase would be only about two-thirds of that 10 percent by 2021 (the ninth year of the policy). The result of that chain of calculations is savings of 0.01 percent for the Medicare program, even before considering the higher spending that would result from having more people survive to receive benefits.

### **Budgetary Impact Over the Longer Term**

Beyond the next 10 years, estimates of the budgetary effects of the illustrative increase in the cigarette tax are even more uncertain. Because people’s income tends to rise over time with the growth of productivity, it would probably be necessary to increase the excise tax beyond

5. Those revenue increases would not be considered in regular cost estimates of proposed legislation because of the longstanding practice with such estimates of assuming that proposals would not affect GDP.

the 50-cent inflation-adjusted rise that was modeled for the first decade in order to continue to have the same effect on people’s smoking behavior. Thus, for its longer-term estimates, CBO assumed that the excise tax increase would be indexed not only for inflation but also for growth in average real income.

Despite the greater uncertainty of longer-term estimates, CBO’s model of changes in annual health care spending per capita and in longevity offers some insights into the pattern and rough size of the budgetary impact over the long run. As more time passes, the savings from reductions in annual health care costs per capita increase, as does the number of living people who otherwise would have died. In addition, people who quit smoking because of the policy see bigger improvements in their health over time. Also, as the years go by, a larger share of the population consists of people who grew up with the higher excise tax in effect, and because young people are more sensitive to cigarette prices than older people are, a greater fraction of people who otherwise would have smoked choose not to because of the policy.

**Effects on Specific Programs Through 2085.** Whether health care programs would have lower or higher costs over time would depend on whether the reduced annual per capita spending on healthier people outweighed the added costs of providing health benefits to more people. In the case of Medicare, CBO’s modeling indicates that the decreases in mortality because of reductions in smoking would add people disproportionately to older age groups—the population served by Medicare—and that sometime during the second decade of the policy, the increase in health care costs from greater longevity would become the dominant effect for that program. Consequently, the policy would have little net impact on annual spending for Medicare in 2025, CBO estimates, and it would increase Medicare spending thereafter: by about 0.001 percent of GDP (0.02 percent of net program spending) in 2035 and by 0.007 percent of GDP (0.07 percent of net program spending) in 2085 (see Summary Table 1 on page iv).<sup>6</sup>

By contrast, for Medicaid and for subsidies offered through the health insurance exchanges established by the

Affordable Care Act, the savings in annual health care costs per capita would always outweigh the costs of increased longevity, because much of those programs’ spending is targeted toward the nonelderly population.<sup>7</sup> As a result, the increase in the cigarette tax would reduce federal spending for Medicaid and the exchange subsidies each year through 2085—by no more than 0.001 percent of GDP, CBO estimates. (Relative to projected spending for those programs, the reduction would equal 0.02 percent in 2025, 0.03 percent in 2035, and 0.02 percent in 2085.)

Because of the policy’s effect on longevity, Social Security would see outlays for retirement and disability benefits increase by about 0.001 percent of GDP (0.01 percent of total program spending) in 2025, by 0.002 percent of GDP (0.03 percent of program spending) in 2035, and by 0.005 percent of GDP (0.07 percent of program spending) in 2085.

**Overall Effects Through 2085.** Including the changes in spending for other programs, CBO estimates that the illustrative increase in the cigarette tax would lead to a net change in total outlays of less than 0.0005 percent of GDP in 2025. Total outlays would increase in subsequent decades because of the policy—by about 0.002 percent of GDP in 2035 and 0.012 percent in 2085. The effects of both lower annual per capita health care spending and greater longevity would grow over time, with the effect of increased longevity becoming dominant during the second decade of the policy (see Summary Figure 1).

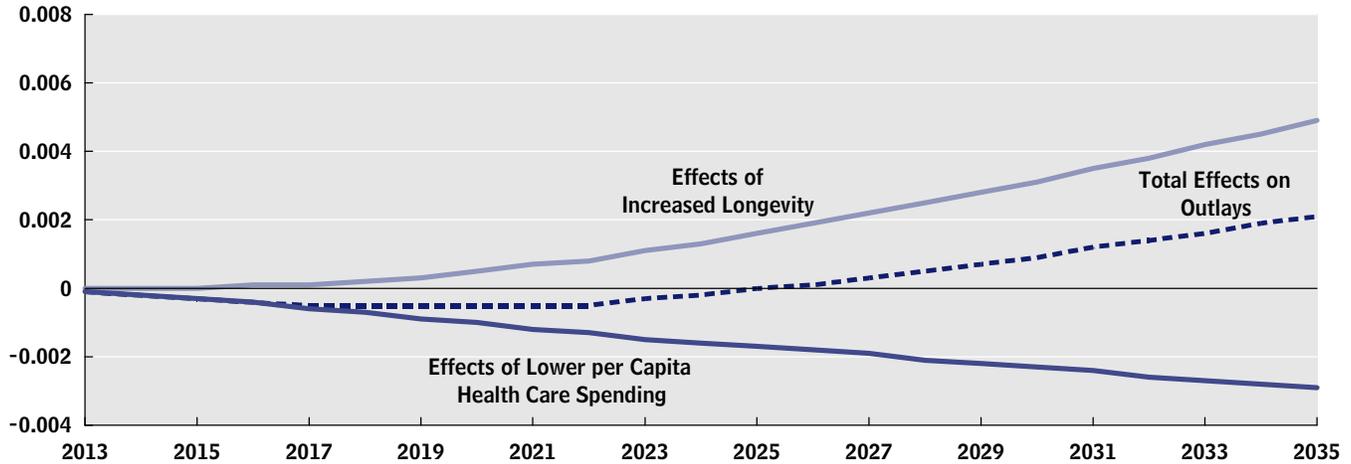
On the revenue side of the budget, the policy’s effect on excise tax receipts would continue to play the largest role, increasing annual revenues by about 0.018 percent of GDP through 2085. In addition, better health would cause revenues from income and payroll taxes to rise (see Summary Figure 2). That increase can largely be attributed to a combination of higher labor earnings per capita (because improvements in health would result in greater earnings while people were employed and cause some people to participate in the labor force longer than they would otherwise), increased longevity (which means that some people who would otherwise have died because of

6. Net Medicare spending is total program spending net of beneficiaries’ premiums and certain amounts paid by states.

7. The Affordable Care Act refers to the Patient Protection and Affordable Care Act (Public Law 111-148) and the health care provisions of the Health Care and Education Reconciliation Act of 2010 (P.L. 111-152).

**Summary Figure 1.****Effects on Outlays of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)



Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

The outlay effects of the tax increase all result from improvements in health. The effects shown here apply only to mandatory outlays.

smoking would instead be alive and in the labor force), and lower health insurance premiums (and thus a higher share of compensation taking the form of taxable wages). Together, those health-related effects on revenues are estimated to amount to 0.005 percent of GDP in 2025, 0.007 percent in 2035, and 0.009 percent in 2085.

Those changes to outlays and revenues would have the net effect of reducing deficits throughout the long-term projection period, mainly because of the additional revenues stemming from the higher excise tax. The overall reduction in the deficit (including the effects of better health) would amount to 0.023 percent of GDP in 2025 and 2035 and to 0.015 percent of GDP in 2085. By themselves, the policy's health effects would have a minuscule impact on the deficit, reducing it by 0.005 percent of GDP in both 2025 and 2035. After about 50 years, the increases in spending for Medicare, Social Security, and other, smaller mandatory programs stemming from increased longevity would exceed the combination of savings for Medicaid and other programs and additional revenues stemming from better health, greater productivity, and more time spent in the labor force. By 2085, those health effects would have the net result of increasing the deficit by 0.003 percent of GDP.

**Uncertainty of the Estimates**

CBO's estimates are based on a thorough analysis of existing data and a review of numerous studies on topics ranging from how people's behavior changes when cigarette prices rise to the specific health consequences of smoking. Those studies differ in their conclusions about the sizes of various effects, and CBO's own analysis is subject to the uncertainties that occur whenever researchers make inferences from data. In addition, the estimates in this report depend on a variety of assumptions that were made when constructing the model of cohorts of smokers and people who would have been smokers in the absence of the policy.

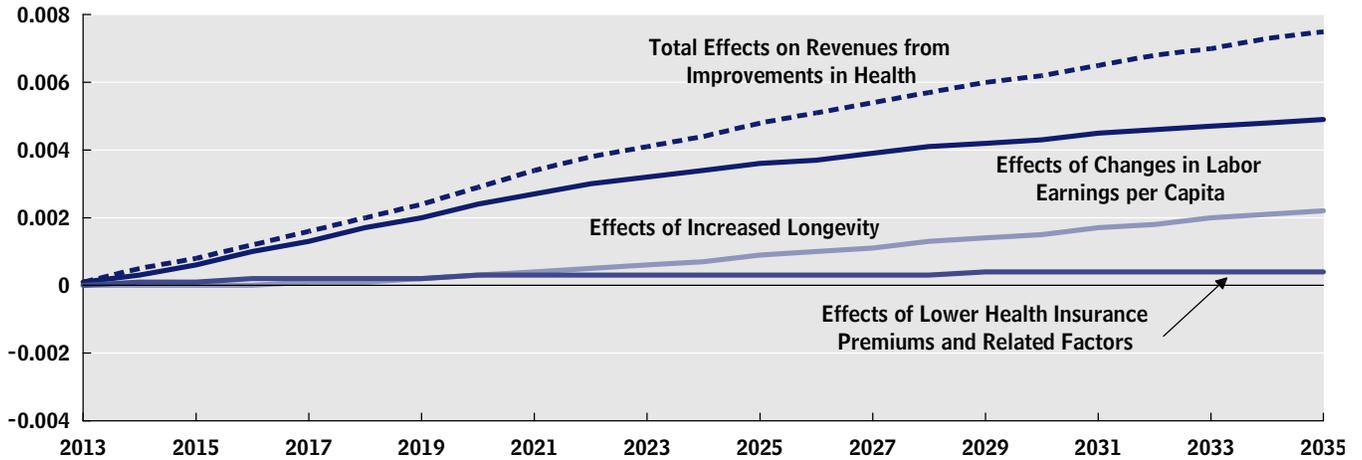
CBO considered those sources of uncertainty and examined how its estimates might change with differing assumptions. Under a range of plausible alternative assumptions, the following general conclusions about an increase in the cigarette tax would continue to apply:

- The changes in federal spending that would result from improved health because of a decrease in the number of smokers would be quite small relative to the size of the affected programs.

**Summary Figure 2.**

**Health-Related Effects on Revenues of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)



Source: Congressional Budget Office.

Note: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

- Federal spending would be reduced throughout the first decade that the tax increase was in effect but would be increased beginning in the second or third decade.
- The effects of improved health would increase revenues on an ongoing basis.
- The health effects of the tax increase would produce a very small net decline in the annual budget deficit for roughly five decades.
- The increased excise tax receipts would exceed the health-related effects of the policy on both revenues and outlays for at least 75 years, with the overall result being a net decrease in the deficit.

# Introduction

**M**any people behave in ways that increase their risk of developing serious health problems. Reducing that risk by encouraging changes in behavior might therefore improve health and increase longevity. Mandatory spending for health care programs accounts for a large and growing share of the federal government’s spending (excluding interest payments on federal debt)—23 percent in 2011 and a projected 33 percent in 2021 under current law.<sup>1</sup> Thus, a question that frequently arises is whether a policy intervention to promote healthy behavior would produce savings for the federal budget.

Achieving large budgetary savings through policies to reduce unhealthy behavior is challenging, however, for several reasons. First, changing people’s actions may require costly policy interventions or combinations of interventions. Second, even if a policy alters people’s behavior, the resulting health benefits—and thus the impact on health care spending—may take time to emerge. Third, although reducing the incidence of illnesses and disabilities could lead to large savings on health care in the long run, any savings to the federal government would be offset by additional spending if people lived longer because of better health. For example, costs for the Medicare program could rise to treat other diseases and conditions during those extra years of life, and spending for programs not directly related to health (such as Social Security) could also rise with increases in longevity. At the same time, federal revenues could grow if people earned more and paid taxes for a longer period, which might offset some or all of that additional spending.

This report examines the myriad links between policy interventions to improve health and effects on the federal

budget. To illustrate those links, the Congressional Budget Office (CBO) analyzed a hypothetical policy to reduce the prevalence of smoking by raising the federal excise tax on cigarettes and small cigars. (That policy is described in detail in Chapter 2.) Other policies that improve health would have many of the same types of effects on the budget as those analyzed here, but the size of those effects could differ substantially for different policies.

Estimating how changes in the health of the population because of a policy change would affect the federal budget involves various steps:

- Estimating how much the policy would cause people to alter their behavior;
- Estimating how changes in behavior would translate into improvements in health;
- Projecting how improvements in health would affect average annual health care spending per person and mortality rates (and thus the size and age distribution of the population);
- Applying the projections for health care spending per person and mortality to individual federal programs, taking into account the nature of the benefits they provide and the characteristics of the beneficiaries they serve; and
- Determining how improvements in the health of the population would affect federal revenues by changing, for example, people’s labor force participation and productivity and the share of compensation they receive as taxable earnings.

All of those steps can require a significant amount of analysis—by CBO and by other researchers on whose

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1. Mandatory spending is spending that is not controlled through the Congress’s annual appropriation process; instead, it stems from the eligibility criteria and benefit or payment rules set in law for various programs.

work CBO can draw. A policy that discourages smoking by raising the excise tax on cigarettes provides a good case study because a substantial body of research exists about the effects of changes in cigarette prices on smoking rates, as well as about the impact of smoking on health, health care spending, longevity, and (to a lesser extent) earnings.

## Smoking Rates and Existing Federal Policies Toward Smoking

Smoking is among the most common risky behaviors directly associated with major illnesses. In 1964, the U.S. Surgeon General declared that “cigarette smoking is a health hazard of sufficient importance in the United States to warrant appropriate remedial action.”<sup>2</sup> Since then, more than 30 reports from the Surgeon General and numerous other studies have documented the harmful effects of smoking on health and the causal link between tobacco use and disease. In part because of efforts by the federal government, state governments, and the public health community, the percentage of adults in the United States who smoke has been cut in half since the mid-1960s.<sup>3</sup> The rate of decline has slowed in recent years, however, and in 2010 (the latest year for which data are available) more than 45 million people—about 19 percent of U.S. adults—continued to smoke.<sup>4</sup> Consequently, reducing disease, disability, and death from

2. Public Health Service, *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service* (1964), p. 33.
3. Although there are various types of tobacco use, this study focuses on cigarette smoking. The government’s definition of a smoker has changed slightly over the years. Before 1992, the Centers for Disease Control and Prevention (CDC) defined current smokers as people who reported having smoked at least 100 cigarettes in their lives and who currently smoked. Since 1992, the CDC has defined current smokers as people who report having smoked at least 100 cigarettes in their lives and who also report smoking every day or some days.
4. Centers for Disease Control and Prevention, “Vital Signs: Current Cigarette Smoking Among Adults Aged 18 Years or Older—United States, 2005–2010,” *Morbidity and Mortality Weekly Report*, vol. 60, no. 35 (September 9, 2011), pp. 1207–1212, and “Smoking & Tobacco Use—Adult Cigarette Smoking in the United States: Current Estimate” (fact sheet, March 9, 2011), [www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/adult\\_data/cig\\_smoking/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm). The estimates of current smoking rates are based on self-reporting and were not verified by observation or testing. People may underreport their smoking behavior, which could lead to underestimates of total smoking rates.

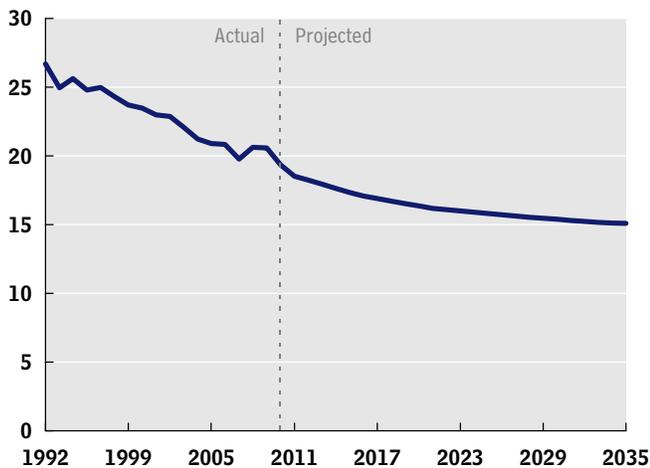
smoking remains one of the federal government’s primary goals for improving the health of the population.<sup>5</sup>

Over the years, the federal government has pursued various policies that have been intended to discourage, or have had the effect of discouraging, the use of tobacco products. For example, a federal excise tax on tobacco has been in effect since the 1860s. That tax was raised most recently in 2009, from 39 cents to \$1.01 per pack of cigarettes. Other federal policies that affect smoking include restrictions on young people’s access to tobacco, limits on the marketing and advertising of tobacco products, a ban on smoking on all scheduled airline flights, and requirements for the size of warning labels on cigarette packages. The federal government has also taken specific steps to help smokers quit—for example, by offering certain smoking-cessation benefits to Medicare beneficiaries with no cost sharing and by requiring health plans in the Federal Employees Health Benefits program to do so for their enrollees. In addition, the Affordable Care Act included several provisions to expand coverage of smoking-cessation benefits by Medicaid and to make such benefits (along with other preventive benefits, such as cholesterol tests) available with no cost sharing under some private health insurance plans.<sup>6</sup>

Partly because of such policies, CBO expects smoking rates in the United States to continue to decline. Looking at data from the National Health Interview Survey, at the continuing effects of recent federal laws, and at the expected impact of current and future levels of state tobacco taxes, CBO projects that the share of U.S. adults who smoke cigarettes will fall from about 19 percent in 2010 to about 16 percent in 2021 under current law and then level off at 15 percent in 2035 and beyond (see Figure 1-1). Those smoking rates come from a detailed baseline that CBO has constructed of the number of smokers in each age group, projected into the future

5. In 2010, the Department of Health and Human Services established 10-year goals for the nation’s health under an initiative called Healthy People 2020. Tobacco use is one of the initiative’s leading health indicators; a goal under that initiative is to reduce the percentage of U.S. adults who smoke cigarettes to 12 percent by 2020.
6. The Affordable Care Act refers to the Patient Protection and Affordable Care Act (Public Law 111-148) and the health care provisions of the Health Care and Education Reconciliation Act of 2010 (P.L. 111-152).

**Figure 1-1.**  
**Percentage of U.S. Adults Who Smoke Cigarettes**



Source: Congressional Budget Office based on data from the National Health Interview Survey.

Note: Adult smokers are defined here as people age 18 or older who report that they have smoked at least 100 cigarettes in their lives and that they currently smoke every day or some days.

using the assumptions of the Social Security trustees for growth in the general population and incorporating estimates of the number of people who will quit smoking in the future without any further policy interventions.

Developing a baseline for the prevalence of smoking over coming decades in the absence of further federal policy changes is extremely challenging. One particularly thorny issue is how to interpret recent patterns in smoking rates. Over the past two decades, the rate of smoking among U.S. adults has declined at an average pace of almost 2 percent a year; but between 2005 and 2010, that pace slowed to an average of about 1 percent a year. Tobacco researchers disagree about what the slowdown represents. One argument is that as smoking rates decline, the smokers who are left are those who either find it the most difficult to quit or have no desire to quit—a phenomenon known as “hardening of the target.” The hardening hypothesis suggests that further reductions in smoking rates will be much more difficult to achieve than those experienced so far. But a review of the research literature shows that the hypothesis reflects many different definitions and measures of hardening, and depending on the definition, the evidence is mixed. Moreover, researchers

with varying perspectives have reached different conclusions about whether hardening is occurring at all.<sup>7</sup>

Some policy analysts argue that the decline in the prevalence of smoking has stalled because states’ funding for tobacco cessation has fallen in recent years; states’ adoption of tobacco-cessation laws has varied widely; and spending on cigarette marketing by the tobacco industry, although lower than in the past, remains high (while marketing of smokeless tobacco has expanded).<sup>8</sup> Given the disparate views on how to interpret recent data about smoking rates, and the uncertainty about future anti-smoking initiatives, CBO assumes that the prevalence of smoking will level off at 15 percent for the long term under current law on the basis of evidence about the lowest smoking rates found among U.S. states and various developed countries.<sup>9</sup>

## CBO’s Analysis of the Effects of Federal Policies Toward Smoking

In the past few years, CBO has addressed the issue of how changes in smoking would affect the federal budget in the

7. Michael Chaiton and others, “‘Hardcore’ Definitions and Their Application to a Population-Based Sample of Smokers,” *Nicotine and Tobacco Research*, vol. 12, no. 8 (July 2, 2010), pp. 860–864; John Hughes, “The Hardening Hypothesis: Is the Ability to Quit Decreasing Due to Nicotine Dependence? A Review and Commentary,” *Drug and Alcohol Dependence*, vol. 117, no. 2–3 (March 2011), pp. 111–117; and Gary Giovino and others, *Cigarette Smoking Prevalence and Policies in the 50 States: An Era of Change—The Robert Wood Johnson Foundation ImpacTeen Tobacco Chart Book* (State University of New York at Buffalo, 2009).
8. Giovino and others, *Cigarette Smoking Prevalence and Policies in the 50 States*; Tobacco Free Kids, *A Broken Promise to Our Children—The 1998 State Tobacco Settlement 13 Years Later* (Tobacco Free Kids, 2011); and Centers for Disease Control and Prevention, “Smoking & Tobacco Use—Tobacco Industry Marketing” (fact sheet, March 21, 2011), [www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/tobacco\\_industry/marketing/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/tobacco_industry/marketing/index.htm), and “Smoking & Tobacco Use—Smokeless Tobacco Facts” (fact sheet, August 4, 2011), [www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/smokeless/smokeless\\_facts/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/smokeless/smokeless_facts/index.htm).
9. Although CBO projects average smoking rates for the United States as a whole, trends in smoking vary widely by region and socioeconomic status. For example, among U.S. states, smoking rates for adults in 2010 ranged from 9.1 percent in Utah to 26.8 percent in West Virginia; see Centers for Disease Control and Prevention, “Vital Signs: Current Cigarette Smoking Among Adults Aged 18 Years or Older—United States, 2005–2010,” *Morbidity and Mortality Weekly Report*, vol. 60, no. 35 (September 9, 2011), pp. 1207–1212.

context of cost estimates for tobacco-related legislation. Those estimates focused on pregnant women enrolled in Medicaid. If women refrain from smoking during pregnancy, they are less likely to give birth to low-weight babies—who have relatively high medical costs at birth and afterward—or to experience other complications during pregnancy.<sup>10</sup> They are also likely to have fewer miscarriages, meaning that some of the savings from reduced complications are offset by costs associated with additional live births. Accounting for all of those effects, CBO drew the following conclusions about how a reduction in the number of smokers would alter federal spending for Medicaid:

- Spending would drop by about \$200 million between 2009 and 2019 under the Children’s Health Insurance Program Reauthorization Act of 2009 (now Public Law 111-3) because of that legislation’s 62-cent increase in the federal excise tax on tobacco products.<sup>11</sup>
- Spending would decline by about \$100 million between 2010 and 2019 because of the regulatory changes contained in the Family Smoking Prevention and Tobacco Control Act (P.L. 111-31), which included further restricting young people’s access to tobacco; strengthening warning labels on tobacco products; and requiring manufacturers to get permission from the Food and Drug Administration if they want to market products in a way that suggests reduced health risks or reduced exposure to potentially hazardous substances.<sup>12</sup> (Those savings were in addition to savings previously estimated and credited to the Children’s Health Insurance Program Reauthorization Act.)
- Spending would decline by another \$90 million between 2010 and 2019 under the Affordable Care Act because of its provisions to eliminate cost sharing

for smoking-cessation treatments for pregnant women enrolled in Medicaid.<sup>13</sup>

In addition, in 1998, CBO released an analysis of a proposed settlement between five major tobacco companies and a group of state attorneys general.<sup>14</sup> The analysis focused on how the settlement could reduce cigarette consumption and estimated the amount of payments the tobacco industry would be required to make under the proposed agreement.

This report expands on those earlier CBO analyses by examining how reductions in smoking rates would affect the entire federal budget and by considering effects over the long term (through 2085) as well as during the usual 10-year budget window. Specifically, CBO looked at the various channels through which an illustrative increase in the excise tax on cigarettes could influence the federal budget, in addition to the effect on excise tax receipts:

- A decrease in the prevalence of smoking because of the tax increase would lower the incidence of various illnesses and disabilities, which in turn would reduce federal spending on health care services under programs such as Medicaid and Medicare, decrease health insurance premiums, and reduce the cost of disability insurance.
- Improvements in life expectancy because of the decline in smoking would increase federal spending on health care programs and on programs that provide disability or retirement benefits, such as Social Security.
- Improved health might cause some workers to delay retirement or enable them to have higher earnings; consequently, federal revenues from income and payroll taxes would rise, and spending on federal retirement programs might decline.
- Federal revenues from income and payroll taxes might also rise if improvements in health resulted in lower premiums for employer-sponsored health insurance, which are not subject to income or payroll taxes,

10. Public Health Service, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease—A Report of the Surgeon General* (2010), Chapter 8, and *Women and Smoking—A Report of the Surgeon General* (2001), Chapter 1.

11. See Congressional Budget Office, cost estimate for H.R. 2, Children’s Health Insurance Program Reauthorization Act of 2009 (February 11, 2009).

12. See Congressional Budget Office, cost estimate for H.R. 1256, Family Smoking Prevention and Tobacco Control Act (August 25, 2009).

13. See Congressional Budget Office, letter to the Honorable Nancy Pelosi on H.R. 4872, Reconciliation Act of 2010 (Final Health Care Legislation) (March 20, 2010).

14. Congressional Budget Office, *The Proposed Tobacco Settlement: Issues from a Federal Perspective* (April 1998).

leading to an increase in the amount that employers spend on taxable wages.

So far as is possible, this analysis describes in quantitative terms how CBO would estimate the budgetary effects of proposals that would reduce smoking rates. Those effects are illustrative and do not represent a cost estimate for a specific legislative proposal.

If lawmakers were to consider raising the excise tax on cigarettes—or adopting other policies that would promote a healthier population—their proposals would depend on a variety of considerations besides the effects on the federal budget. Those other considerations would most likely include the impact of a proposed policy on people’s health, views about the appropriate role of the government in influencing behavior, the burdens that the proposed policy might impose on people in different circumstances, and the effects of the policy on the budgets of state and local governments. Those other considerations lie beyond the scope of this analysis, which addresses only the impact of an increase in the cigarette tax on the federal budget (with related analysis of the effects on health and longevity).

### Limitations of This Report

This study reflects CBO’s current assessment of the research literature about people’s likely responses to a change in the excise tax on cigarettes and about how those responses would affect people’s health, health care spending, longevity, and labor earnings. New research or analysis related to the issues discussed here could affect future CBO estimates of the effects of a change in the cigarette tax or other policies designed to reduce smoking.

In addition, the details of particular policy changes and the way in which they were combined could make an important difference for their impact on the federal budget.

This analysis does not consider effects on people’s use of tobacco products other than cigarettes and small cigars, such as smokeless tobacco. (In 2009, the latest year for which data are available, about 3.5 percent of U.S. adults used smokeless tobacco.)<sup>15</sup> In addition, although smoking rates vary widely by state and by income group, the estimates in this study represent costs and savings to programs on a national level.

### Implications for Future Analyses

This report demonstrates the complexity of estimating the federal budgetary impact of a policy intervention to promote health or prevent disease. Because of the wide range of potential effects on federal outlays and revenues, a considerable amount of information is necessary to conduct a comprehensive analysis of this type. For illustrative purposes, CBO chose to focus on a policy to discourage smoking because of the extensive data and research that already exist on issues related to smoking. Even with those information resources, the analysis proved challenging, with multiple gaps in the available data. For some other potential preventive health policies, data and research evidence are less extensive, and a similar type of analysis would be much more difficult and speculative.

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15. Centers for Disease Control and Prevention, “Smoking & Tobacco Use—Smokeless Tobacco Facts” (fact sheet, August 4, 2011), [www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/smokeless/smokeless\\_facts/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/smokeless/smokeless_facts/index.htm).



## Effects of Antismoking Policies on Behavior

**T**he first step in assessing how a policy initiative to discourage smoking would affect the federal budget is to estimate how the policy would alter the behavior of current and potential smokers. This chapter examines research about the behavioral effects of past increases in tobacco taxes and other initiatives to reduce smoking rates. It also describes the expected behavioral effects of the hypothetical tax increase that the Congressional Budget Office uses in this study to illustrate the changes in the federal budget associated with a reduction in smoking.

### Past Increases in Excise Taxes on Tobacco

Excise taxes are currently applied to cigarettes and other tobacco products at the federal, state, and local levels of government. Advocates cite two rationales for those taxes besides raising revenues:

- People are thought to underestimate the addictive power of tobacco and its harmful impact on both their short- and long-term health. Moreover, even when they understand the risks of smoking, they still may not act on that knowledge. By raising the price of cigarettes, increases in excise taxes give people a financial incentive to smoke less. Such increases can have their strongest and longest-lasting impact by discouraging young people from starting to smoke. (Once people become addicted to a substance, they are apt to be less responsive to financial and other incentives to reduce consumption.)
- Smoking imposes costs on nonsmokers—such as health problems stemming from secondhand smoke—that are not reflected in the pretax price of tobacco. Whether smoking imposes additional costs or savings on federal programs (ranging from Medicaid and Medicare to Social Security) or has other effects on the

federal budget is one of the key questions analyzed in this study.

As information about the harmful effects of smoking has become more prevalent in recent decades, governments have responded by raising excise taxes on tobacco products. At the federal level, the excise tax on cigarettes was increased by 62 cents (from 39 cents to \$1.01 per pack) in 2009. At the state level, all but three state governments raised taxes on cigarettes between 2002 and 2011. By the beginning of 2012, those state taxes averaged \$1.46 per pack (they ranged from 17 cents in Missouri to \$4.35 in New York).<sup>1</sup> Some localities also impose excise taxes on cigarettes; for example, New York City adds a tax of \$1.50 per pack on top of the state excise tax.

The increases in those tax rates over time and the variation among states have provided economists with data to examine how higher prices affect the amount of cigarettes purchased. Studies of the impact of tax increases on smoking sometimes assume that the overall reduction in cigarette consumption that occurs when prices rise is made up of two equal factors: a change in the number of people who smoke (the prevalence of smoking) and a change in the number of cigarettes consumed per smoker (the intensity of smoking). For example, if a tax increase causes overall cigarette consumption to fall by 10 percent, approximately 5 percent is attributed to people who quit smoking entirely and approximately 5 percent is attributed to people who continue to smoke but do so less frequently. Those two factors interact with one another, so the percentage decline for each one is not exactly half

1. Those figures include the District of Columbia. See Centers for Disease Control and Prevention, “State Cigarette Excise Taxes—United States, 2010-2011,” *Morbidity and Mortality Weekly Report*, vol. 61, no. 12 (March 30, 2012), p. 203; and Orzechowski & Walker, *The Tax Burden on Tobacco: Historical Compilation*, vol. 46 (Orzechowski & Walker, 2011), p. 16.

of the total percentage decline—though that is a very close approximation for small reductions.<sup>2</sup>

The change in smoking behavior in response to a change in price is often summarized by an elasticity, which quantifies the percentage change in quantity demanded (measured in packs of cigarettes purchased) that follows a 1 percent increase in price. Much of the research literature on tobacco estimates the long-run price elasticity of overall demand for cigarettes among adults at somewhere between -0.3 and -0.7, meaning that a 1 percent rise in the price of cigarettes causes overall consumption to decline by between 0.3 percent and 0.7 percent.<sup>3</sup> Those elasticities include the effects of price changes on both the number of people who smoke and on the number of cigarettes consumed per smoker. Thus, if half of those estimated elasticities can be attributed to a reduction in the number of people who smoke and half to a reduction in cigarettes consumed per smoker, the elasticity of the number of people who smoke appears to range between -0.15 and -0.35.

Research indicates that younger smokers alter their overall consumption of cigarettes more in response to price changes than older smokers do. Their long-run price elasticity of demand has been estimated at between -0.5 and -1.5, compared with -0.3 to -0.7 for all adults.<sup>4</sup> The higher range for younger smokers is consistent with the ideas that sensitivity to price declines once people become addicted to a substance and that lower-income people

(including the young) are more responsive to price increases than higher-income people are.

## The Illustrative Tax Increase Used in This Analysis

CBO chose to analyze the impact on tobacco consumption—and the ultimate effects on the federal budget—of raising the federal excise tax on cigarettes and small cigars by 50 cents per pack, from \$1.01 to \$1.51.<sup>5</sup> Although other effective antismoking policies are possible (see Box 2-1), a tax increase is the most clearly defined and has the strongest base of evidence suggesting that it reduces cigarette consumption, making it a good example for tracing the linkages to the federal budget.

The illustrative tax increase would take effect at the beginning of fiscal year 2013. Incorporating expected price changes by manufacturers in response to the policy, it would translate into a rise of about 10 percent in the price that consumers would pay for cigarettes, on average, nationwide. Starting on January 1, 2014, the tax increase would be adjusted annually to keep pace with inflation. After 2021, it would also be adjusted to keep pace with growth in real (inflation-adjusted) income, so that the tax increase would continue to have the same impact relative to people's income over time.

In analyzing the effects of that tax increase on health and the federal budget, CBO focused on the reduction in the number of smokers and the resulting decrease in exposure to secondhand smoke, not on the reduction in cigarette consumption by people who would continue to smoke. (As discussed in the next chapter, research about whether health improves for people who reduce but do not quit smoking is inconclusive.) To estimate the change in the number of smokers because of the tax increase, CBO assumed an average elasticity of smoking prevalence of

2. In this case, the percentage reduction in prevalence and the percentage reduction in intensity are each 5.1 percent instead of 5 percent, because  $(1 - 0.051) \times (1 - 0.051) = 0.9$ , or a 10 percent decline. When the number of smokers is reduced, the impact of a decline in smoking intensity on total cigarette consumption is smaller than it would be if measured against the original (unreduced) number of smokers.
3. See Craig A. Gallet and John A. List, "Cigarette Demand: A Meta-Analysis of Elasticities," *Health Economics*, vol. 12, no. 10 (October 2003), pp. 821–835; and Frank J. Chaloupka and Kenneth E. Warner, *The Economics of Smoking*, Working Paper 7047 (National Bureau of Economic Research, March 1999). Those elasticities are overall nationwide estimates; responses may differ by region.
4. See Hana Ross and Frank J. Chaloupka, "The Effect of Public Policies and Prices on Youth Smoking," *Southern Economic Journal*, vol. 70, no. 4 (April 2004), pp. 796–815; and Philip DeCicca and others, "Youth Smoking, Cigarette Prices, and Anti-Smoking Sentiment," *Health Economics*, vol. 17, no. 6 (June 2008), pp. 733–749.

5. For the sake of simplicity, this policy changes taxes only on cigarettes and small cigars (defined as those weighing 3 pounds or less per 1,000). Researchers have found that people may substitute one kind of tobacco product for another as the relative prices change. However, estimates of the decline in cigarette consumption from a higher excise tax should not be affected by such substitution, because the literature on elasticities of consumption generally allows for that substitution to occur. However, to the extent that some of the people assumed in this analysis to quit smoking switch to other tobacco products instead, that substitution could lead the estimates presented here to overstate improvements in the health of the population by a small amount.

**Box 2-1.****Effects of Other Policies to Reduce Smoking**

Expert committees interested in reducing smoking rates have suggested not only raising excise taxes on tobacco products but also providing smoking-cessation treatments—such as counseling, medication, or nicotine patches or gum—at reduced or no cost to smokers.<sup>1</sup> Research into the effectiveness of providing financial support for such treatments has produced mixed results: Some studies have found no impact on quitting, and others have found increased rates of quitting. Many of those studies suffered from methodological limitations, examining small populations over short time periods. In addition, many were designed in ways that made it hard to isolate and identify the effects of a particular cessation policy. For instance, many of the studies required participants to also be involved in some other cessation effort, such as counseling sessions or behavioral programs.

Another possible approach to reducing smoking is a comprehensive tobacco control policy, which would combine tax increases and smoking-cessation treatments with additional initiatives such as education campaigns, clinical programs, federal regulations, economic strategies, and social programs aimed at discouraging smoking.<sup>2</sup> Research measuring the effects of many of those other initiatives is less plentiful than research measuring the effects of raising excise taxes alone. Nevertheless, many studies have found that some of those initiatives have had a measurable impact on tobacco consumption. Although the interaction between different initiatives may be important, it is likely that the impact of any single

one is less significant than the impact of a substantial increase in excise taxes. In addition, studies of the effects of the additional initiatives encounter many of the methodological difficulties discussed above for cessation treatments.

Some prominent examples of comprehensive tobacco control programs have occurred at the state level. In 1989, California implemented the California Tobacco Control Program, a comprehensive policy that included mass media campaigns, increased monitoring and enforcement of antismoking laws, a grant program for community-level policy interventions, and increases in tobacco taxes. Several other states—including Florida, Massachusetts, and Oregon—implemented comprehensive tobacco control programs in the 1990s. Various studies of the effects of those comprehensive programs indicate that they were associated with a decline in the prevalence of smoking.<sup>3</sup> However, because the programs contain multiple policy components, including tax increases, identifying the impact of any single policy is difficult. In addition, as knowledge about the harmful effects of tobacco continues to become more common, it is unclear whether future education and mass media efforts would have the same impact as past initiatives.

1. Those expert committees include the Task Force on Community Preventive Services and the Institute of Medicine's Committee on Reducing Tobacco Use.
2. See Richard J. Bonnie, Kathleen Stratton, and Robert B. Wallace, eds., *Ending the Tobacco Problem: A Blueprint for the Nation* (National Academies Press, 2007); and Department of Health and Human Services, *Ending the Tobacco Epidemic: A Tobacco Control Strategic Action Plan for the U.S. Department of Health and Human Services* (November 10, 2010).

3. See Michael D. Slater, "Media Campaigns and Tobacco Control," Appendix N in Bonnie, Stratton, and Wallace, eds., *Ending the Tobacco Problem*; John P. Pierce and others, "Has the California Tobacco Control Program Reduced Smoking?" *JAMA*, vol. 280, no. 10 (September 9, 1998), pp. 893–899; Centers for Disease Control and Prevention, "Tobacco Use Among Middle and High School Students—Florida, 1998–1999," *Morbidity and Mortality Weekly Report*, vol. 48, no. 12 (April 2, 1999), pp. 248–253; William L. Hamilton and others, *Independent Evaluation of the Massachusetts Tobacco Control Program—Eighth Annual Report: January 1994–June 2001* (Abt Associates, 2003); and Centers for Disease Control and Prevention, "Decline in Cigarette Consumption Following Implementation of a Comprehensive Tobacco Prevention and Education Program—Oregon, 1996–1998," *Morbidity and Mortality Weekly Report*, vol. 48, no. 7 (February 26, 1999), pp. 140–143.

slightly less than -0.3 on the basis of its interpretation of the research literature.<sup>6</sup>

The staff of the Congress's Joint Committee on Taxation (JCT) estimates the revenue effects of proposals that would alter the Internal Revenue Code, including proposals to change excise tax rates on tobacco. Using JCT's revenue calculations, CBO estimated that the indexed tax increase would reduce the total number of packs of cigarettes purchased by almost 6.5 percent in 2021 compared with projected purchases under current law. (In 2021, the tax increase would amount to about 60 cents per pack.) Translating that overall decrease in consumption into an effect on the prevalence of smoking, CBO estimated that in the years just after the tax increase took effect, smoking rates would decline by about 5 percent among 12- to 17-year-olds, by 4.5 percent among 18-year-olds, by slightly less than 4 percent among 19- to 39-year-olds, and by about 1.5 percent among people age 40 or older.<sup>7</sup>

The effect of the tax increase on smoking prevalence would take the form of inducing some people to quit smoking and discouraging others from starting to smoke. Most of the quitting would occur soon after the higher excise tax was implemented. In later years, the main effect on prevalence would stem from a reduction in the number of people who started smoking. By 2021, 4.3 percent fewer 18- to 24-year-olds would be smokers than would be the case under current law, CBO estimates. As those people aged, they would become older adults with lower smoking rates than their predecessors, while being replaced by a new group of 18- to 24-year-olds who

would also be less likely to smoke because of the tax increase.

Another consequence of the policy is that more people would stay alive because they had stopped smoking. CBO estimates that there would be just over 10,000 people living in 2021 who would have died if they had not quit smoking. The number of additional people still alive would grow to approximately 66,000 by 2035 and 212,000 by 2085. (Those population effects are discussed in more detail in Chapter 5.)

Several caveats should be considered when evaluating CBO's analysis. Estimating the effects of a tax increase on smoking involves a great deal of uncertainty, because it is difficult to distinguish between past changes in consumption patterns that resulted from a price increase and changes that resulted from other factors, such as increased antismoking education or shifts in demographic characteristics that are associated with lower smoking rates (see Box 3-1 in Chapter 3). In addition, the impact of a future excise tax increase, especially a large increase, could be dampened by factors that are difficult to measure, such as a rise in smuggling of cigarettes across borders or in Internet sales by international vendors who evade the tax.

Some antismoking advocates favor raising the federal excise tax by \$1 or more per pack rather than the 50-cent increase (indexed for inflation) examined here. If the tax increase was double the size of CBO's policy example, the estimated health effects would also be roughly double those presented here, because the number of people who quit smoking as a result of the tax increase would approximately double. The effects of tax increases that were larger multiples of the one considered here would be more uncertain, because such increases would be outside the range of price changes on which the estimates of consumers' responsiveness to price increases have been based.

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6. The response of smokers to higher prices is subject to much uncertainty. The effects of modifying that assumed price elasticity are examined at the end of Chapter 6.
  7. CBO's analysis of the policy's impact on various cohorts tracks the effects of reductions in smoking beginning at age 18. (For more details, see Chapter 5.)

## Effects of Smoking on Health, Health Care Spending, and Longevity

**B**ecause smoking has been linked to a host of health problems, some of which can cause early death, policies that decrease smoking will improve health and extend life expectancy. Such policies will also reduce the average amount spent on health care per person in a given year, although that reduction will reach its full extent only gradually, because some of the harmful health effects of smoking can take many years to disappear. The total impact on the federal budget from changes in health care spending will depend on two effects: a reduction in annual health care costs while people are alive and an increase in health care costs as people live longer.

To provide a basis for analyzing the budgetary effects of government policies that reduce the prevalence of smoking, this chapter examines the impact of smoking on health, per capita health care spending, and longevity. In particular, the Congressional Budget Office reviewed the extensive literature about how smoking and ceasing to smoke can alter people's health and longevity, examined previous research about the impact of smoking on health care spending, and performed its own statistical analyses of how smoking affects health care spending and mortality. That review and analysis point to the following key conclusions:

- Medical research has demonstrated that smoking increases the likelihood of developing a variety of diseases and decreases life expectancy. In addition, research has concluded that quitting reverses at least some of the adverse effects of smoking, resulting in improved health and longevity.
- Studies have consistently shown that smoking increases annual health care spending. Studies that compare lifetime health care spending for smokers and

nonsmokers tend to show more conflicting results, as they seem to be sensitive to the assumptions made in the study.

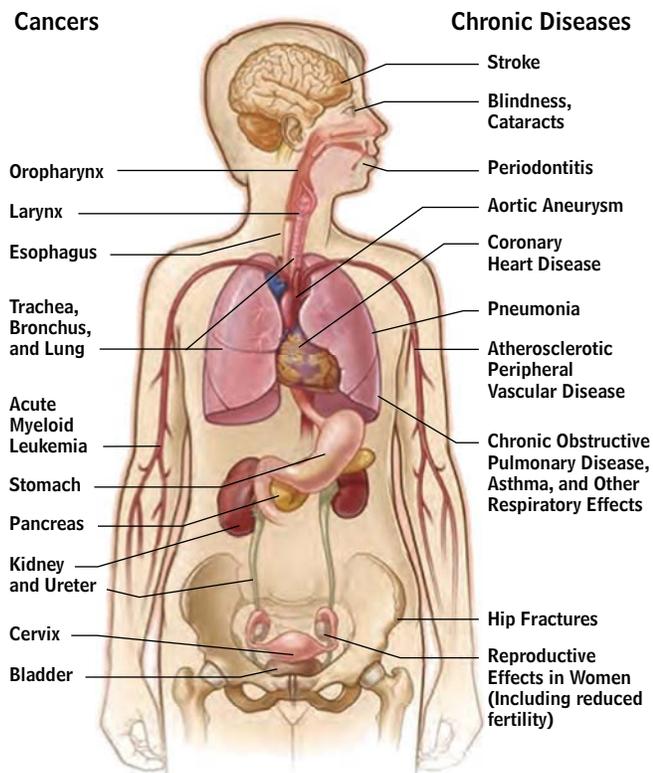
- CBO used regression analysis to isolate the effects of smoking on annual health care spending per capita from the effects of other personal characteristics that are correlated with smoking but that exert their own separate influence on health care spending. CBO estimates that annual health care spending per capita is 11 percent to 16 percent higher for current or former smokers, depending on their age, than for people who have never smoked but have the other characteristics typical of smokers (such as a lower education level and higher alcohol consumption). CBO also estimates that smoking accounts for roughly 7 percent of total annual health care spending—a result consistent with past research.
- Using a similar approach to assess the effects of smoking on mortality rates, CBO concluded that mortality rates are generally higher for smokers than for people who have never smoked but who otherwise resemble smokers. Thus, if people quit or never started smoking because of a policy intervention, they would be likely to live several years longer than they would otherwise, CBO estimates.

### Smoking's Impact on Health

A large number of research studies show that smoking increases people's likelihood of developing certain diseases (compared with people who have never smoked) and causes earlier death. Thus, if people never began smoking, the prevalence of those smoking-attributable diseases would decline, and life expectancy would increase.

### Figure 3-1.

## Diseases Linked to Smoking



Source: Public Health Service, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease—A Report of the Surgeon General* (2010).

The medical literature also finds that ceasing to smoke improves health. The risks of many smoking-attributable diseases decline after quitting, but there is a small elevated risk of certain diseases, such as respiratory cancers, that may never completely go away. As a result, although the difference in the risk of death at any given age between quitters and people who have never smoked decreases over time, some difference always remains.

### Conditions Attributable to Smoking

In 1964, an advisory committee to the Surgeon General that reviewed more than 7,000 articles and research reports concluded that enough evidence existed to consider smoking a cause of both lung cancer (in men) and bronchitis.<sup>1</sup> Since then, health researchers have continued to add to the scientific evidence of the harmful effects of

1. Public Health Service, *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service* (1964), pp. 25–40.

tobacco use or exposure on the human body, and the Surgeon General has issued dozens of reports cataloguing the relationships between smoking and various types of health problems, including numerous cancers, stroke, heart disease, pneumonia and other respiratory problems, and reproductive health issues (see Figure 3-1).

Over the past few decades, research has also documented the specific mechanisms by which smoking leads to disease. Cigarette smoke contains more than 7,000 chemicals, at least 69 of which are known to cause cancer.<sup>2</sup> When inhaled, those chemicals are absorbed by the body and cause cellular damage, which in turn leads to cancer, cardiovascular and pulmonary diseases, and other health problems. Some of those problems develop immediately; but for many, there is a time lag, sometimes of decades, between starting to smoke and the onset of disease. Although research is continuing in this field, CBO's review of the medical literature concludes that smoking increases the risk of developing more than 20 medical conditions as well as the risk of early death.

Secondhand smoke—the inhalation of smoke by someone other than the smoker, sometimes referred to as environmental tobacco smoke or passive smoking—has also been linked to a number of illnesses. Among infants and children, exposure to secondhand smoke increases the risk of sudden infant death syndrome, ear infections, and various respiratory problems; among adults, it boosts the risk of heart disease and lung cancer.<sup>3</sup>

Estimates of the number of people exposed to secondhand smoke vary widely. In surveys, approximately 15 percent of adults report being subject to such passive smoking. However, studies that assess secondhand smoke by measuring the nicotine metabolites in people's bodies suggest an exposure rate of approximately 40 percent among adults.<sup>4</sup> Those figures are in addition to the roughly 19 percent of U.S. adults who smoke directly.

2. Public Health Service, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease—A Report of the Surgeon General* (2010), Chapter 2.
3. Public Health Service, *The Health Consequences of Involuntary Exposure to Tobacco Smoke—A Report of the Surgeon General* (2006), Chapter 1.
4. Wendy Max, Hai-Yen Sung, and Yanling Shi, "Who Is Exposed to Secondhand Smoke? Self-Reported and Serum Cotinine Measured Exposure in the U.S., 1999–2006," *International Journal of Environmental Research and Public Health*, vol. 6, no. 5 (May 2009), pp. 1633–1648.

### Smoking and Early Death

Many of the diseases attributable to smoking can be fatal, and about half of all long-term smokers are expected to die from a smoking-related illness.<sup>5</sup> Tobacco use is considered the leading preventable cause of early death in the United States, which indicates that a reduction in tobacco use would increase life expectancy.

Two major studies followed groups of smokers and non-smokers over long periods to examine the lifetime effects of smoking; both concluded that smoking reduces life expectancy significantly. A study that followed more than 34,000 British doctors from 1951 to 2001 established that smoking lowered life expectancy for men by an average of 10 years.<sup>6</sup> Another study—based on the Cancer Prevention Survey II, which has followed 1.2 million U.S. volunteers age 30 or over since 1982—estimated that smoking reduced life expectancy by 11 years for male participants and by 9 years for female participants.<sup>7</sup> The figures from both studies were based on comparisons of people who never smoked and people who smoked until death (lifetime smokers).

Another study estimated life expectancy at age 24 among people expected to be lifetime smokers, typical smokers (a category that includes smokers who will quit at some point before death), or lifelong nonsmokers.<sup>8</sup> It estimated that among women, life expectancy at age 24 for those who never smoked was six years greater than for lifetime smokers and almost four years greater than for typical smokers. (The latter figure was roughly two years when adjusted for differences in the characteristics of typical smokers and people who do not smoke.) A similar pattern emerged among men, although the differences in life expectancy were generally two to three years greater than for women.

5. Public Health Service, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease—A Report of the Surgeon General* (2010), p. 647.

6. Richard Doll and others, “Mortality in Relation to Smoking: 50 Years’ Observations on Male British Doctors,” *British Medical Journal*, vol. 328, no. 7455 (June 24, 2004), pp. 1519–1529.

7. Donald H. Taylor Jr. and others, “Benefits of Smoking Cessation for Longevity,” *American Journal of Public Health*, vol. 92, no. 6 (June 2002), pp. 990–996.

8. Frank A. Sloan and others, *The Price of Smoking* (MIT Press, 2004)

### The Health Benefits of Quitting

People who stop smoking when they are young avoid most of the health risks associated with smoking.<sup>9</sup> However, health benefits from quitting occur even for older people. Although a former smoker does not have the same health profile as someone who has never smoked, medical research indicates that quitting produces tangible health benefits. The extent to which the risk of smoking-attributable disease declines and the length of time over which the decline occurs vary by condition. For example, studies have shown the following:

- Some benefits occur within minutes of quitting—20 minutes after someone smokes his or her last cigarette, the person’s heart rate drops, and 12 hours after quitting, the concentration of carbon monoxide in his or her blood returns to normal.
- After a few years of not smoking, a quitter’s risk of developing lung or laryngeal cancer declines; that improvement continues, although never by enough for the risk to equal to that of someone who has never smoked.
- As soon as 5 years after quitting, a former smoker’s risk of developing cancer of the esophagus or oral cavity is half that of someone who continues to smoke. That risk declines further over time.
- Within 5 to 15 years after quitting, a former smoker’s risk of stroke declines to match that of someone who has never smoked.<sup>10</sup>

Among other benefits, quitting also reduces people’s risk of peripheral artery disease (blocked arteries, typically in the legs or arms) and their rates of respiratory symptoms, such as coughing and shortness of breath.<sup>11</sup> In addition, women who quit smoking decrease their risk of adverse

9. International Agency for Research on Cancer, *Tobacco Control: Reversal of Risk After Quitting Smoking*, Handbooks of Cancer Prevention, vol. 11 (IARC, 2007).

10. The information in the first, third, and fourth bullets comes from Public Health Service, *The Health Consequences of Smoking: What It Means to You* (2004). The information in the second bullet has been confirmed by multiple studies, which are surveyed in International Agency for Research on Cancer, *Tobacco Control*.

11. Public Health Service, *The Health Consequences of Smoking*.

reproductive outcomes.<sup>12</sup> For example, women who stop smoking before they become pregnant, or even in the first three to four months of pregnancy, have babies of the same birth weight as women who have never smoked.

Despite those declines, quitting does not erase all of the health risks related to smoking. For example, former smokers exhibit higher risks of lung and laryngeal cancer than people who have never smoked, even after a long period of not smoking.<sup>13</sup> Such small, persistent risks may never completely disappear.

A 1990 report concluded that ceasing to smoke at any age reduces the risk of early death. Smokers who quit before age 50 halve their risk of dying in the next 15 years, compared with people who continue to smoke.<sup>14</sup> Among former smokers, the decline in that risk begins shortly after quitting and continues for at least 10 to 15 years, after which the risk of death from all causes is nearly equal to that of someone who has never smoked.<sup>15</sup> Thus, policies that increase the number of people who quit smoking can be expected to raise life expectancy.

New studies examining the relationship between smoking cessation and health continue to emerge, but some areas remain less well understood than others. For example, evidence about the health effects of cutting down on smoking rather than quitting entirely is inconclusive. Although some studies have found an association between reductions in smoking and declines in the risk of certain diseases, other studies have found that when people reduce the number of cigarettes they consume, their health does not improve significantly.<sup>16</sup> (That latter conclusion is consistent with several studies that have found evidence that people who reduce the number of cigarettes they smoke tend to compensate by smoking each cigarette longer or switching to a brand with a higher nicotine level.)<sup>17</sup> A systematic review of interventions aimed at reducing the harmful effects of smoking concluded that it remains unclear whether decreasing but not quitting smoking produces long-term health benefits.<sup>18</sup>

12. Public Health Service, *Women and Smoking—A Report of the Surgeon General* (2001), Chapter 1.

13. International Agency for Research on Cancer, *Tobacco Control*.

14. Public Health Service, *The Health Benefits of Smoking Cessation—A Report of the Surgeon General* (1990), pp. 1–16 and 71–92.

15. *Ibid.*, pp. 71–92.

## Issues in Estimating the Impact of Smoking on Health Care Spending and Longevity

The medical literature is conclusive that smoking causes harm and that people who quit smoking will improve their health and life expectancy. However, using those conclusions, which are based on disease-specific research, to estimate the overall consequences of smoking-prevention policies is challenging.

In particular, it is difficult to use disease-specific research to determine the extent to which overall differences in health care spending and mortality between smokers and nonsmokers result from all of the diseases that may be caused or aggravated by smoking. The reasons for that difficulty are that other, non-smoking-related diseases exist to which both groups are subject (some of which are aggravated by smoking) and that individuals differ in characteristics besides smoking. When determining the degree to which smoking-related illnesses cause health care spending and mortality rates to vary between smokers and nonsmokers, it is important to account for the following factors:

### ■ The scope of smoking-related diseases—To paint a comprehensive picture of the effects of smoking,

16. Studies concluding that smoking reduction results in improved health include Nina S. Godtfredsen, Eva Prescott, and Merete Osler, “Effect of Smoking Reduction on Lung Cancer Risk,” *JAMA*, vol. 294, no. 12 (September 28, 2005), pp. 1505–1510; Dorothy K. Hatsukami and others, “Effects of Cigarette Reduction on Cardiovascular Risk Factors and Subjective Measures,” *Chest*, vol. 128, no. 4 (October 2005), pp. 2528–2537; and Björn Eliasson and others, “Effect of Smoking Reduction and Cessation on Cardiovascular Risk Factors,” *Nicotine & Tobacco Research*, vol. 3, no. 3 (August 2001), pp. 249–255. For studies that conclude that smoking reduction does not result in improved health, see, for example, Aage Tverdal and Kjell Bjartveit, “Health Consequences of Reduced Daily Cigarette Consumption,” *Tobacco Control*, vol. 15, no. 6 (December 2006), pp. 472–480; James H. Stein and others, “Smoking Cessation, but Not Smoking Reduction, Reduces Plasma Homocysteine Levels,” *Clinical Cardiology*, vol. 25, no. 1 (January 2002), pp. 23–26; Nina S. Godtfredsen and others, “Smoking Reduction, Smoking Cessation, and Incidence of Fatal and Nonfatal Myocardial Infarction in Denmark 1976–1988: A Pooled Cohort Study,” *Journal of Epidemiology and Community Health*, vol. 57, no. 6 (June 2003), pp. 412–416; and Nina S. Godtfredsen and others, “Risk of Hospital Admission for COPD Following Smoking Cessation and Reduction: A Danish Population Study,” *Thorax*, vol. 57, no. 11 (November 2002), pp. 967–972.

analysts need to consider as many of the diseases caused by smoking as possible. Not all diseases have been studied equally thoroughly, however—in some cases because of data limitations and in other cases because they have only recently been linked to smoking. It is also important to incorporate conditions that are not caused by smoking but are aggravated by it. Studies that include some but not all of the illnesses related to smoking will tend to underestimate the impact of smoking on health care spending and mortality.

- **Competing risks**—Although ceasing to smoke may reduce health care spending and mortality rates from smoking-related illnesses at a given age, its effects on overall health care spending and mortality are less clear. For instance, some people who quit smoking may avoid developing lung cancer and dying in their 60s, but instead, because of increased longevity, they may have a stroke in their 70s. Accounting for such competing risks is important in estimating how a change in smoking behavior affects life expectancy and costs. If competing risks are not adequately incorporated, the impact of smoking on health care spending and mortality may be misestimated.
- **Characteristics of smokers**—People who smoke and people who do not smoke differ not only in terms of their smoking behavior but also in terms of their individual characteristics, health insurance coverage, health behaviors other than smoking, and attitudes toward risk—characteristics that can influence their risk of developing diseases and thus their health care spending and mortality rates. (For more about those differences, see Box 3-1.) Many of those differences

would remain unchanged even if people quit or never started smoking because of a policy intervention. In estimating the effect of smoking on annual per capita health care spending and mortality, it is important to account for factors other than smoking that affect those outcomes and that are correlated with smoking—in other words, to compare the outcomes of smokers with those of people who otherwise resemble smokers but do not smoke.

As described below, researchers—including CBO—have adopted various methodologies to address those issues in their analyses.

### Smoking and Health Care Spending

Studies by a variety of researchers have concluded that smoking increases total annual health care spending, generally by about 6 percent to 8 percent. Studies that compare lifetime health care spending for smokers and nonsmokers have tended to show more conflicting results, with some studies finding that lifetime spending is higher for smokers and others finding that it is higher for nonsmokers.

CBO performed its own analysis of how smoking affects annual per capita health care spending, using regression analysis to isolate the impact of smoking from the impact of other personal characteristics that are correlated with smoking but that have their own effects on health care spending. That analysis suggests that smoking accounts for 11 percent to 16 percent of annual health care spending per capita for current or former smokers, depending on their age. Consistent with past research, the analysis also suggests that smoking accounts for 7 percent of total annual health care spending. In other words, if no adults who are currently alive had ever smoked, total annual health care spending would be 7 percent lower. However, that result could be a smaller reduction, or even an increase, in health care spending if the possible effects of greater longevity stemming from a lack of smoking were taken into account.

### Past Studies of the Effects of Smoking on Health Care Spending

Previous studies differ in how they tackle the estimation issues mentioned above, the time horizon considered, and other aspects of their methodology. In terms of time horizons, *cross-sectional* studies estimate the costs of smoking at a point in time, whereas *longitudinal* studies estimate

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17. See, for example, John R. Hughes and Matthew J. Carpenter, “The Feasibility of Smoking Reduction: An Update,” *Addiction*, vol. 100, no. 8 (August 2005), pp. 1074–1089. Researchers have looked at compensatory behavior in the context of changes in cigarette prices: See Matthew C. Farrelly and others, “The Effects of Higher Cigarette Prices on Tar and Nicotine Consumption in a Cohort of Adult Smokers,” *Health Economics*, vol. 13, no. 1 (January 2004), pp. 49–58; Jérôme Adda and Francesca Cornaglia, “Taxes, Cigarette Consumption, and Smoking Intensity,” *American Economic Review*, vol. 96, no. 4 (September 2006), pp. 1013–1028; and Jason Abrevaya and Laura Puzzello, “Taxes, Cigarette Consumption, and Smoking Intensity: Comment,” *American Economic Review* (forthcoming).
  18. Lindsay F. Stead and Tim Lancaster, “Interventions to Reduce Harm from Continued Tobacco Use,” *Cochrane Database of Systematic Reviews*, issue 3, article CD005231 (July 18, 2007).

**Box 3-1.****Differences in the Characteristics of Smokers and Nonsmokers**

Data from various surveys indicate that smokers differ from nonsmokers in more than their tobacco use. They also differ noticeably in a variety of demographic traits, health-related factors, and attitudes that can independently affect their health care spending or longevity. For example, current smokers tend to be younger than people who have never smoked, and former smokers tend to be older. Both current and former smokers are more likely than people who have never smoked to be male, to be non-Hispanic white, and to have no more than a high school education (see the table at right). At the same time, current smokers are less likely to be married or to have had health insurance in the previous year than either former smokers or people who have never smoked.

In terms of other characteristics that can have a direct bearing on health, current and former smokers are more likely to drink alcohol than people who have never smoked, and former smokers are more apt to be overweight or obese than either current smokers or people who have never smoked. Current smokers are also less likely to have received a flu shot in the past year or to wear seat belts. In addition, a greater percentage of current smokers consider themselves more likely to take risks than the average person, and a slightly greater share believe they can overcome illness without help from someone with medical training.

Some of the characteristics of smokers would tend to increase health care spending and mortality rates in their own right, regardless of whether someone smoked; others would tend to decrease health care spending and mortality rates. For instance, lower education levels tend to be associated with higher mortality rates. As a result, failing to account for the tendency of smokers to be less educated might result in inadvertently attributing effects to smoking that are more properly attributable to smokers' education level—a characteristic that is likely to remain even in the absence of smoking. In that case, simple comparisons of people who do and do not smoke might overstate the effects of smoking (and, by extension, the benefits of not smoking).

For that reason, a number of studies—including the Congressional Budget Office's analyses of the impact of smoking on health care spending and longevity (described in this chapter) and on earnings (described in the next chapter)—have used regression techniques to isolate the effects of smoking from the effects of other factors. Those techniques allow studies to compare smokers with people who have the same characteristics as smokers but who do not smoke; thus, they produce a more accurate picture of the various effects of smoking.

**Continued**

the costs of smoking over a lifetime, incorporating the shorter life expectancy of smokers. A third type of study, referred to here as *policy simulation*, simulates how changes in smoking rates—caused by a hypothetical policy change—would alter the trajectory of health care spending over a number of years relative to what it would be otherwise. That approach relies heavily on assumptions about such things as how a population's smoking rates would evolve with and without the policy.

Studies also differ according to other aspects of the methodology they use. Older studies, dating back to the 1970s, relied on a bottom-up—or disease-specific—

methodology, in which the share of spending attributable to smoking was calculated by identifying major diseases associated with smoking and estimating the share of spending on each one. The sum of those disease-specific estimates yielded the overall impact of smoking on health care spending. Some more-recent studies have used a top-down—or regression—methodology, in which health care spending for nonsmokers is compared with spending for smokers, after adjustments for other differences in the characteristics of the two groups.

Which of those two methodologies would, in theory, be likely to produce more-accurate estimates of the impact

## Box 3-1.

Continued

## Differences in the Characteristics of Smokers and Nonsmokers

## Distribution of Nonsmokers and Smokers by Various Characteristics (Percent)

	People Who Have Never Smoked	Current Smokers	Former Smokers
Age Group			
18–44	51	52	30
45–64	30	37	38
65 or older	19	11	32
Total	100	100	100
Sex			
Male	39	53	52
Female	61	47	48
Total	100	100	100
Race or Ethnicity			
White <sup>a</sup>	69	75	80
Black <sup>a</sup>	13	13	8
Hispanic	12	8	8
Other <sup>a</sup>	6	4	4
Total	100	100	100
Education Level			
High school or less	41	63	48
More than high school	58	37	52
Total	100	100	100
Marital Status			
Married	51	38	52
Not married	49	62	48
Total	100	100	100
Alcohol Consumption			
Lifetime abstainer	30	12	9
Current drinker	58	72	70
Former drinker	11	15	20
Total	100	100	100
Body Mass Index Category <sup>b</sup>			
Underweight	3	4	3
Normal weight	37	39	31
Overweight	34	34	38
Obese	26	24	27
Total	100	100	100
Had Health Insurance in the Past Year	89	80	91
Attitudes Toward Risk			
Received flu shot in the past year	32	22	43
Wears seat belt always or nearly always	92	82	90
More likely to take risks than the average person	20	27	21
Believes he or she can overcome illness without help from a medically trained person	23	24	21

Source: Congressional Budget Office based on data for 2000 to 2008 from the Medical Expenditure Panel Survey and for 1998 to 2007 from the National Health Interview Survey.

a. Non-Hispanic.

b. Body mass index is a commonly used measure of body fat, calculated by dividing a person's weight in kilograms by the square of his or her height in meters. Underweight is defined as a body mass index of less than 18.5, normal weight as 18.5 to 24.9, overweight as 25.0 to 29.9, and obese as 30.0 or more.

of smoking on health care spending is unclear, because each addresses the three estimating issues listed above differently. The disease-specific approach might fail to account for all smoking-related illnesses, thus resulting in lower estimates than the regression approach. The disease-specific approach might also be less effective at accounting for competing risks among people who do and do not smoke, thus resulting in higher estimates than the regression approach (all else being equal). Furthermore, to the extent that the disease-specific approach fails to account for other differences in the characteristics of smokers and nonsmokers, its estimates could be biased in either direction depending on how those characteristics relate to spending. For example, smokers are more likely to be male than female, and men tend to have lower levels of annual health care spending than women do. Thus, failing to account for differences by sex would tend to underestimate the impact of smoking on spending.

The regression approach is better suited to accounting for all smoking-related diseases and for competing risks, but it can have its own limitations in dealing with differences in the other characteristics of smokers and nonsmokers. The accuracy of estimated effects depends on the extent to which all of the determinants of health care spending and mortality are accounted for in the analysis. Inaccuracies in regression estimates are possible if certain variables that are correlated with smoking and that can also affect health care spending and mortality are not included in the data available for an analysis.

**Cross-Sectional Studies.** Although studies that look at the costs of smoking at a point in time use different data sources and methodologies (disease-specific or regression) and focus on different years, they generally suggest that smoking accounts for 6 percent to 14 percent of total annual health care spending—with most of the estimates between 6 percent and 8 percent.<sup>19</sup> Overall, there is no clear relationship between the methodology used and the size of the estimated effect, perhaps because of differences in the underlying data and year of the study. In a rare example of a study that used both regression and disease-specific methods to examine the impact of smoking (in this case on Medicaid's spending for acute care in Massachusetts), the estimate based on the disease-specific approach was two-thirds of the estimate based on the regression approach.<sup>20</sup>

Some cross-sectional studies have examined the effects of smoking on the health-care-related spending of specific payers (such as government programs, private health plans, or patients themselves). For example, one recent study estimated that smoking accounts for 11 percent of Medicaid spending, on average, although that share varies widely by state—from 6 percent in New Jersey to 18 percent in Arizona and Washington.<sup>21</sup> Another recent study compared smoking's impact on health care spending by private payers, Medicare, and Medicaid and on people's out-of-pocket health care costs.<sup>22</sup> The share of spending attributable to smoking was highest for government programs: about 11 percent for Medicaid (consistent with the fact that low-income people tend to have high smoking rates) and roughly 10 percent for Medicare (consistent with the fact that the likelihood of smoking-related disease increases as people get older). By comparison, smoking was estimated to account for about 6 percent

19. For a detailed summary of that research, spanning data from the mid-1960s to the early 1990s, see Wendy Max, "The Financial Impact of Smoking on Health-Related Costs: A Review of the Literature," *American Journal of Health Promotion*, vol. 15, no. 5 (May/June 2001), pp. 321–331; Kenneth E. Warner, Thomas A. Hodgson, and Caitlin E. Carroll, "Medical Costs of Smoking in the United States: Estimates, Their Validity, and Their Implications," *Tobacco Control*, vol. 8, no. 3 (September 1999), pp. 290–300; and Prabhat Jha and Frank J. Chaloupka, eds., *Tobacco Control in Developing Countries* (Oxford University Press, 2000), Chapter 4. That research is based on data from years when the prevalence of smoking was much higher than it is today. Thus, if the same methods were used now, the overall costs of smoking would probably be smaller than in the past. However, to the extent that differences in health care spending between smokers and nonsmokers have grown over time, the overall costs of smoking could be larger now than in the past. A more recent study, based on data from the late 1990s and early 2000s, concludes that smoking accounts for 5 percent of total annual health care spending; see Douglas E. Levy and Joseph P. Newhouse, "Assessing the Effects of Tobacco Policy Changes on Smoking-Related Health Expenditures," in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011), Chapter 11.

20. David M. Cutler and others, "How Good a Deal Was the Tobacco Settlement? Assessing Payments to Massachusetts," *Journal of Risk and Uncertainty*, vol. 21, no. 2/3 (November 2000), pp. 235–261.

21. Brian S. Armour and others, "State-Level Medicaid Expenditures Attributable to Smoking," *Preventing Chronic Disease*, vol. 6, no. 3 (July 2009), pp. 1–10. That study was based on data from the late 1990s and early 2000s.

of spending by private payers and less than 2 percent of out-of-pocket spending.

**Longitudinal Studies.** The longitudinal, or life-cycle, approach provides another way to measure the impact of smoking on health care spending. It assesses the lifetime burden of smoking—taking into account the fact that smoking increases health care spending in any year while also reducing life expectancy—by comparing health care spending for a smoker over his or her lifetime with spending for a nonsmoker. Those spending estimates are usually expressed in present-value terms so that all figures are in current dollars. (Present value refers to a single number that expresses a flow of current and future spending in terms of an equivalent lump sum spent today.)

Present-value calculations depend on the rate of interest, or discount rate, that is used to translate future cash flows into current dollars. The discount rate is especially important in comparing lifetime health care spending for smokers and nonsmokers because the two groups have different patterns of spending over time: Health care spending for smokers tends to be high, although for a concentrated period in middle age, whereas spending for nonsmokers tends to occur over a longer period, with higher spending occurring at older ages. The lower the discount rate used in such comparisons, the higher the present value of future spending will be, and the greater the likelihood that lifetime spending will be lower for smokers than for nonsmokers. Conversely, the higher the discount rate, the lower the present value of future spending, and the greater the likelihood that lifetime spending will be higher for smokers than for nonsmokers. In general, longitudinal studies that compute present values use discount rates in the 3 percent to 5 percent range.<sup>23</sup>

22. Douglas E. Levy and Joseph P. Newhouse, “Assessing the Effects of Tobacco Policy Changes on Smoking-Related Health Expenditures,” in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011), Chapter 11. The effects cited in the text apply to the noninstitutionalized population.

23. The discount rate that is appropriate for a particular calculation depends on the riskiness of the future cash flows and whether the rate applies to an individual or to society as a whole. (A higher discount rate may be more appropriate when discussing the perspective of an individual, to reflect the person’s aversion to risks involving future costs or income.)

Longitudinal studies have reached mixed conclusions about the impact of smoking on people’s lifetime spending for health care. Some conclude that smokers have higher lifetime spending, despite their shorter life expectancies, whereas other studies conclude that nonsmokers have higher lifetime spending because they live longer. Differences in the studies’ methodologies (disease-specific or regression), in their discount rates and other assumptions, and in their sources of data make it difficult to compare their results.<sup>24</sup>

The two longitudinal studies that use regression analysis to account for differences in the characteristics of smokers and nonsmokers that are related to health care spending conclude that smoking increases lifetime spending.<sup>25</sup> Although those studies draw on different data sources, they are similar in that they use data from the United States and compare lifetime spending using present values.

Longitudinal research that employs the disease-specific methodology produces estimates that do not always agree about the direction of the effect of smoking on lifetime spending. That methodology requires detailed assumptions about the associations between smoking and the risk of specific diseases, and those assumptions vary greatly among studies. Such studies also vary in whether they use a discount rate. Studies that do not discount future spending conclude that smokers have lower lifetime spending than nonsmokers. The reverse is not the case, however: Not all studies that discount future

24. For a detailed summary of that research, see Wendy Max, “The Financial Impact of Smoking on Health-Related Costs: A Review of the Literature,” *American Journal of Health Promotion*, vol. 15, no. 5 (May/June 2001), pp. 321–331; and Prabhat Jha and Frank J. Chaloupka, eds., *Tobacco Control in Developing Countries* (Oxford University Press, 2000), Chapter 4. Two more-recent studies not included in those summaries are Susanne R. Rasmussen and others, “The Total Lifetime Costs of Smoking,” *European Journal of Public Health*, vol. 14, no. 1 (March 2004), pp. 95–100; and Pieter H.M. van Baal and others, “Lifetime Medical Costs of Obesity: Prevention No Cure for Increasing Health Expenditure,” *PLOS Medicine*, vol. 5, no. 2 (February 2008), pp. 242–249. The first study concludes that smoking increases people’s lifetime spending; the second study concludes the opposite.

25. Willard G. Manning and others, *The Costs of Poor Health Habits* (Harvard University Press, 1991); and Frank A. Sloan and others, *The Price of Smoking* (MIT Press, 2004).

spending conclude that smokers are more expensive than nonsmokers.

Researchers have also used the longitudinal approach to estimate changes in lifetime spending when people quit smoking, with conflicting results. Again, differences in the studies' methodologies, modeling assumptions, and sources of data make comparisons difficult. One study that used data from Denmark concluded that lifetime health care spending is lower for people who quit smoking than for those who continue to smoke, with savings largest for people who quit at younger ages.<sup>26</sup> In contrast, a study based on data from the United States found that if 51- or 52 year-olds were to stop smoking, their lifetime health care spending would increase.<sup>27</sup>

**Policy Simulations.** A third approach that past studies have used to examine the impact of smoking simulates how changes in smoking rates—generally caused by an illustrative policy change—would affect the path of health care spending for a given population over a specific period, relative to what spending would have been without the policy change. Such studies, like the CBO analysis discussed in Chapters 5 and 6, posit scenarios that would produce changes in the prevalence of smoking and then estimate the accompanying changes in total health care spending. Smoking-related simulation studies tend to be hard to compare because of differences in their scenarios and the models they use; three examples are described below.

The Archimedes model is a simulation model based on individual physiological characteristics (such as blood pressure and glucose levels), diseases, and aspects of the health care system (such as patterns of health care use and costs of treating specific diseases). The model, which simulates interventions by adjusting biomarkers and processes, can compute changes in people's health outcomes, health care use, and costs.<sup>28</sup> A study based on that model estimated that a complete cessation of smoking by the

U.S. population would save at most \$47 billion in health care spending for cardiovascular disease, diabetes, and coronary heart disease over 30 years.<sup>29</sup>

The Future Elderly Model, which focuses on the elderly and near-elderly population, simulates health care spending as a function of changes in risk factors (such as smoking and obesity), self-reported conditions (such as stroke, heart disease, arthritis, hypertension, diabetes, lung disease, and cancer), and functional status (such as limitations on activities of daily living). Starting with the health status of an elderly population in a base year, the model estimates the future health status and health care costs of that population as it ages as well as those of newly entering cohorts. (For example, in a study looking at a policy that would affect 65-year-olds, as those adults age, each year's new cohort of 65-year-olds is added to the sample.) Researchers have used the Future Elderly Model to estimate that a complete cessation of smoking by Medicare beneficiaries would increase the program's spending on the elderly slightly (by less than 1 percent) in 2030.<sup>30</sup> In that model, changes in life expectancy that increase spending outweigh reductions in per capita health care spending.

A 2011 study used projections of future smoking rates, combined with annual per capita spending by smoking status, to examine how various tobacco control policies would change total health care spending between 2005 and 2025.<sup>31</sup> Those policies included a scenario incorporating recommendations from the Institute of Medicine (IOM) for reducing smoking, a high-impact scenario aimed at lowering smoking rates even further, and a

26. Susanne R. Rasmussen and others, "The Total Lifetime Health Cost Savings of Smoking Cessation to Society," *European Journal of Public Health*, vol. 15, no. 6 (December 2005), pp. 601–606.

27. Dana P. Goldman and others, "The Benefits of Risk Factor Prevention in Americans Aged 51 Years and Older," *American Journal of Public Health*, vol. 99, no. 11 (November 2009), pp. 2096–2101.

28. Biomarkers are indicators within the body that can be used to measure the progress of a disease or the effects of treatment.

29. Richard Kahn and others, "The Impact of Prevention on Reducing the Burden of Cardiovascular Disease," *Circulation*, vol. 118 (July 29, 2008), pp. 576–585. When that study was published, cancer was not included in the model. Adding it to the model would probably change those savings.

30. Dana P. Goldman and others, "The Value of Elderly Disease Prevention," *Forum for Health Economics & Policy*, vol. 9, no. 2 (2006).

31. Douglas E. Levy and Joseph P. Newhouse, "Assessing the Effects of Tobacco Policy Changes on Smoking-Related Health Expenditures," in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011), Chapter 11.

complete cessation of smoking. The study estimated that smoking rates among noninstitutionalized adults would decline from 20.4 percent in 2005 to 16.2 percent in 2025 without any policy change, to 10.4 percent under the IOM scenario, to 5.7 percent under the high-impact scenario, and to zero under the cessation scenario.<sup>32</sup> Using regression techniques to account for differences in characteristics between smokers and nonsmokers, analysts estimated changes in health care spending for adults under the various scenarios. They concluded that all three scenarios would result in small savings through 2025 relative to spending with no policy intervention: 0.40 percent under the IOM scenario, 0.81 percent under the high-impact scenario, and 1.37 percent under the complete-cessation scenario.

### CBO's Analysis of the Effects of Smoking on Health Care Spending

As an input for its estimates of how smoking affects the federal budget, CBO used regression analysis to quantify how annual health care spending per capita differs according to people's smoking status. Not all of the difference in spending between smokers and nonsmokers is attributable to smoking, so CBO's method aims to disentangle the impact of smoking on health care spending from the impact of other personal characteristics—such as lower education levels or higher alcohol consumption—that are correlated with smoking but have independent effects on health care spending (see Box 3-1 on page 16). CBO's analysis is similar to previous studies that used the cross-sectional approach and regression methodology.

**Data and Methods.** CBO based its analysis on data from the Medical Expenditure Panel Survey (MEPS), which surveys members of the civilian, noninstitutionalized U.S. population and provides detailed information on their health care use and spending. Information in the MEPS about smoking is limited to whether respondents are current smokers. However, people surveyed for the MEPS are drawn from households that responded to

the previous year's National Health Interview Survey (NHIS), which does ask about people's smoking history.<sup>33</sup> Hence, the two surveys can be linked.<sup>34</sup> The data set that CBO used contains data from the 2000–2008 MEPS linked to data from the 1998–2007 NHIS, for a total of roughly 80,000 observations. (CBO combined a number of years' worth of data to increase the precision of the estimates.)

CBO used a two-part model for this analysis—a standard statistical technique for analyzing health care spending, in which a significant fraction of the population has no spending in a given year. The first part of the model estimated the probability of having any health care spending, and if that probability was positive, the second part estimated the spending. Both parts of the model represented health care spending as a function of whether a person smoked or not and of other individual characteristics.<sup>35</sup> Smoking status was defined in two ways: first, according to whether people had ever or had never smoked, and second, by a more detailed breakdown, according to whether people had never smoked, were current smokers, or were former smokers who had quit less than 5 years earlier, 5 to 14 years earlier, or at least 15 years earlier.

In addition, all of the regressions included controls for age groups (18–24 years old, 25–44 years old, 45–64 years old, 65–74 years old, and 75 and older) and for interactions between smoking status and age group. They also included controls for sex, race or ethnicity, education level, marital status, income, geographic location, alcohol consumption, categories of body mass index

32. David T. Levy and Elizabeth Mumford, "Trends in Smoking Rates Under Different Tobacco Control Policies: Results from the SimSmoke Tobacco Policy Simulation Model," in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011), Chapter 2.

33. In that survey—and in CBO's analysis—a person must have smoked at least 100 cigarettes in his or her life to be considered a current or former smoker.

34. For more details about the MEPS and NHIS, see Agency for Healthcare Research and Quality, "Medical Expenditure Panel Survey—Survey Background" (August 21, 2009), [www.meps.ahrq.gov/mepsweb/about\\_meps/survey\\_back.jsp](http://www.meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp); and Centers for Disease Control and Prevention, "National Health Interview Survey" (April 20, 2012), [www.cdc.gov/nchs/nhis.htm](http://www.cdc.gov/nchs/nhis.htm).

35. The first part was specified as a logistic regression and the second part as a generalized linear model, following the methodology suggested in Melinda Beeuwkes Buntin and Alan M. Zaslavsky, "Too Much Ado About Two-Part Models and Transformation? Comparing Methods of Modeling Medicare Expenditures," *Journal of Health Economics*, vol. 23, no. 3 (May 2004), pp. 525–542.

**Table 3-1.****Annual per Capita Spending on Health Care, by Smoking Status and Age Group**

(2008 dollars)

	18–24	25–44	45–64	65–74	75 or Older
People Who Have Never Smoked	1,870	2,570	5,040	7,790	9,810
Current or Former Smokers	2,010	2,940	6,170	9,230	11,580
Current smokers	2,010	2,850	5,540	7,940	8,750
Former smokers					
For less than 5 years	2,000	3,090	7,650	11,250	15,530
For 5 to 14 years	n.a.	2,920	6,580	9,760	12,280
For 15 years or longer	n.a.	3,330	6,290	9,330	11,770

Source: Congressional Budget Office based on data for 2000 to 2008 from the Medical Expenditure Panel Survey and for 1998 to 2007 from the National Health Interview Survey.

Notes: n.a. = not available (because of a lack of data to produce precise estimates).

The numbers shown here are rounded to the nearest \$10.

(underweight, normal weight, overweight, and obese),<sup>36</sup> health insurance coverage,<sup>37</sup> and attitudes toward risk taking (as measured by the receipt of flu shots, seat belt use, likelihood of taking more risks than the average person, and belief in one's ability to overcome illness without medical help).

**Results.** Annual health care spending per capita is generally higher for people who smoke now than for people who have never smoked (see Table 3-1). That difference is largest in the 45–64 age group, where spending for

current smokers exceeds spending for people who have never smoked by about \$500 per year (in 2008 dollars). The one exception is the 75-and-over age group, where spending for current smokers is lower than spending for people who have never smoked by about \$1,060 a year. That difference may occur because people who have survived to that age while continuing to smoke are in fairly good health (in spite of smoking), or they have a lower propensity to use health services, and thus health care spending for them is lower.

Except in the youngest age group, spending levels are highest for former smokers—even greater than for people who continue to smoke. A comparison of former smokers by length of time since they quit shows that spending is highest for those who stopped smoking recently, a result that is consistent with the notion that people may be motivated to quit by ill health.<sup>38</sup> At age 45 or above, as more time elapses after quitting, annual health care

36. Body mass index is a commonly used measure of body fat, calculated by dividing a person's weight in kilograms by the square of his or her height in meters. Underweight is defined as a body mass index of less than 18.5, normal weight as 18.5 to 24.9, overweight as 25.0 to 29.9, and obese as 30.0 or more.

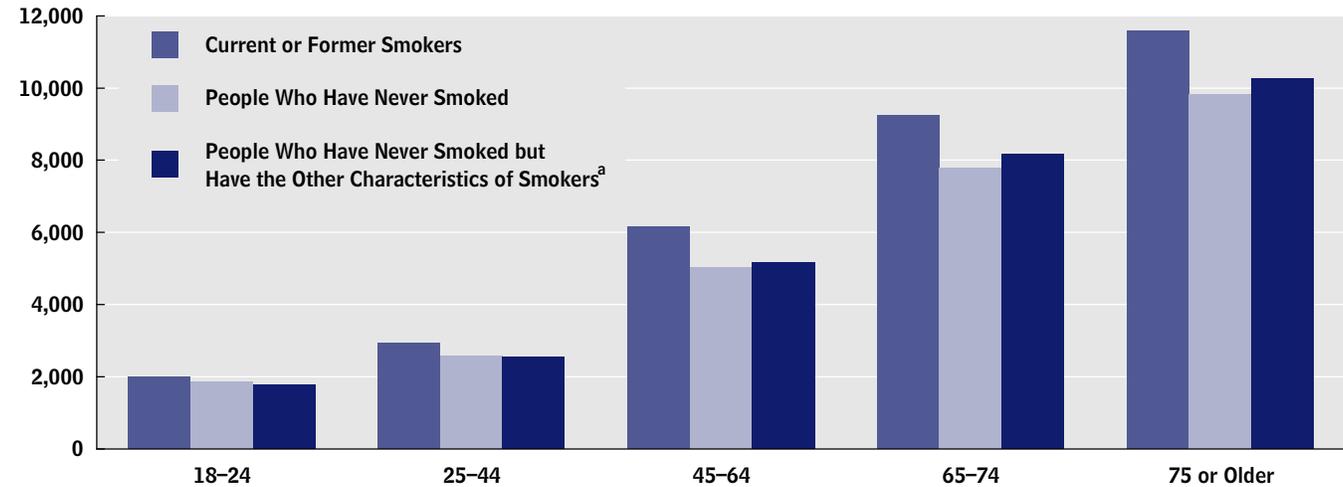
37. There is some concern among health economists that because the decision to have health insurance is controlled by the individual, a more elaborate statistical model should be used in which the decision to have health insurance is also estimated; otherwise, the result could be biased estimates of not only the effect of health insurance on spending but also the effect of smoking on spending. That more elaborate modeling typically requires additional variables that may not be available for the analysis. Another option is to omit health insurance coverage from the model. However, to the extent that having health insurance is a proxy for other variables that affect health care spending and that also happen to be correlated with smoking behavior—such as attitudes toward risk taking—omitting health insurance could lead to biased estimates of the effect of smoking. CBO tested the sensitivity of the results with and without controlling for health insurance coverage and found that the estimates changed somewhat but not dramatically.

38. Supporting that notion, surveys of quitters indicate that health concerns are the most important reason that people stop smoking; see, for example, Linda L. Pederson and others, "Quitting Smoking: Why, How, and What Might Help," *Tobacco Control*, vol. 5, no. 3 (September 1996), pp. 209–214; Norman Hymowitz and others, "Predictors of Smoking Cessation in a Cohort of Adult Smokers Followed for Five Years," *Tobacco Control*, vol. 6, suppl. 2 (June 1997), pp. S57–S62; and Brian C. Martinson and others, "Smoking Cessation Attempts in Relation to Prior Health Care Charges: The Effect of Antecedent Smoking-Related Symptoms?" *American Journal of Health Promotion*, vol. 18, no. 2 (November/December 2003), pp. 125–132.

**Figure 3-2.**

### Annual per Capita Spending on Health Care for Smokers, Nonsmokers, and Nonsmokers Who Otherwise Resemble Smokers, by Age Group

(2008 dollars)



Age Group	Current or Former Smokers (2008 dollars)	People Who Have Never Smoked but Have the Other Characteristics of Smokers <sup>a</sup> (2008 dollars)	Difference Attributable to Smoking (Percent)
18-24	2,010	1,790	11
25-44	2,940	2,550	13
45-64	6,170	5,170	16
65-74	9,230	8,160	12
75 or Older	11,580	10,270	11

Source: Congressional Budget Office based on data for 2000 to 2008 from the Medical Expenditure Panel Survey and for 1998 to 2007 from the National Health Interview Survey.

Note: The dollar amounts in the table are rounded to the nearest \$10.

a. Spending for people who have never smoked but who have the other characteristics of smokers is estimated using a two-part model that controls for the categories of smoking status and age shown here and for a variety of other characteristics that typically differ between smokers and nonsmokers, including education level, sex, income, and marital status.

spending declines but never reaches the level of people who have never smoked.

Attributing all of the differences in spending between smokers (current or former) and nonsmokers to smoking would be incorrect, however, because the two groups differ in attributes other than tobacco use (see Box 3-1 on page 16). A more appropriate comparison is between current or former smokers and people who have never smoked but who otherwise have the same characteristics as smokers. With the comparison refined in that way, the difference in spending attributable to smoking narrows

for people age 45 or over, and annual per capita health care spending is 11 percent to 16 percent higher, depending on age group, for smokers than for people who have never smoked but who otherwise resemble smokers (see Figure 3-2). Thus, differences in demographic characteristics account for \$130 (or 12 percent) of the gap in annual spending between current or former smokers and nonsmokers who otherwise resemble smokers in the 45-64 age group, \$380 (or 26 percent) of the gap in the 65-74 age group, and \$460 (or 26 percent) of the gap in the 75-and-over age group. For people under 45, by contrast, adjusting for differences in demographic characteristics

**Table 3-2.**

### Share of Total Annual Spending on Health Care Attributable to Smoking, by Age Group

	Percentage Attributable to Smoking
18–24	4
25–44	6
45–64	8
65–74	8
75 or Older	5
All Ages	7

Source: Congressional Budget Office based on data for 2000 to 2008 from the Medical Expenditure Panel Survey and for 1998 to 2007 from the National Health Interview Survey.

Note: CBO estimated the share of spending attributable to smoking by predicting spending for smokers and for nonsmokers who have the other characteristics of smokers, calculating the difference between the two, and dividing that difference by total predicted spending for all smokers and nonsmokers.

increases the amount of health care spending attributable to smoking.

**Comparison with Other Findings.** The estimates above of annual per capita health care spending can be used to compute the share of the nation’s total annual health care spending that is attributable to smoking. CBO’s analysis suggests that in recent years smoking has accounted for about 7 percent of total annual health care spending for noninstitutionalized adults (see Table 3-2), which means that if no adults had ever smoked, spending would be lower by that amount.<sup>39</sup> However, that figure does not imply that if all smokers quit permanently and no one else took up smoking, the nation’s annual health care spending would decline by that percentage. Some adverse health effects caused by smoking take time to be reversed, and others may never completely fade away. In addition, some people would live longer than they would otherwise

39. That number is based on the share of the population that has a history of smoking (either current or former smokers), which is about half of all adults, and the difference in per capita health care spending between people with a history of smoking and otherwise similar nonsmokers, which varies from 11 percent to 16 percent depending on age group.

and therefore would receive health care for additional years.

CBO’s 7 percent figure is within the range of estimates from past cross-sectional studies—many of which were based on older data—but it is somewhat higher than the result of a more recent study that used a similar methodology, which estimated that about 5 percent of health care spending is attributable to smoking.<sup>40</sup> Nevertheless, the pattern among age groups is very similar in the two studies: The share of spending attributable to smoking increases with people’s age, as smoking-related diseases start to accumulate, peaking between the ages of 45 and 74. The share of spending attributable to smoking is lower for the oldest age group, probably because a significant number of people who smoke die before reaching that age.

### Smoking and Longevity

CBO also used regression analysis to assess the effects of smoking on how long people live—specifically, on their likelihood of dying in the next 12 months. Similar to its analysis of health care spending, CBO looked at differences in that likelihood as a function of smoking status, using regression techniques to separate the effects of smoking on mortality from the effects of various correlated factors (such as income, education, and alcohol use). CBO then estimated mortality probabilities, by age, for people who have never smoked but who otherwise resemble smokers and compared those probabilities with similar estimates for smokers to calculate the extent to which smoking alters life expectancy.

### Data and Methods

CBO used data from the 1997–2004 National Health Interview Survey, combined with death certificate records from the National Death Index through 2006, to assess the effects of smoking on longevity.<sup>41</sup> The sample was

40. Douglas E. Levy and Joseph P. Newhouse, “Assessing the Effects of Tobacco Policy Changes on Smoking-Related Health Expenditures,” in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011), Chapter 11.

41. For more information about that data linkage, see Centers for Disease Control and Prevention, National Center for Health Statistics, “NHIS Linked Mortality Files” (February 12, 2010), [www.cdc.gov/nchs/data\\_access/data\\_linkage/mortality/nhis\\_linkage.htm](http://www.cdc.gov/nchs/data_access/data_linkage/mortality/nhis_linkage.htm). CBO used the public-use data.

**Table 3-3.****Probability of Dying in the Next Year, by Smoking Status and Age Group**

(Percent)

	18-24	25-44	45-64	65-74	75 or Older
People Who Have Never Smoked	0.1	0.1	0.4	1.3	4.7
Current or Former Smokers	0.1	0.2	0.8	2.9	7.0
Current smokers	0.1	0.2	1.0	4.2	9.2
Former smokers					
For less than 5 years	0.3	0.2	1.7	4.8	8.2
For 5 to 14 years	n.a.	0.2	0.6	3.4	8.7
For 15 years or longer	n.a.	0.1	0.4	1.8	6.1

Source: Congressional Budget Office based on data for 1997 to 2004 from the National Health Interview Survey combined with death certificate records.

Note: n.a. = not available (because of a lack of data to produce precise estimates).

made up of about 240,000 observations. Logistic regressions were performed with the dependent variable set equal to 1 if an individual died in the next year. Independent variables consisted of smoking, age group (18–24, 25–44, 45–64, 65–74, and 75 and older), interactions between age and smoking, sex, marital status, race or ethnicity, education, category of body mass index (underweight, normal weight, overweight, and obese), alcohol consumption, receipt of flu shots (as an indicator of attitudes toward taking risks), and indicators for survey years (to account for trends over time in the effects of other variables that influence mortality rates).

Similar to the spending analysis, smoking was defined in two ways: first, according to whether people had smoked at some point (current or former smokers) or had never smoked (fewer than 100 cigarettes consumed in their lifetime); and second, by a more detailed distinction, according to whether people had never smoked, were current smokers, or were former smokers who had quit less than 5 years earlier, 5 to 9 years earlier, 10 to 14 years earlier, or more than 15 years earlier.<sup>42</sup>

### Results

Current smokers generally have a higher probability of dying in the next year than people who have never smoked (see Table 3-3). Over age 24, the likelihood of

dying in the next year is two to three times as large for current smokers as for people who have never smoked. (In the 18–24 age group, current smokers have about the same probability of death as people who have never smoked, probably because the adverse health effects of smoking have not materialized at those ages.) Although some of the relative differences between those probabilities are large, the probabilities themselves are small: A current smoker between the ages of 45 and 64 has only a 1 percent chance, on average, of dying in the next year, and even for a current smoker age 75 or older, that probability is less than 10 percent.

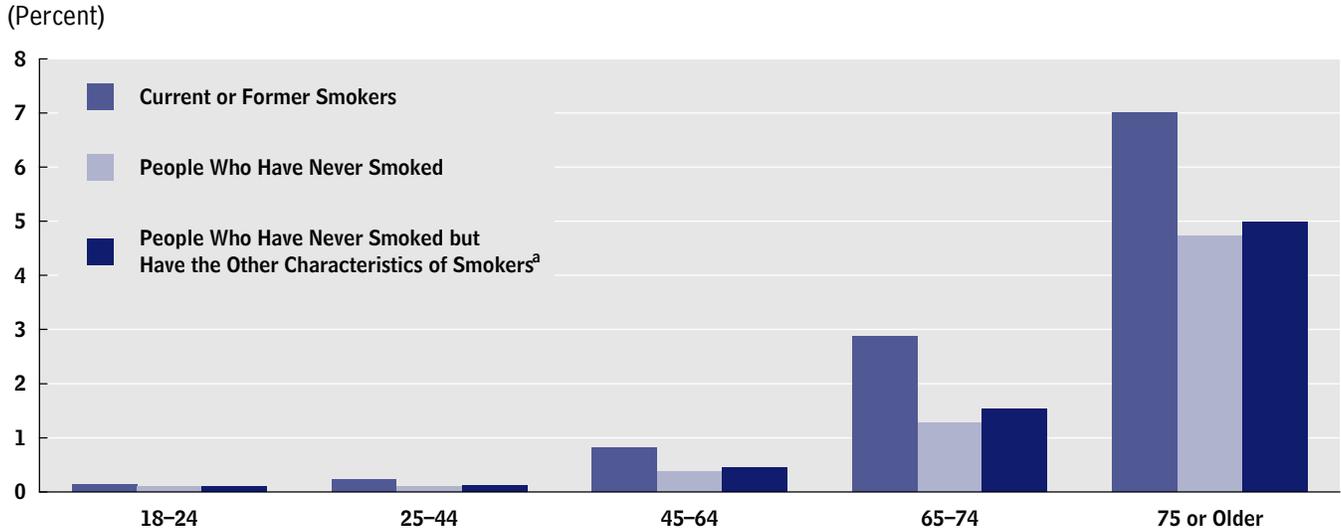
Analogous to what CBO found in its analysis of per capita health care spending, the probability of dying in the next year tends to be greater among some former smokers than among current smokers. In addition, that probability generally decreases as more time elapses after someone stops smoking—a result consistent with epidemiological studies, which find that smoking cessation improves health and longevity.

To refine those estimates and better isolate the impact of smoking on mortality, CBO compared the probability of death for smokers (current or former) and for non-smokers who have the other characteristics of smokers (see Figure 3-3). That comparison, which controls for the various characteristics listed above, tries to ensure that individuals' other attributes are not responsible for differences in mortality between smokers and people who have never smoked. The analysis shows that comparing

42. Because of a larger sample size (about 240,000 versus 80,000), the mortality regressions included more categories for time elapsed after ceasing to smoke than the spending regressions did.

**Figure 3-3.**

**Probability of Dying in the Next Year for Smokers, Nonsmokers, and Nonsmokers Who Otherwise Resemble Smokers, by Age Group**



Source: Congressional Budget Office based on data for 1997 to 2004 from the National Health Interview Survey combined with death certificate records.

a. The probability of dying in the next year for people who have never smoked but who have the other characteristics of smokers is estimated using a logistic regression model that controls for the categories of smoking status and age shown here and for a variety of other characteristics that typically differ between smokers and nonsmokers, including education level, sex, income, and marital status.

smokers with everyone who has never smoked rather than with those who have similar characteristics would overestimate the impact of smoking on mortality for all age groups except 18- to 24-year-olds. Differences in individuals' other characteristics among people ages 25 and older account for 11 percent to 18 percent of the difference in mortality between smokers and people who have never smoked.

**Comparison with Other Findings**

Based on the differences in mortality discussed above, CBO estimated survival patterns among 30-year-olds, 45-year-olds, and 60-year-olds, according to their smoking status (see Figure 3-4). At all of those ages, people who have never smoked have the highest probability of surviving to any given age. People who have never smoked but have the other characteristics of smokers have slightly lower survival probabilities. At the other extreme, typical smokers (a group that reflects the likelihood that a person will quit smoking at some point in his or her life) and lifetime smokers have the lowest expected survival probabilities.

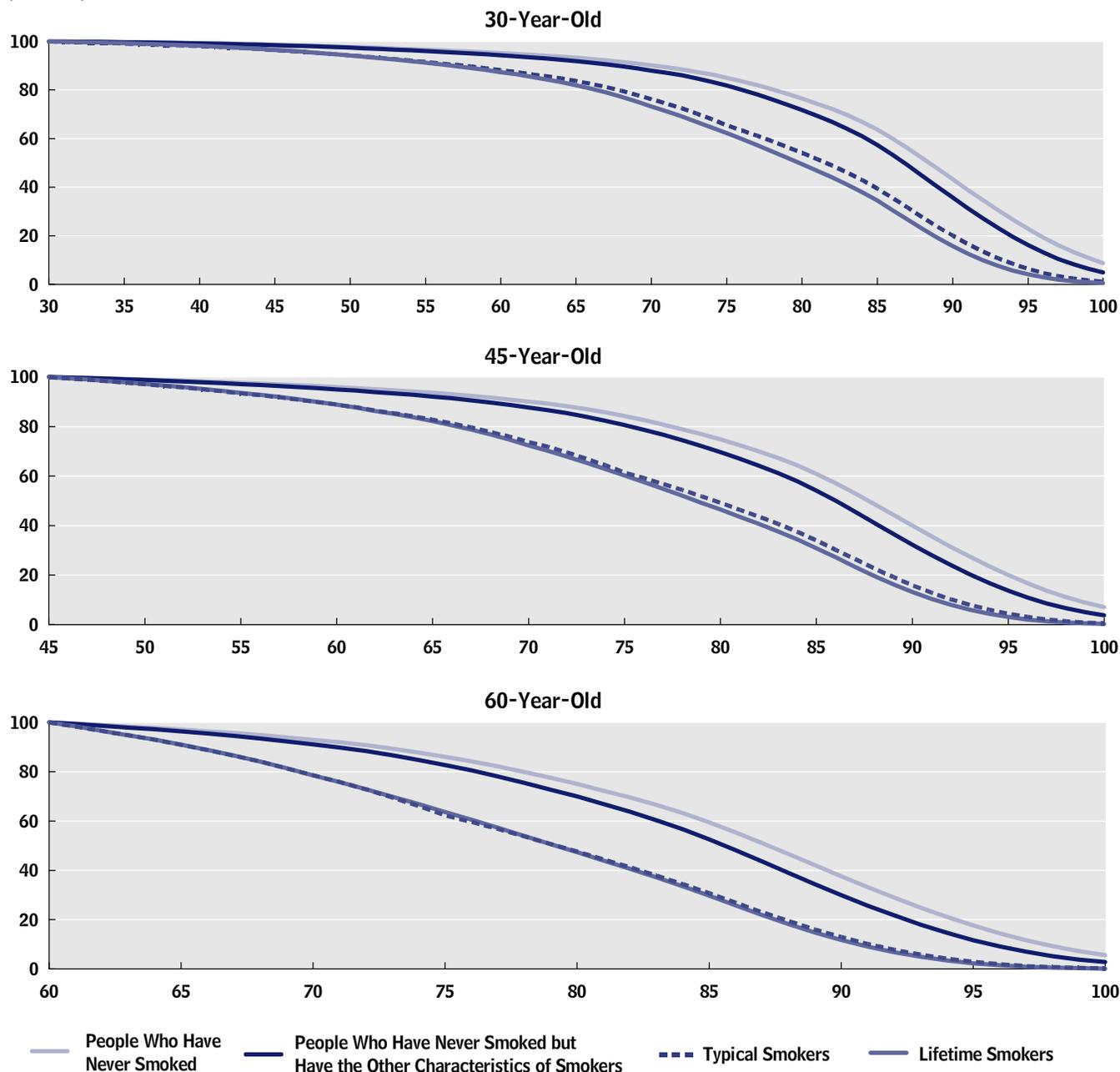
CBO also estimated people's life expectancy in 2013 at ages 30, 45, and 60 according to their smoking status (see Table 3-4).<sup>43</sup> Life expectancy at those ages is lowest for people who are assumed to smoke until death. It is slightly higher for typical smokers (taking into account the fact that some of the people assumed to be smoking at those ages may quit before death and that, as survey data show, mortality rates rise when people stop smoking, probably because they do so when ill). People who never smoke have the highest life expectancy at those three ages. Thus, one simple approach to estimating the impact of smoking on life expectancy—comparing typical smokers with people who never smoke—would suggest that

43. The life expectancy estimates shown in Table 3-4 are based on underlying mortality rates that are projected to decline over time. That is, age-specific mortality rates are projected to be lower for people born in later years. Hence, people who were 30 years old in 2013 would have lower mortality rates over a lifetime than people who were 45 in 2013, and the 45-year-olds would in turn have lower mortality rates than people who were 60 in 2013. That reduction in mortality rates over time would partly offset the natural tendency for people who have lived longer to survive to a greater age.

**Figure 3-4.**

**Probability of Surviving to a Given Age for 30-, 45-, and 60-Year-Olds in 2013, by Smoking Status**

(Percent)



Source: Congressional Budget Office based on data for 1997 to 2004 from the National Health Interview Survey combined with death certificate records.

Notes: Lifetime smokers are people who are assumed to smoke until death, whereas typical smokers reflect the fact that people may quit before death. Survival probabilities for people who have never smoked but who have the other characteristics of smokers were estimated using a logistic regression model that controls for smoking status, age, and a variety of other characteristics that typically differ between smokers and nonsmokers, including education level, sex, income, and marital status.

These estimates of survival probabilities incorporate projected improvements in mortality rates over time.

**Table 3-4.****Life Expectancy at Ages 30, 45, and 60 in 2013, by Smoking Status**

(Years)	30-Year-Old	45-Year-Old	60-Year-Old
People Who Have Never Smoked	56	41	26
People Who Have Never Smoked but Have the Other Characteristics of Smokers	54	39	24
Typical Smokers	48	33	19
Lifetime Smokers	47	32	19

Source: Congressional Budget Office based on data for 1997 to 2004 from the National Health Interview Survey combined with death certificate records.

Notes: "Life expectancy" refers to the average years of life remaining at a given age. These estimates of life expectancy incorporate projected improvements in mortality rates over time.

Lifetime smokers are people who are assumed to smoke until death, whereas typical smokers reflect the fact that people may quit before death.

smoking reduces life expectancy at ages 30, 45, and 60 by about 7 to 8 years. However, adjusted for differences in other characteristics between smokers and nonsmokers, the reduction in life expectancy at those ages that is specifically attributable to smoking declines to roughly 5 to 6 years. That result indicates that other factors besides smoking help to give people who never smoke longer life expectancies than current or former smokers. CBO's findings fall within the range of previous studies described earlier in this chapter, which estimate that, in general, smoking reduces life expectancy by about 6 to 10 years.

### Implications of CBO's Results About Health Care Spending and Longevity

Any policy aimed at reducing smoking would be expected to produce smaller changes in health care spending and longevity than the results from CBO's comparisons of smokers and otherwise similar nonsmokers imply. Those results are best interpreted as the effects of preventing someone who would have become a smoker from ever taking up smoking. However, in the case of someone who already smoked but was encouraged to quit because of higher cigarette taxes or other policies, it would take a number of years before mortality rates and health care spending approached those of a nonsmoker with

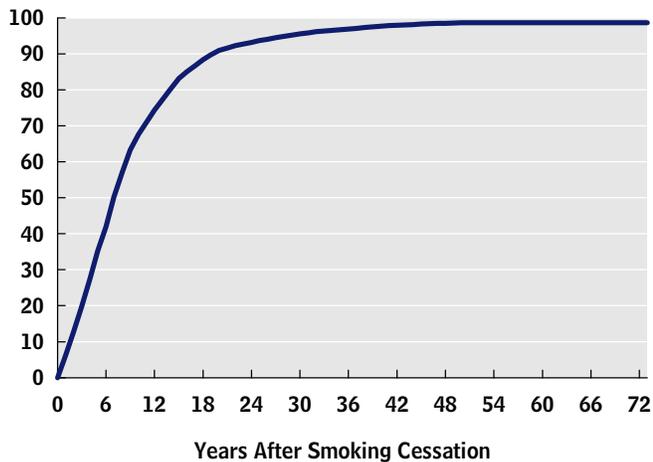
otherwise similar characteristics, because some negative effects of smoking take time to fade away and others never disappear entirely.

After assessing the medical literature that examines the extent to which smoking cessation reduces the risk of disease, CBO constructed an index that captures improvements in mortality by the time elapsed after cessation. In principle, that index, or "health response lag," ranges from 0 to 100 percent: At 0, expected mortality among quitters shows no improvement; at 100 percent, expected mortality among quitters has improved enough to match that of people who have never smoked. In constructing the health response lag, CBO examined diseases caused by smoking and judged, on the basis of the medical literature, how soon after cessation the risk of mortality from each disease begins to decline, the maximum extent of that decline, and the number of years after cessation that the maximum is reached. To calculate an overall trend in the benefits of quitting, CBO combined that information using weights that correspond to the shares of deaths attributable to different diseases. Measured by that index, the benefit of quitting is about 5 percent in the first year, increases sharply to about 70 percent after 10 years, reaches roughly 90 percent after 20 years, and then levels off at just below 100 percent after 50 years (see Figure 3-5).

**Figure 3-5.**

### Rate at Which Former Smokers' Longevity and Health Care Spending Approach Those of People Who Have Never Smoked

(Percentage recovery)



Source: Congressional Budget Office based on International Agency for Research on Cancer, *Tobacco Control: Reversal of Risk After Quitting Smoking*, Handbooks of Cancer Prevention, vol. 11 (IARC, 2007); and Public Health Service, *The Health Consequences of Smoking—A Report of the Surgeon General* (2004), and *The Health Benefits of Smoking Cessation—A Report of the Surgeon General* (1990).

Notes: In this figure, zero means no change in longevity and health care spending, and 100 percent means complete recovery (with people who quit smoking having the same expected mortality and annual per capita health care spending as people who have never smoked).

For the calculations underlying this figure, CBO focused on how ceasing to smoke affects various diseases, including malignancies (such as lung, esophageal, pancreatic, bladder, and oral cancer), ischemic heart disease, stroke, abdominal aortic aneurysm, coronary heart disease and other cardiovascular disease, and chronic obstructive pulmonary disease. Together, those diseases were responsible for 86 percent of the deaths attributable to smoking in 2004.

Because of data limitations, CBO assumed that annual health care spending per capita for quitters would decrease at the same rate that mortality rates would improve. Thus, the same “health response lag” would apply.<sup>44</sup>

The hypothetical increase in cigarette taxes that is the focus of this study would affect the number of people who started or stopped smoking. As described in more detail in Chapter 5, CBO’s analysis compares health care spending and longevity under current law and under the tax increase, using the estimated differences in health care spending and longevity by smoking status reported in this chapter.

44. Calculating an overall trend for changes in health care spending after people quit smoking would involve determining the time path of the progression and severity of each disease that is attributable to smoking and the costs of treating each disease—information that is not available with adequate precision. As a rough approximation, CBO constructed a separate index to summarize the path of health care spending after cessation, basing smoking-attributable spending for each disease on estimates of smoking-attributable mortality from the Centers for Disease Control and Prevention and basing the costs of treating each disease on treatment costs in the Medicare program. (Prescription drug data are not available by disease, so spending for prescription drugs was not included in the construction of that separate index.) Ideally, the costs of treating a disease would be based on information about the treatment costs of each smoker with that disease, but such numbers are not readily available. The shapes of the health response lags for mortality and health care spending turned out to be very similar, so CBO opted to use the same one for both outcomes. Nevertheless, it is possible that a more refined approach to calculating changes in health care spending after smoking cessation—using more-complete data, for example—could yield different results.



## Effects of Smoking on Labor Earnings

**B**esides affecting health care spending and longevity, as discussed in Chapter 3, smoking can have an impact on the economy and the federal budget through its effects on earnings. Specifically, smoking can reduce total labor earnings—defined as the total income that people receive from paid employment—in two broad ways: by decreasing the number of people who work for pay and by reducing those people’s pay while at work. Studies have found that smokers die earlier, retire sooner, and are less likely to have a job than nonsmokers, which means that smoking probably reduces the overall size of the paid workforce.<sup>1</sup> In addition, studies have concluded that smokers miss work more often for health-related reasons, perform less well when at work, and have lower hourly wages than nonsmokers do.<sup>2</sup> Combined, those effects on employment and on earnings while employed suggest that smokers may have lower lifetime earnings than otherwise similar nonsmokers. Reductions in the prevalence of smoking might therefore lead to higher labor earnings and thus to higher federal tax revenues.

This chapter analyzes the extent to which smoking affects labor earnings. It also looks at the impact of smoking on retirement, employment, hours worked, and wages—the channels through which smoking can affect earnings—and compares the Congressional Budget Office’s findings with those of past studies. CBO’s analysis is based on data from the Current Population Survey (CPS), a widely used survey that records information about earnings and smoking.<sup>3</sup>

On the basis of those data, CBO concludes that smokers are more likely to be jobless than people who have never smoked but who otherwise resemble smokers in terms of age, region, sex, race or ethnicity, education level, and marital status. Current smokers also have lower hourly wages and lower labor earnings, on average, than otherwise similar people who have never smoked. Former smokers face some of the same consequences, although in other ways, they appear to fare better than people who have never smoked.

Differences in employment and earnings between current smokers, former smokers, and people who have never

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1. U.S. Congress, Office of Technology Assessment, *Smoking-Related Deaths and Financial Costs*, OTA Staff Memo (September 1985); Dietrich Rothenbacher and others, “Early Retirement Due to Permanent Disability in Relation to Smoking in Workers of the Construction Industry,” *Journal of Occupational and Environmental Medicine*, vol. 40, no. 1 (January 1998), pp. 63–68; B.S. Armour and others, “Annual Smoking-Attributable Mortality, Years of Potential Life Lost, and Productivity Losses—United States, 1997–2001,” *Morbidity and Mortality Weekly Report*, vol. 54, no. 25 (July 1, 2005), pp. 625–628; B. Adhikari and others, “Smoking-Attributable Mortality, Years of Potential Life Lost, and Productivity Losses—United States, 2000–2004,” *Morbidity and Mortality Weekly Report*, vol. 57, no. 45 (November 14, 2008), pp. 1226–1228; Lise Lotte N. Husemoen and others, “Smoking and Subsequent Risk of Early Retirement Due to Permanent Disability,” *European Journal of Public Health*, vol. 14, no. 1 (March 2004), pp. 86–92; and K. Koskenvuo and others, “Smoking Strongly Predicts Disability Retirement Due to COPD: The Finnish Twin Cohort Study,” *European Respiratory Journal*, vol. 37, no. 1 (January 2011), pp. 26–31.

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2. See Michael T. Halpern and others, “Impact of Smoking Status on Workplace Absenteeism and Productivity,” *Tobacco Control*, vol. 10, no. 3 (September 2001), pp. 233–238; William B. Bunn III and others, “Effect of Smoking Status on Productivity Loss,” *Journal of Occupational and Environmental Medicine*, vol. 48, no. 10 (October 2006), pp. 1099–1108; and Walter F. Stewart and others, “Lost Productive Work Time Costs from Health Conditions in the United States: Results from the American Productivity Audit,” *Journal of Occupational and Environmental Medicine*, vol. 45, no. 12 (December 2003), pp. 1234–1246.

3. This chapter focuses on the impact of smoking on taxable earnings; because of a lack of data, it does not consider smoking’s effect on nontaxable fringe benefits. The value of fringe benefits is closely linked to labor earnings, however, so increases in earnings caused by a decline in smoking would be likely to generate similar increases in fringe benefits.

smoked are not entirely attributable to smoking, given that the groups differ in other characteristics that are correlated with labor earnings, such as education level. Controlling for differences in measured characteristics leaves a smaller but still significant gap between the labor earnings of nonsmokers and those of smokers. In CBO's view, that remaining gap is probably not wholly attributable to smoking status; some of it most likely stems from differences between smokers and nonsmokers (on average within those groups) in personal traits that are not measured in surveys.

### **CBO's Data and Methods**

Unlike the surveys that CBO used to analyze health care spending and longevity, the CPS collects data about wages, hours worked, and other aspects of respondents' employment situation in addition to information about smoking behavior. As a result, it is better suited than those other surveys to studying the effects of smoking on labor earnings.

Each month, the CPS surveys roughly 60,000 U.S. households that are representative of the civilian U.S. population in terms of age, employment status, health, and location. (It does not survey active-duty military personnel or people in correctional institutions.) Data from the CPS are the source of many of the Bureau of Labor Statistics' most widely used statistics on employment, unemployment, and wages. In May and August 2006 and January 2007, the CPS included the Tobacco Use Supplement (TUS), which contained detailed questions about people's current and past smoking status, in addition to the regular CPS questions about employment, wages, and earnings. A set of data from the TUS and the CPS (containing roughly 200,000 observations) allowed CBO to compare the earnings of smokers with those of nonsmokers who were similar in a variety of characteristics.<sup>4</sup>

4. In some of its analyses for this study, CBO distinguished among former smokers according to the number of years since they quit smoking. The TUS records information about years since smoking cessation, but only for the survey respondents, not for other adults in the surveyed households. Because the respondents themselves are not a random sample of the population as a whole, CBO did not view the TUS's information about length of time since quitting as reliable.

### **Measured Differences Between Smokers and Nonsmokers**

As discussed in Box 3-1 on page 16, survey data show that people who have never smoked differ (on average) from current or former smokers in dimensions that are easily measured, such as age, sex, and education level. For example, men are more likely to smoke than women, and people with a high school diploma are more likely to smoke than people with a college or graduate degree. Sex, education level, and other factors correlated with smoking are also related to earnings; for instance, men are more likely to work for pay than women are, and their average earnings are higher than women's. Moreover, people with more education have much higher earnings, on average, than people with less education do. Smokers also appear to have a higher tolerance for risk, which may affect their earnings. Any credible estimate of the impact of smoking on earnings must account for the differences between smokers and nonsmokers in such measured characteristics.

Another difference between smokers and nonsmokers that may affect earnings and income is their attitudes toward the future. Research suggests that smokers are more "present-minded"—that is, more willing to pay future costs for present rewards—than are people who have never smoked. Present-minded people may smoke more if they place little weight on smoking-related illnesses and health care costs that may not be borne for many years to come. That same focus on the present may lead people to develop fewer work-related skills, through formal schooling or otherwise. It is well established that lower investment in schooling and skill development results in lower earnings, on average.<sup>5</sup>

### **Unmeasured Differences Between Smokers and Nonsmokers**

In the analyses in this chapter, CBO controlled for differences in measured characteristics between smokers and nonsmokers—age, region, sex, race or ethnicity,

5. Research suggests that a lack of cognitive skills, including the ability to focus on the future, explains the risky behavior of some young people, such as smoking, teenage pregnancy, drug use, and participation in illegal activities; see James J. Heckman, Jora Stixrud, and Sergio Urzua, "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior," *Journal of Labor Economics*, vol. 24, no. 3 (July 2006), pp. 411–482.

education level, and marital status. Those attributes account for less than half of the variability in wages and earnings seen among smokers or among nonsmokers.<sup>6</sup> Put differently, wages and earnings differ considerably for smokers and nonsmokers with the same measured demographic characteristics. The remaining difference may be attributable to people's *unmeasured* characteristics, such as the quality (rather than quantity) of their education, their confidence, dedication, self-discipline, salesmanship, social skills, and many other factors difficult to gauge from surveys. If smokers and nonsmokers differ in such unmeasured traits, on average, then the difference between the earnings of smokers and nonsmokers will not measure the causal effect of smoking, even if the comparison is limited to measurably similar people. That issue is widely recognized in the economics and health literature and is one that CBO adjusts for in its estimates of the impact of smoking on earnings.

People who stop smoking, especially those who quit in midlife, may retain some of the unmeasured characteristics of smokers. Even if midlife quitters' tendency to focus on the present and attitudes toward risk change in ways that cause them to stop smoking, their previous choices about education and skill development (presumably influenced by their prior attitudes) may continue to affect their earnings after they quit. People who are highly present-minded in their teens and early 20s, for example, may both smoke and end their education after high school. If they become less present-minded in, say, their 30s, they may quit smoking but be unable to fully recover the education and work experience they would have had if they had been more future-minded in their youth. Restricting comparisons to people with similar measured years of education probably controls for some, but not all, elements of those differences between smokers and nonsmokers.

## Effects of Smoking on Employment and Wages

The total income that someone receives from paid work in a week or a year depends both on how many hours the

person works and on his or her average hourly wage. As a precursor to its analysis of the effects of smoking on annual earnings (discussed later in this chapter), CBO examined smoking's relationships to total hours worked in a week and to average hourly wages. Smoking could affect weekly hours worked by increasing the likelihood of retirement, by decreasing employment among people who have not yet retired, and by reducing the weekly hours worked by people who have jobs. CBO examined each of those channels separately.

CBO's review of published research and its analysis of data from the CPS suggest that smokers are more likely than nonsmokers to be retired and less likely to have a job before retirement. There is little evidence that nonsmokers with jobs work more hours per week than smokers with jobs do, although CBO's review and its own analysis indicate that nonsmokers tend to have higher hourly wages than measurably similar smokers.

### Retirement

Studies of data from Europe have found that smokers are more likely to be in poor health and more apt to be disabled and retired than similar nonsmokers.<sup>7</sup> Studies of U.S. data have looked at how declining health—whether caused by smoking or not—affects retirement.<sup>8</sup> They have found that adults in declining health retire earlier—or expect to retire at younger ages in the future—than similar adults in good health. The differences are

6. For a discussion of how unobserved factors can drive differences in earnings or wages for various groups, see Lawrence F. Katz and David H. Autor, "Changes in the Wage Structure and Earnings Inequality," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, vol. 3A (North Holland, 1999), pp. 1463–1555.

7. K. Koskenvuo and others, "Smoking Strongly Predicts Disability Retirement Due to COPD: The Finnish Twin Cohort Study," *European Respiratory Journal*, vol. 37, no. 1 (January 2011), pp. 26–31; Dietrich Rothenbacher and others, "Early Retirement Due to Permanent Disability in Relation to Smoking in Workers of the Construction Industry," *Journal of Occupational and Environmental Medicine*, vol. 40, no. 1 (January 1998), pp. 63–68; and Lise Lotte N. Husemoen and others, "Smoking and Subsequent Risk of Early Retirement Due to Permanent Disability," *European Journal of Public Health*, vol. 14, no. 1 (March 2004), pp. 86–92.

8. John Bound and others, "The Dynamic Effects of Health on Labor Force Transitions of Older Workers," *Labour Economics*, vol. 6, no. 2 (June 1999), pp. 179–202; Mark McClellan, "Health Events, Health Insurance, and Labor Supply: Evidence from the Health and Retirement Survey," in David A. Wise, ed., *Frontiers in the Economics of Aging* (University of Chicago Press, 1998); Kathleen McGarry, "Health and Retirement: Do Changes in Health Affect Retirement Expectations?" *Journal of Human Resources*, vol. 39, no. 3 (Summer 2004), pp. 624–648; and Kerry Anne McGeary, "How Do Health Shocks Influence Retirement Decisions?" *Review of Economics of the Household*, vol. 7, no. 3 (September 2009), pp. 307–321.

**Table 4-1.**

**Effects of Smoking on Retirement, Employment, Hours Worked, Hourly Wages, and Labor Earnings, by Smoking Status**

(Percent)

	Current Smokers	Former Smokers
Effect of Smoking on the Likelihood of Being Retired	-0.4	-0.7
Effect of Smoking on the Likelihood of Being Employed <sup>a</sup>	-3.9	-0.8
Effect of Smoking on Weekly Hours Worked <sup>b</sup>	0.7	0.3
Effect of Smoking on Hourly Wages <sup>b</sup>	-4.0	4.6
Effect of Smoking on Labor Earnings		
All respondents in survey <sup>c</sup>	-11.7	1.3
Only respondents ages 50 to 74	-17.9	-1.4

Source: Congressional Budget Office based on data for May and August 2006 and January 2007 from the Current Population Survey.

Note: The numbers shown here are relative to outcomes for people who have never smoked but who otherwise resemble current or former smokers in terms of age, region, sex, race or ethnicity, education level, and marital status.

- a. Among respondents who are not retired.
- b. Among respondents with a job.
- c. The Current Population Survey covers people between the ages of 20 and 74.

especially pronounced among people who have recently had a heart attack or stroke or been diagnosed with cancer. Because smoking is linked to heart attacks, strokes, and certain types of cancer, those findings, together with the European studies, suggest that reductions in smoking could delay retirement by reducing the prevalence of those diseases.

CBO examined patterns of retirement in the CPS data and—after controlling for the measured characteristics discussed above—found that current smokers are slightly (0.4 percent) less likely to be retired than people who have never smoked but are similar in other measurable ways (see Table 4-1). Former smokers are about 0.7 percent less likely to be retired than people who have never smoked. Those calculations point to a different effect of smoking on retirement than has been found in the previous literature. However, the small size of those estimated effects and the results of many other studies led CBO to conclude that smokers are more rather than less likely to be retired than nonsmokers.

**Employment**

Among adults who have not yet retired, research indicates that health problems such as heart attacks, strokes, and

cancer—many of which are related to smoking—reduce the probability of having a job, even in people as young as 35.<sup>9</sup> Other serious health conditions that are less clearly tied to smoking, such as breast cancer and diabetes, also reduce employment.<sup>10</sup> Translating those results into the effect of smoking on employment is difficult, however, because many smokers have not yet suffered (and may

9. See Mark McClellan, “Health Events, Health Insurance, and Labor Supply: Evidence from the Health and Retirement Survey,” in David A. Wise, ed., *Frontiers in the Economics of Aging* (University of Chicago Press, 1998); and Steven Stern, “Measuring the Effect of Disability on Labor Force Participation,” *Journal of Human Resources*, vol. 24, no. 3 (Summer 1989), pp. 361–395. The McClellan study did not distinguish between the different effects on the labor market of different types of cancer.

10. See Cathy J. Bradley and others, “Short-Term Effects of Breast Cancer on Labor Market Attachment: Results from a Longitudinal Study,” *Journal of Health Economics*, vol. 24, no. 1 (January 2005), pp. 137–160; Cathy J. Bradley, Heather L. Bednarek, and David Neumark, “Breast Cancer and Women’s Labor Supply,” *Health Services Research*, vol. 37, no. 5 (October 2002), pp. 1309–1328; and Sandeep Vijan, Rodney A. Hayward, and Kenneth M. Langa, “The Impact of Diabetes on Workforce Participation: Results from a National Household Sample,” *Health Services Research*, vol. 39, no. 6 (December 2004), pp. 1653–1669.

never suffer) from those conditions, and many non-smokers will suffer from them.

CBO's statistical analysis supports the conclusion that smokers who have not yet retired are less likely to have a job than similar nonsmokers. CBO analyzed the relationship between smoking and employment using CPS data, adjusted for the measured characteristics described above. Those adjusted data suggest that current smokers are nearly 4 percent less likely to be employed than people who have never smoked (see Table 4-1). The difference for former smokers is much smaller.

### Weekly Hours Worked

Smoking and its related health effects could lead some employees to reduce the number of hours they work each week. A previous study of that issue concluded that, as a group, men with a recent heart attack, stroke, or cancer diagnosis and women with a recent diagnosis of chronic obstructive pulmonary disease reduced their work hours in the following year. Those reductions occurred both through a lower rate of employment and through a reduction in work hours among people still employed.<sup>11</sup> CBO's analysis of data from the CPS, however, indicates that smokers work almost 1 percent more hours than similar nonsmokers (see Table 4-1).

### Hourly Wages

Numerous studies have analyzed the direct effect of smoking on hourly wages. A 1997 study of U.S. workers found that hourly wages were between 4 percent and 8 percent lower for smokers than for measurably similar nonsmokers.<sup>12</sup> A more recent study used longitudinal data from the Panel Study of Income Dynamics and concluded that wages for long-term smokers were 4 percent to 11 percent lower than wages for otherwise similar nonsmokers.<sup>13</sup> That study also found that among a group of young smokers who were followed over the years, those who would later go on to quit had higher wages, even while still smoking, than those who would continue to

smoke. That result suggests that much of the cross-sectional relationship between smoking and wages may be driven by unmeasured factors that affect both smoking and wages. Studies of workers in the United Kingdom, Canada, and Australia support that interpretation.<sup>14</sup>

In addition, a 2011 study of U.S. workers surveyed in the National Longitudinal Survey of Youth found roughly the same difference in wages between smokers and measurably similar nonsmokers—but only for smokers with employer-provided health insurance.<sup>15</sup> Uninsured smokers did not have lower wages than nonsmokers.

CBO's analysis of the relationship between hourly wages and smoking in the CPS data found results generally comparable with those of past studies.<sup>16</sup> Wages of current smokers surveyed in the CPS were roughly 4 percent lower than those of measurably similar people who have never smoked (see Table 4-1). By contrast, former smokers earned more than their counterparts who had never smoked. Taken at face value, that result would seem to imply that the path to higher wages is to start smoking and then quit. A more plausible interpretation, however, is that people who quit smoking differ from people who have never smoked in unmeasured characteristics—such as willpower—that are beneficial both for earnings and for the likelihood that they will stop smoking on their own.

11. Mark McClellan, "Health Events, Health Insurance, and Labor Supply: Evidence from the Health and Retirement Survey," in David A. Wise, ed., *Frontiers in the Economics of Aging* (University of Chicago Press, 1998).

12. Phillip B. Levine, Tara A. Gustafson, and Ann D. Velenchik, "More Bad News for Smokers? The Effects of Cigarette Smoking on Wages," *Industrial and Labor Relations Review*, vol. 50, no. 3 (April 1997), pp. 493–509.

13. Irina B. Grafova and Frank P. Stafford, "The Wage Effects of Personal Smoking History," *Industrial and Labor Relations Review*, vol. 62, no. 3 (April 2009), pp. 381–393. The factors statistically controlled for in that study included education, race, years of labor market experience, years of tenure in the current job, union membership, marital status, region, and an indicator of whether the person held a white-collar job or not.

14. Nils Braakmann, *The Smoking Wage Penalty in the United Kingdom: Regression and Matching Evidence from the British Household Panel Survey*, Working Paper 96 (University of Lüneburg, August 2008); M. Christopher Auld, "Smoking, Drinking, and Income," *Journal of Human Resources*, vol. 40, no. 2 (Spring 2005), pp. 505–518; and Yew L. Lee, "Wage Effects of Drinking in Australia," *Australian Economic Review*, vol. 36, no. 3 (September 2003), pp. 265–282.

15. Benjamin Cowan and Benjamin Schwab, "The Incidence of the Healthcare Costs of Smoking," *Journal of Health Economics*, vol. 30, no. 5 (September 2011), pp. 1094–1102.

16. As with the academic literature on this topic, CBO's analysis was restricted to people for whom information about wages was available in the data (that is, it excluded people who were unemployed or who had left the labor force for retirement or other reasons).

One reason that current smokers have lower wages than nonsmokers, on average, may be that they tend to be absent from work more often, which may keep them from receiving raises or advancing to better-paid positions. Studies of U.S. employees have found higher rates of absenteeism among smokers than among nonsmokers.<sup>17</sup> Studies of workers in the United Kingdom, Australia, and Sweden have also found higher absenteeism rates among smokers.<sup>18</sup> Another U.S. study concluded that smokers have roughly twice as much “lost productive time” at work, a concept that includes both absenteeism and unproductive work time.<sup>19</sup> Studies of self-reported productivity also suggest that smoking reduces productivity at work—another factor that may hold down smokers’ wages.<sup>20</sup>

Those findings about absenteeism and productivity do not fully address the issue of whether the factors that depress smokers’ wages would change if people quit smoking.<sup>21</sup> It may be that smokers’ higher absenteeism rates are a direct consequence of smoking itself—say,

because smoking makes people less healthy and less able to attend work. Or it may be that the same attitudes toward risk and tendency to focus on the present lead to both smoking and absenteeism. If those fundamental personal traits remain after people stop smoking, then absenteeism and low wages may persist for smokers who quit as a result of an increase in the cigarette tax.

## Overall Effect of Smoking on Earnings

Retirement, employment rates, hours worked, and hourly wages affect the federal budget primarily through their impact on labor earnings, on which people pay income and payroll taxes. Thus, the overall effect of smoking on earnings has more direct consequence for the federal budget than the separate effects of smoking on retirement, employment, hours worked, and wages.<sup>22</sup> Only a few recent studies have looked at that overall relationship, however. An analysis based on the Health and Retirement Study concluded that annual earnings are roughly 10 percent lower for current smokers than for nonsmokers after controlling for differences in age, sex, race, education, marital status, and measures of health and

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17. See, for example, Jessica Primoff Vistnes, “Gender Differences in Days Lost from Work Due to Illness,” *Industrial and Labor Relations Review*, vol. 50, no. 2 (January 1997), pp. 304–323; Frank A. Sloan and others, *The Price of Smoking* (MIT Press, 2004); J. Paul Leigh, “Smoking, Self-Selection, and Absenteeism,” *Quarterly Review of Economics and Finance*, vol. 35, no. 4 (Winter 1995), pp. 365–386; and Richard W. Ault and others, “Smoking and Absenteeism,” *Applied Economics*, vol. 23, no. 4 (1991), pp. 743–754. Those estimates vary depending on the definition of absenteeism, the database used, and the set of factors statistically controlled for. Vistnes shows that the estimated effect of smoking on absenteeism is sensitive to the inclusion of health status as a statistical control factor; however, to the extent that health status is itself a function of smoking, including it could lead to an underestimate of the causal effect of smoking on absenteeism.
18. Katharine R. Parkes, “Relative Weight, Smoking, and Mental Health as Predictors of Sickness and Absence from Work,” *Journal of Applied Psychology*, vol. 72, no. 2 (May 1987), pp. 275–286; Robert Bush and Mark Wooden, “Smoking and Absence from Work: Australian Evidence,” *Social Science and Medicine*, vol. 41, no. 3 (August 1995), pp. 437–446; and Petter Lundborg, “Does Smoking Increase Sick Leave? Evidence Using Register Data on Swedish Workers,” *Tobacco Control*, vol. 16, no. 2 (April 2007), pp. 114–118.
19. Walter F. Stewart and others, “Lost Productive Work Time Costs from Health Conditions in the United States: Results from the American Productivity Audit,” *Journal of Occupational and Environmental Medicine*, vol. 45, no. 12 (December 2003), pp. 1234–1246.

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20. See, for example, Michael T. Halpern and others, “Impact of Smoking Status on Workplace Absenteeism and Productivity,” *Tobacco Control*, vol. 10, no. 3 (September 2001), pp. 233–238; Ronald Loeppke and others, “Health and Productivity as a Business Strategy,” *Journal of Occupational and Environmental Medicine*, vol. 49, no. 7 (July 2007), pp. 712–721; and Ron Z. Goetzel and others, “The Relationship Between Modifiable Health Risk Factors and Medical Expenditures, Absenteeism, Short-Term Disability, and Presenteeism Among Employees at Novartis,” *Journal of Occupational and Environmental Medicine*, vol. 51, no. 4 (April 2009), pp. 487–499.
21. An apparent contradiction exists between CBO’s estimates for weekly hours worked (that smokers work slightly more hours than nonsmokers) and other researchers’ estimates of absenteeism (that smokers are absent more). That difference is probably explained by the fact that the CPS question about weekly hours used in this analysis asks about “usual weekly hours.” It is possible that smokers report that they “usually” work as many hours per week as measurably similar nonsmokers while at the same time being absent more often in “unusual” circumstances.
22. The total effect of smoking on earnings cannot be precisely inferred from the separate effects of smoking on the probability of employment, the number of hours worked, and hourly wages, because that total effect will depend on the extent to which the separate effects on employment, hours worked, and wages tend to be concentrated in the same people.

functioning.<sup>23</sup> A recent study of workers in Albania concluded that smokers earn 19 percent to 23 percent less than similar nonsmokers after controlling for a wide range of demographic factors.<sup>24</sup>

CBO's analysis of data from the CPS also indicates that current smokers earn less than otherwise similar people who have never smoked. The difference is about 12 percent after controlling for age, region, sex, race or ethnicity, education level, and marital status (see Table 4-1 on page 34). When the CPS sample is limited to workers between the ages of 50 and 74, the earnings gap for current smokers is 18 percent.<sup>25</sup>

The earnings differentials in CBO's analysis are much smaller for former smokers. Data from the CPS indicate that former smokers earn about 1 percent more than otherwise similar people who have never smoked, or about 1 percent less than people who have never smoked if the sample is limited to those over age 50.

23. Michael Hurd and others, "The Effects of Tobacco Control Policy on the Social Security Trust Fund," in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011). Because smoking harms health, controlling for health and functional status in that study's model excluded the effect that smoking has on earnings through its effects on health.

24. Michael Lokshin and Kathleen Beegle, "Forgone Earnings from Smoking: Evidence for a Developing Country," in Solomon Polachek and Konstantinos Tatsiramos, eds., *Research in Labor Economics*, vol. 33 (Emerald Group Publishing, 2011), pp. 209–238.

25. CBO also analyzed the difference in the earnings of nonsmokers and smokers as reported in the University of Michigan's Health and Retirement Study (HRS), which surveys people over age 50. That difference was significantly larger than in the CPS sample limited to a similar age group: 29 percent, after controlling for the measured characteristics described above, rather than 18 percent. The difference between the two sources of data may result from differences in the ways in which the two surveys measure earnings and smoking behavior. CBO's findings from the HRS were higher than those of another study that also used HRS data: Michael Hurd and others, "The Effects of Tobacco Control Policy on the Social Security Trust Fund," in Peter Bearman, Kathryn M. Neckerman, and Leslie Wright, eds., *After Tobacco: What Would Happen if Americans Stopped Smoking?* (Columbia University Press, 2011). However, that study also controlled for differences in health status. Because health status is itself affected by smoking, in CBO's judgment it was more appropriate to omit that factor from the analysis for the purposes of this report.

### The Role of Unmeasured Factors

There are strong reasons to conclude that at least some of the observed difference in the earnings of smokers and nonsmokers is indeed caused by smoking. Smokers are less healthy than nonsmokers, on average, and as noted above, research has shown that poor health leads to earlier retirement, lower rates of employment, and lower wages. There is also strong evidence that smokers are more likely to be absent from work because of sick leave and are less productive while at work. Thus, a substantial portion of the earnings gap between smokers and nonsmokers, after controlling for measured factors, is probably attributable to smoking itself.

However, the academic literature and CBO's analyses suggest the presence of unmeasured ways in which smokers and nonsmokers differ, on average, even when comparisons are restricted to people with similar measured characteristics, such as age, sex, and years of education. If poor health among smokers was the only mechanism driving the relationship between smoking status and earnings, then former smokers would earn the same as nonsmokers (or less, if they still had smoking-related illnesses) rather than earning more, as CBO and some other researchers concluded. The findings that former smokers have higher hourly wages and (by some measures) higher earnings suggest that the estimated effects of smoking reflect more than just smoking's impact on health.

The presence of unmeasured factors is also reflected in other relationships between tobacco use and earnings. The Tobacco Use Supplement of the CPS asked about respondents' use of other tobacco products in addition to cigarettes, such as pipe tobacco, cigars, and chewing tobacco. CBO found that cigar smokers earn significantly more than similar nonsmokers (after controlling for the same demographic factors mentioned above). It is unlikely that cigar smoking causes higher earnings, although it may be that higher earnings induce some people to smoke cigars. Even though cigarette smokers have lower earnings, the causality may not flow exclusively from smoking status to labor earnings.

In its analysis of how a reduction in smoking would affect the federal budget—using a methodology described in detail in Chapter 5—CBO assumed that people who

stopped or never began smoking would have higher earnings because of not smoking. The extent of that assumed increase varied by age group:

- 4 percent for people in the 18–34 age range,
- 6 percent for people in the 35–44 age range,
- 5 percent for people in the 45–54 age range,
- 7 percent for people in the 55–64 age range,
- 5 percent for people in the 65–74 age range, and
- 0 at other ages.

Those effects are smaller than the relationship between smoking and earnings that CBO estimated from the CPS data because CBO believes that a significant portion of that relationship is not causal; rather, it reflects attributes, such as a tendency to focus on the present, that are prevalent among smokers, reduce earnings, and are not completely adjusted for in CBO’s statistical analysis. Inducing people to stop smoking would probably not change those underlying attributes. Thus, CBO’s judgment is that the best available estimates of the effects on earnings of quitting or never starting to smoke are those listed above. CBO’s estimates of those effects vary with age because the health problems attributable to smoking differ by age. For example, the effects are estimated to be highest for people in the 55–64 age range, when the health effects of smoking are most likely to have a severe impact on earnings.

In the analyses described in Chapter 3, by contrast, CBO interpreted the results of regression-based models as reflecting the causal relationships between smoking and health, per capita health care spending, and longevity. In CBO’s judgment, it is appropriate to adjust the cross-sectional relationship downward for smoking and earnings even though such adjustments were not made in those other analyses. The different treatment reflects CBO’s assessment that earnings, which are a complex

function of individual attitudes and attributes, are more likely than those other outcomes to be affected by the underlying factors that drive differences in smoking behavior.

### Other Issues About the Relationship Between Smoking and Earnings

As explained in Chapter 3, the improvement in health that occurs when someone is induced by a policy to quit smoking is not assumed to be immediate but instead follows a “health response lag,” in which it takes many years for the health of quitters to approximate that of nonsmokers with similar characteristics (see Figure 3-5 on page 29). CBO applied the same lag structure to increases in earnings that result from ceasing to smoke: Earnings are presumed to rise toward the higher, nonsmokers’ level over the course of many years. That assumption is based on CBO’s assessment that the mechanisms through which smoking cessation might improve earnings—such as better health and less absenteeism—are likely to work in much the same way as the effects of smoking cessation on health itself.

Another issue involving the relationship between smoking and earnings is whether the lower earnings of current smokers are an offset to their higher health care costs. As mentioned above, a recent study concluded that the earnings penalty from smoking exists only among workers with employer-provided health insurance.<sup>26</sup> One interpretation of that finding is that employers pay smokers less so as to offset their higher health care costs—or in other words, that smokers pay for their higher health care costs with reduced earnings. To the extent that is true, an estimate of the total costs to society from smoking (something CBO has not attempted to construct in this analysis) should not include both the increased health care costs and reduced earnings of smokers, because that would entail double counting of what is essentially one higher cost.

26. Benjamin Cowan and Benjamin Schwab, “The Incidence of the Healthcare Costs of Smoking,” *Journal of Health Economics*, vol. 30, no. 5 (September 2011), pp. 1094–1102.

## Modeling the Budgetary Effects of an Increase in the Cigarette Tax

**A** reduction in the number of people who smoke would have repercussions throughout the federal budget. It would affect spending for a wide range of health care programs as well as for programs that provide retirement or disability benefits. Such a reduction would also affect federal revenues in various ways. To illustrate the budgetary impact of a policy intervention to reduce smoking, the Congressional Budget Office has analyzed the effects of a 50-cent per pack increase in the federal excise tax on cigarettes and small cigars. The tax increase would begin in fiscal year 2013 and would be adjusted for inflation each year thereafter; starting in 2022, it would also be adjusted to keep pace with growth in income over the long term (defined in this analysis as running through 2085). Those adjustments would mean that the tax increase could be expected to have the same effect on people's smoking behavior over time.

Estimating the effects of that policy on spending and revenues requires having an analytical model that includes the following steps:

1. Determining the total number of people who would quit or would never start smoking because of the policy. Although everyone who smoked would be subject to higher cigarette prices following the tax increase, CBO defined people "affected" by the policy as the members of those two groups.<sup>1</sup>
2. Determining what annual health care spending per capita, longevity, and earnings for various subsets of

those groups would look like in the years to come under current law and then specifying how those outcomes would change as a result of the tax increase.

3. Using the estimates from step 1 and the changes in longevity from step 2 to project the size and age distribution of the affected population under current law and under the policy.
4. Using the population projections from step 3 and the changes in health care spending and earnings from step 2 to project the effects of the policy on annual per capita health care spending and earnings for the affected population.
5. Applying the projections from steps 3 and 4 to specific federal programs—taking into account the nature of the benefits they provide and the characteristics of the populations they serve—and to federal revenues.

This chapter outlines some of the key features of CBO's modeling approach; the estimated effects on spending for specific programs and on revenues are described in the next chapter.

### Number of Smokers and Nonsmokers Affected by the Policy

CBO projects that under current law, the share of U.S. adults who smoke cigarettes will decline from about 19 percent in 2010 to about 16 percent in 2021 (see Figure 1-1 on page 3) before leveling off at about 15 percent in 2035 and for the long term. Those percentages translate to 44.2 million smokers in 2013, declining to 42.9 million in 2021 and rising to 44.5 million in 2035. Between 2021 and 2035, the projected growth in the adult population more than outweighs the projected

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1. In addition to its effects on those groups, the tax increase could alter the health and other outcomes of people who lived with someone who quit or did not start smoking because of the policy. CBO's approach to incorporating the impact of those people's lower exposure to secondhand smoke is described later in this chapter.

**Box 5-1.****The Treatment of Secondhand Smoke in CBO's Analysis**

Estimates of the number of people currently exposed to secondhand smoke (SHS) vary greatly depending on the measure used. A recent study found that the rate of self-reported exposure to SHS among non-smoking adults was approximately 15 percent but that a measure of the presence of certain nicotine-related compounds in the bodies of nonsmoking adults indicated exposure rates closer to 40 percent.<sup>1</sup> For its analysis, the Congressional Budget Office focused on SHS exposure in households, defining an SHS-exposed household as one in which non-smokers, including children, live with people who smoke inside the home. If people quit smoking because of the illustrative increase in the cigarette tax, more households would be smoke-free as a result.

Determining how changes in the number of current smokers would affect the nonsmoking population—and consequently the federal budget—is a multistage process that requires estimating the following factors:

- The percentage of smokers who live with non-smokers,
- The number of nonsmokers in households that have one or more smokers,
- The increase in the number of people living in smoke-free households as a result of the policy, and
- The magnitude of improvements in the health of people formerly exposed to secondhand smoke relative to improvements in the health of quitters.

CBO used data from the National Health and Nutrition Examination Survey, the Medical Expenditure Panel Survey, and the Current Population Survey to estimate the number of nonsmokers living with smokers—a group that would potentially be affected by the policy. (Because CBO focused only on SHS exposure in households, the number of affected non-smokers is lower than it would be if CBO had considered any exposure to SHS, including in the workplace.) Using the rates of quitting assumed to stem from the tax increase, CBO determined the proportion of households that would become smoke-free

1. See Wendy Max, Hai-Yen Sung, and Yanling Shi, “Who Is Exposed to Secondhand Smoke? Self-Reported and Serum Cotinine Measured Exposure in the U.S., 1996–2006,” *International Journal of Environmental Research and Public Health*, vol. 6, no. 5 (May 2009), pp. 1633–1648.

Continued

decline in the smoking rate, resulting in an increase in the number of smokers.

Using the price elasticities described in Chapter 2, CBO calculated the number of adult smokers who would be affected by the tax increase through 2085. That number encompasses two distinct groups: people who would be smokers when the policy took effect, and young adults (ages 18 to 21) who would not take up smoking because of the policy but would have done so otherwise. (Data from the National Health Interview Survey suggest that few people start smoking after age 21.) CBO assumed that the policy's impact on the smoking behavior of existing smokers would be fully realized by 2014, one year after the tax increase was implemented. For people who

did not take up smoking because of the policy, the effect would last through 2085—that is, in every year from 2013 to 2085, fewer young adults would start smoking because of the tax increase.

CBO projected the number of affected people by age in order to incorporate the effects of smoking on health care spending, longevity, and earnings (discussed in Chapters 3 and 4), which differ according to age group. That projection entailed estimating the number of future smokers by age and applying age-specific price elasticities.<sup>2</sup>

2. Projections of the number of future smokers were based on projections of the U.S. population by the Social Security trustees and projections of future smoking rates by CBO.

**Box 5-1.****Continued****The Treatment of Secondhand Smoke in CBO's Analysis**

as a result of the policy, and hence the number of nonsmoking children and adults who would be affected by the policy. For a household to be considered smoke-free in this analysis, every smoker in the household must quit.

To determine how exposure to SHS affects health, CBO reviewed the medical literature. Studies have found, for example, that nonsmoking adults who are exposed to SHS have a 25 percent to 30 percent greater risk of developing coronary heart disease and a 20 percent to 30 percent greater risk of developing lung cancer than adults who are not exposed to SHS.<sup>2</sup> CBO assumed that the full benefits of improved health from a smoke-free household would accrue to all adults no longer exposed to SHS in the household. On the basis of those factors, CBO incorporated the improvements in health for adults no longer exposed to SHS at home as an additional adjustment to the

health improvements for people who quit or did not take up smoking.

CBO concluded that the total impact of the policy on health care spending and longevity for adults who were no longer exposed to SHS would be equivalent to about 5 percent of the policy's total impact on health care spending and longevity for adults who stopped or never started smoking. That conclusion combines two effects described earlier: the change in the number of people who would no longer be exposed to SHS (as a percentage of adults who would change their smoking behavior because of the policy) and the resulting improvements in health for people who would no longer be exposed to SHS (relative to the improvements in health for adults who would no longer be smoking). CBO also incorporated that adjustment to changes in earnings.

For programs that cover large numbers of children, such as Medicaid, CBO used a similar set of calculations to incorporate the improvements in health for children who would no longer be exposed to SHS at home because of the policy.

2. Public Health Service, *The Health Consequences of Involuntary Exposure to Tobacco Smoke—A Report of the Surgeon General* (2006), Chapters 7 and 8.

In addition to smokers affected by the policy, CBO incorporated the impact of a change in the cigarette tax on people exposed to secondhand smoke. Calculating that impact involved determining the number of people who would no longer be exposed to secondhand smoke as a result of the policy and the impact of such exposure on health (see Box 5-1).

### **Methodology for Estimating Outcomes Under Current Law and the Illustrative Tax Increase**

CBO used the findings in Chapters 3 and 4 (and related calculations) to determine the effects of an increase in the cigarette tax on health care spending, longevity, and earnings for various subsets of the population affected by the policy.<sup>3</sup> To do that, CBO had to project what the

future smoking behavior of the affected groups would be under current law. Of the people projected to stop smoking under the policy (groups 1B and 2B in Figure 5-1), some would quit at a later date under current law—so the policy would simply accelerate their quitting—and others would continue to smoke until death under current law. Similarly, of the people who would not

3. In Chapter 3, CBO compared health care spending and mortality for current or former smokers and people who have never smoked but who otherwise resemble smokers. That approach offered a comprehensive accounting of the costs of smoking and allowed CBO's analyses to be directly comparable with the results of previous studies. The illustrative tax increase, however, would affect current and future smokers but not former smokers. Thus, to estimate the budgetary effects of the tax increase, CBO repeated those analyses by comparing only *current* smokers with people who have never smoked but who have the other characteristics of *current* smokers.

start smoking because of the policy (groups 4B and 5B in the figure), some would take up smoking but quit at a later date under current law, and others would take up smoking and continue until death. A key assumption in CBO's analysis is that smokers who quit under current law would be more likely to do so because of illness than smokers who quit because of the tax increase.

### Health Care Spending and Longevity

CBO estimated health care spending and mortality in each year under current law using weighted averages of spending or mortality for people who continue to smoke and for those who quit smoking, by the time elapsed after quitting. For example, if 2 percent of smokers affected by the policy would quit on their own in 2013 in the absence of the tax increase, then the probability of dying in 2013 under current law for affected people would be  $(0.98 \times \text{the probability of death among current smokers}) + (0.02 \times \text{the probability of death among former smokers who quit between 0 and 4 years earlier})$ . For those calculations, CBO used the values that surveys report for former smokers (as presented in Chapter 3), which show that mortality rates and health care spending temporarily increase when people stop smoking.

CBO assumed that over time, with the tax increase in place, health care spending for affected people would decrease and longevity would increase, eventually approaching the levels for people who do not smoke but have the other characteristics of smokers.<sup>4</sup> The transition to lower annual health care spending and longer life expectancy was assumed in CBO's model to vary according to whether people who would quit under the new policy would continue to smoke or quit under current law:

- For people who would quit under the policy but would keep smoking until death under current law (group 1B in Figure 5-1), health care spending and longevity were weighted so that they were initially closer to those for current smokers and eventually—using the health response lag shown in Figure 3-5 on page 29—approached the levels for people who have never smoked but who otherwise resemble smokers.
- For people who would quit under current law as well as under the policy (group 2B in Figure 5-1), health care spending and longevity were further adjusted to reflect the fact that many of those people would have

stopped smoking under current law because of bad health. CBO projected the year in which they would have quit in the absence of the tax increase. People who would have stopped sometime close to 2013 were assumed to experience a temporary increase in health care spending and decrease in longevity, similar to the effects that people currently experience when they quit. That assumption recognizes that those near-term quitters would stop smoking largely because of ill health and, consequently, would experience very little improvement in health care spending and longevity for having quit slightly earlier under the policy. At the other extreme, CBO assumed that people whose quitting would be accelerated by many years because of the policy would largely avoid negative health effects.

CBO's model also considers the effects on people who would have started smoking under current law but refrain from doing so because of the policy (groups 4B and 5B in Figure 5-1). Health care spending and longevity for those people were assumed to be the same as for people who have never smoked but who otherwise resemble smokers.

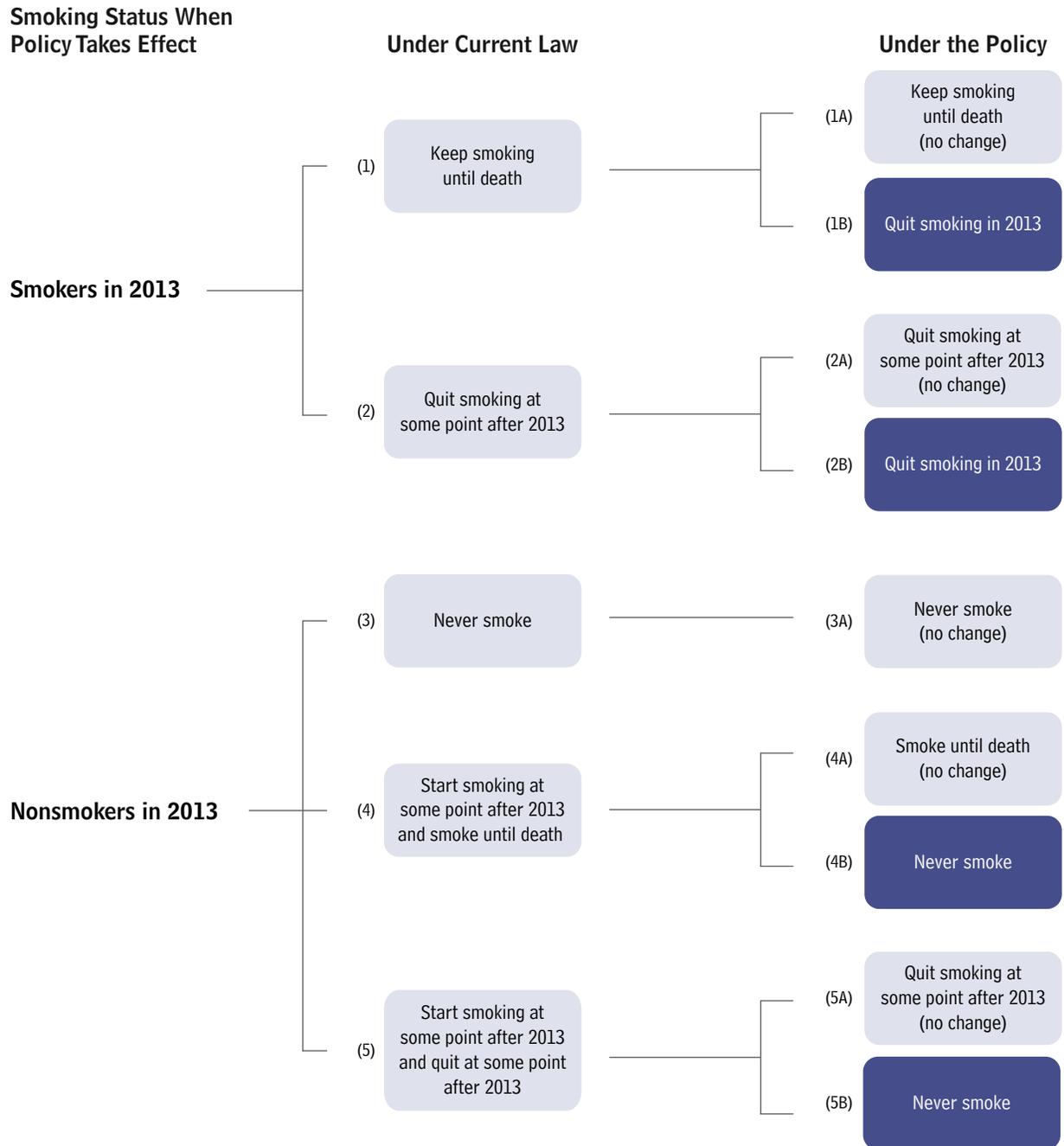
### Earnings

Earnings under current law were calculated using the same formula that was used for health care spending and longevity: a weighted average of earnings for people who continue to smoke and for those who quit smoking. In

4. That assumption may not be accurate if people's other individual characteristics or behaviors (which are assumed in the analysis to be constant) change with or because of smoking cessation. For instance, many studies have found that smoking cessation is associated with weight gain; see, for example, Daniel Eisenberg and Brian C. Quinn, "Estimating the Effect of Smoking Cessation on Weight Gain: An Instrumental Variable Approach," *Health Services Research*, vol. 41, no. 6 (December 2006), pp. 2255-2266; and Panagiotis Kasteridis and Steven T. Yen, "Smoking Cessation and Body Weight: Evidence from the Behavioral Risk Factor Surveillance Survey," *Health Services Research*, online early release (February 22, 2012). Although CBO did account for people's general category of body mass index (underweight, normal, overweight, or obese), it did not change the categorization of anyone who was modeled as changing his or her smoking behavior. Thus, effects will be somewhat misstated to the extent that people move from one general category of body mass index to another because of the higher cigarette tax. However, the typical amount of weight gain after smoking cessation is small enough to suggest that such changes in category are unlikely and that specifically correcting for those cases would have a negligible impact on the budget estimates presented in the next chapter.

**Figure 5-1.**

**Groups of People That CBO Considered in Its Analysis to Be Affected by the Illustrative Increase in the Cigarette Tax**

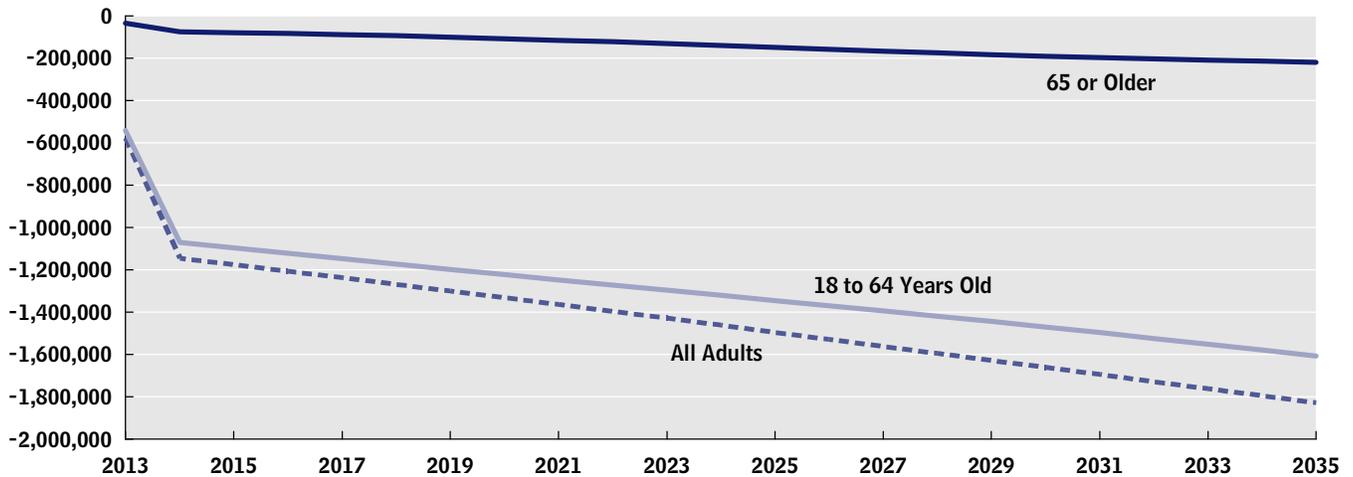


Source: Congressional Budget Office.

Note: Dark blue shading denotes groups considered to be directly affected by the policy. (CBO's analysis also takes into account the policy's indirect effects on people who are no longer exposed to secondhand smoke at home.)

**Figure 5-2.**

### Cumulative Reduction in the Number of Smokers Because of the Illustrative Increase in the Cigarette Tax



Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

This figure represents the cumulative number of people who would quit smoking or never begin smoking as a result of the rise in cigarette prices stemming from the tax increase.

this case, however, to estimate earnings for people who quit smoking, CBO did not use the actual earnings data that surveys report for former smokers. As discussed in Chapter 4, survey data indicate that former smokers have higher earnings than nonsmokers. In CBO’s view, that result occurs because former smokers have unmeasured characteristics that lead to higher earnings independent of smoking behavior. For that reason, the earnings of former smokers are not an appropriate guide to the effect of smoking cessation on earnings. Instead, CBO computed earnings for quitters as a weighted average of earnings for current smokers and for people who do not smoke but have the other characteristics of smokers (as presented in Chapter 4), using the health response lag described in Chapter 3. In essence, although health care spending and mortality rates are expected to increase temporarily for people who quit smoking under current law, earnings for those people are assumed to slowly improve without falling first.

Earnings for people who quit smoking under the policy (groups 1B and 2B in Figure 5-1) were calculated with the same formula as the one used for people who quit

under current law: Earnings were initially closer to those of current smokers and eventually approached those of people who have never smoked but who otherwise resemble smokers. Thus, changes in earnings among quitters are the same under the policy as under current law; the policy simply accelerates those changes.

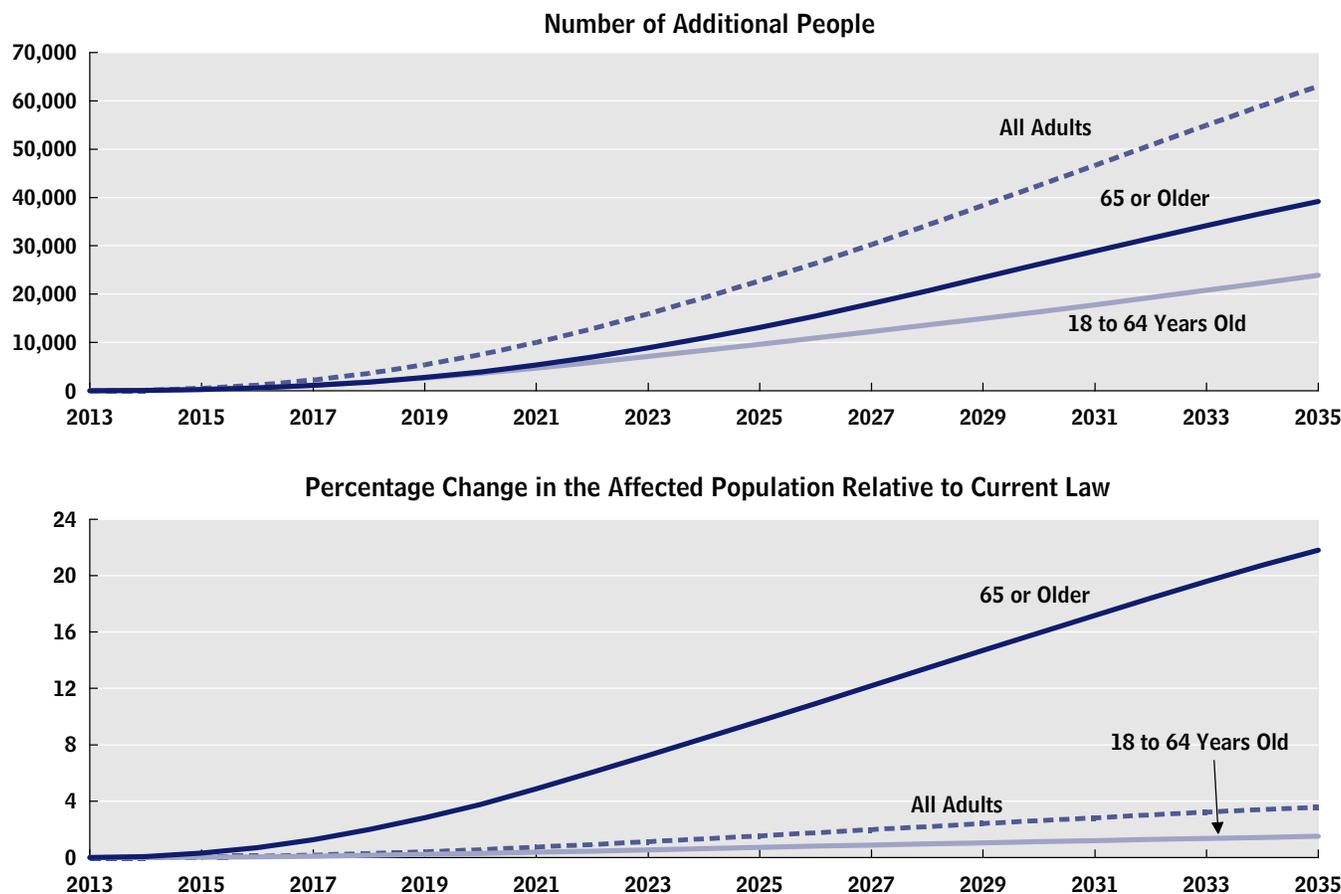
Earnings for people who would start to smoke under current law but refrain from doing so because of the policy (groups 4B and 5B in the figure) are assumed to match earnings for people who do not smoke but have the other characteristics of smokers.

### Population Changes Resulting from the Policy

With the illustrative increase in the cigarette tax, a total of about 1.4 million fewer adults would smoke in 2021 than would otherwise be the case, CBO estimates (see Figure 5-2). By 2035, that reduction would total about 1.8 million. In keeping with CBO’s elasticity assumptions, the majority of those people would be between the ages of 18 and 64.

**Figure 5-3.**

**Population Increase Resulting from the Illustrative Increase in the Cigarette Tax**



Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

The top panel shows the number of additional people who would be alive in a given year because of the policy. The bottom panel shows those additional people as a percentage increase in the population affected by the policy (defined as people who would quit smoking or never begin smoking as a result of the rise in cigarette prices stemming from the tax increase).

As the reduction in smoking increased longevity (in line with the health response lag described in Chapter 3), the growth of the U.S. population would increase slightly. By 2021, just over 10,000 additional adults would be alive because of the policy who would not be alive under current law—a little less than half of them between the ages of 18 and 64 and a little more than half age 65 or older (see the top panel of Figure 5-3). Of the 18- to 64-year-olds who would quit or not start smoking because of the tax increase, 0.4 percent would be alive in 2021 who would not be alive under current law; of the people 65 or older, that figure would be 4.9 percent (see the bottom

panel of Figure 5-3). Those additional survivors would represent increases of about 0.002 percent in the total number of 18- to 64-year-olds and 0.009 percent in the total number of people 65 or older compared with the populations in those age groups under current law.

By 2035, the number of additional adults would grow to about 63,000. At that point, about 1.5 percent of the 18- to 64-year-olds and 21.8 percent of the people age 65 or older who quit or did not start smoking because of the tax increase would be alive who would not be alive under current law. Those changes represent increases of

0.011 percent in the total number of 18- to 64-year-olds and 0.051 percent in the total number of people 65 or older compared with the populations in those age groups under current law.

## Changes in Annual per Capita Health Care Spending and Earnings

CBO estimates that for adults affected by the policy (those who would quit or not start smoking as a result of the tax increase) annual per capita spending on health care would be about 7 percent lower in 2021 than it would be under current law and about 10 percent lower in 2035 (see the top panel of Figure 5-4). Those estimates were computed for each year by taking the difference in annual per capita health care spending under the illustrative tax increase and under current law (as described above) and dividing it by annual per capita health care spending for the U.S. population.<sup>5</sup> That percentage change represents a weighted average—based on detailed population counts (by age) under current law and under the tax increase.<sup>6</sup> (The advantage of estimating changes in annual per capita health care spending for the affected population relative to overall annual per capita health care spending is that CBO can then apply that percentage change to federal programs—each of which has its own per capita spending level.)

The reduction in annual per capita health care spending for people affected by the policy would grow larger with time as improvements in health accumulated and as the affected population was increasingly made up of people who never took up smoking under the policy. The percentage reduction would be somewhat greater among people ages 18 to 64, reflecting the slightly bigger impact of smoking on health care spending for that age group.<sup>7</sup>

5. CBO used those results, which were based on the civilian non-institutionalized population, to guide its estimates for all adults.
6. CBO computed a weighted average for all ages for illustrative purposes. When estimating changes to specific programs, CBO used more disaggregated results to account for differences by age in the programs' participation and spending.
7. Although the percentage reduction in health care spending is estimated to be somewhat smaller for people age 65 or older, the dollar impact on total health care spending may still be larger for those people because average spending levels increase with age.

Likewise, CBO estimates that average per capita earnings for adults affected by the policy would be almost 3 percent higher by 2021 and about 3½ percent higher by 2035 than under current law, measured as a percentage of average earnings for the total U.S. population (see the bottom panel of Figure 5-4). Again, the average percentage change in earnings would be slightly higher among people ages 18 to 64, reflecting the slightly larger impact of smoking on earnings for that age group than for people age 65 or older (see Chapter 4).

## Methodology for Estimating Changes in Federal Spending and Revenues

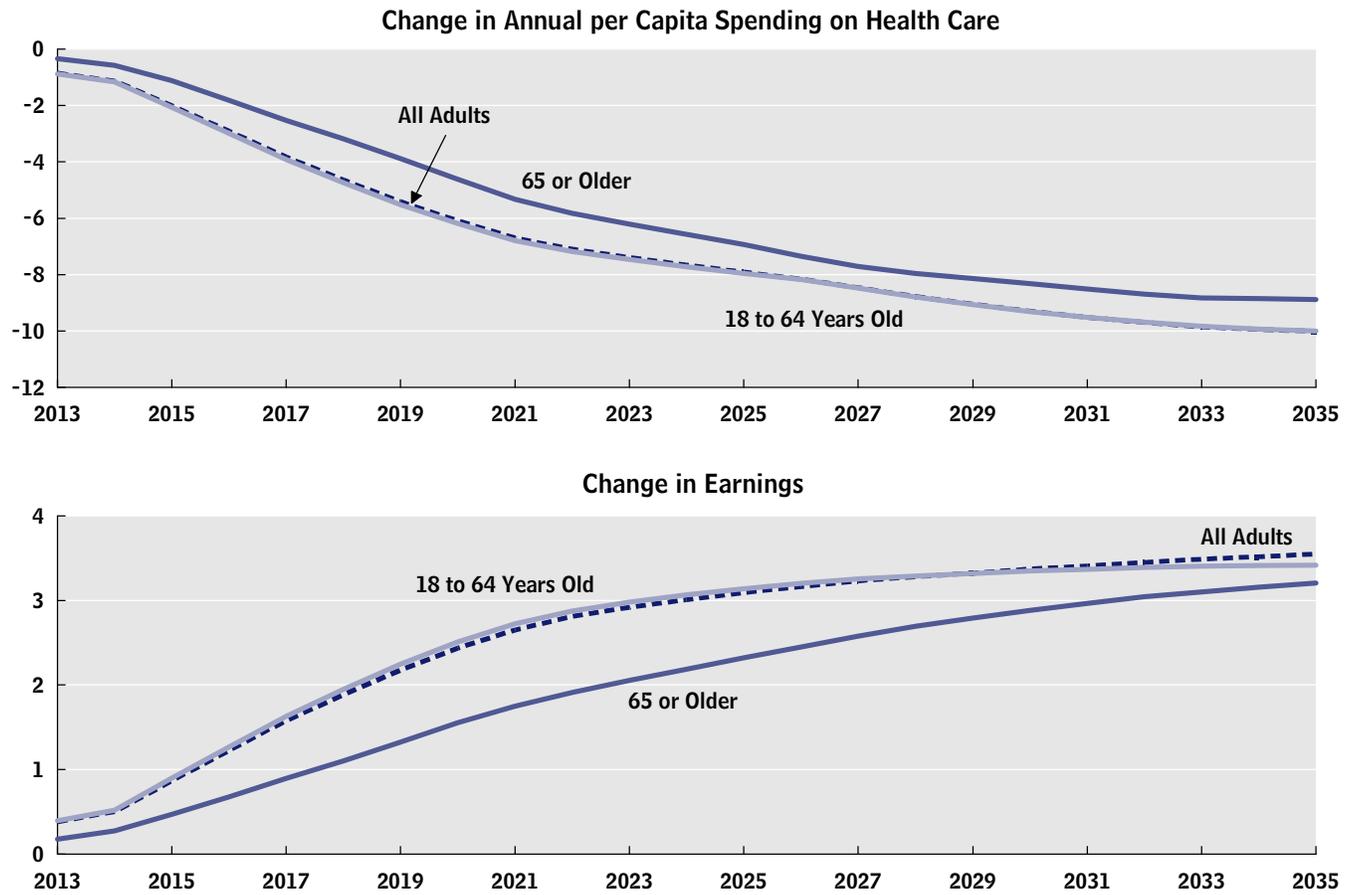
Estimating the budgetary impact of the tax increase on each affected federal program and on federal revenues—beyond the additional excise tax receipts that would be collected because of the policy—requires the following steps:

- Identifying the share of the population affected by the policy (with an adjustment to reflect people no longer exposed to secondhand smoke, as described in Box 5-1) that would participate in each program.
- Estimating the change in spending by federal health care programs for people affected by the policy (who are expected to be alive under current law and under the policy), using the percentages shown in the top panel of Figure 5-4 applied to the average spending projected under current law for each program; and then calculating the federal costs of the additional lives shown in the top panel of Figure 5-3, using spending for people affected by the policy applied to each program's average cost of benefits for people in similar age groups under current law.
- Estimating the effects on participation rates in disability programs that would come from improvements in health and longevity.
- Estimating the effects on federal retirement programs that would result from increases in longevity and changes in people's retirement decisions.
- Estimating the change in revenues that would stem from the increase in taxable income for people affected by the policy (who are expected to be alive under current law and under the policy), using the percentage

**Figure 5-4.**

**Average Changes in Health Care Spending and Earnings for People Affected by the Illustrative Increase in the Cigarette Tax**

(Percent)



Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

This figure represents the percentage changes in annual per capita health care spending and earnings for people who would quit smoking or never begin smoking as a result of the rise in cigarette prices stemming from the tax increase. The changes were computed by taking the difference in annual health care spending or earnings for those people under the policy and under current law and dividing that difference by either annual per capita health care spending for the U.S. population (based on data for 2000 to 2008 from the Medical Expenditure Panel Survey and for 1998 to 2007 from the National Health Interview Survey) or average earnings for the U.S. population (based on data for 2006 and 2007 from the Current Population Survey).

changes in earnings in the bottom panel of Figure 5-4 applied to average earnings projected under current law; and then calculating the additional taxable income from the additional lives shown in the top panel of Figure 5-3, using earnings for people affected by the policy applied to average projected earnings for people of similar ages under current law.

- Estimating the change in revenues that would occur as improvements in health led to lower health insurance premiums—and thus higher taxable wages—and to lower subsidies through health insurance exchanges.

The results of those calculations are described in the next chapter.



## Effects of an Increase in the Cigarette Tax on the Federal Budget

**T**he Congressional Budget Office used the results of the methodology described in Chapter 5 to assess how a 50-cent per pack increase in the federal excise tax on cigarettes and small cigars would alter spending on certain federal programs as well as federal revenues. Specifically, CBO estimated that if the tax increase began in 2013 and was indexed thereafter to keep pace with inflation, and later with the growth of people's income, it would reduce federal budget deficits by a total of about \$42 billion through 2021 (the end of the standard 10-year window for budget estimates at the time this analysis was conducted).<sup>1</sup> The policy would continue to reduce annual deficits over the long term (defined in this analysis as running through 2085), although by small amounts relative to the size of the economy—by about 0.02 percent of gross domestic product (GDP), on average.

Those reductions in deficits stem largely from additional excise tax receipts collected because of the increase in the tax rate. However, there would also be costs or savings for a large number of programs—as well as additional tax revenues—because of changes in the health, longevity, or earnings of people affected by the policy (defined as those who would stop or never start smoking as a result of the tax increase) as well as of people who would no longer be exposed to secondhand smoke (SHS) at home because of the policy. Thus, the estimates reported in this chapter reflect the following factors:

- People affected by the policy and those no longer exposed to SHS because of it would experience improvements in their health over time, which would decrease annual health care spending for them and might also reduce their likelihood of qualifying for disability benefits. Those effects would reduce federal outlays for health care and disability programs. In addition, better health would result in lower premiums for private health insurance, which would affect federal spending on premium and cost-sharing subsidies for people who purchase health insurance through the exchanges set to begin operating in 2014.<sup>2</sup>
- People affected by the policy or no longer subject to SHS would be likely to live longer than they would have if they had started or continued to smoke or to be exposed to SHS. Thus, the savings to the federal government from lower annual per capita health care spending and from fewer people becoming eligible for disability benefits would be at least partly offset by additional spending as healthier people lived longer.
- An increase in the excise tax on cigarettes would have both direct and indirect effects on federal revenues. Revenues would rise directly with the collection of

1. Estimates of the policy's budgetary effects through 2021 are relative to CBO's current-law baseline projections for the 2012–2021 period published in Congressional Budget Office, *Preliminary Analysis of the President's Budget for 2012* (March 2011).

2. Created under the Affordable Care Act, health insurance exchanges are clearinghouses through which people will be able to compare and purchase health insurance plans available in their area and through which federal tax credits for premium and cost-sharing subsidies will be made available.

additional excise tax receipts.<sup>3</sup> Revenues would also be affected less directly because of changes in health as fewer people smoked or were exposed to SHS. For example, the improved health and longevity of some workers would increase their labor force participation and wages, thus raising receipts from income and payroll taxes. In addition, lower health insurance premiums would result in a larger share of compensation being paid in the form of taxable wages rather than untaxed benefits, boosting receipts from income and payroll taxes further.<sup>4</sup>

This chapter summarizes CBO's analysis of the effects of the illustrative tax increase on spending for various non-military federal health care, retirement, and disability programs as well as for programs of the Departments of Defense and Veterans Affairs. The chapter also examines the policy's impact on federal revenues. The discussion of changes in spending focuses on mandatory programs (whose funding is determined by the programs' rules and eligibility criteria rather than by annual appropriations from lawmakers). For programs that also have a component of discretionary spending (which is determined by appropriations each year), CBO calculated the reductions in costs resulting from the policy; those reductions could be realized if future appropriations were decreased to reflect the lower costs.

The budgetary effects described here are illustrative and do not represent a CBO cost estimate of a legislative proposal. They differ from traditional CBO cost estimates in several respects:

3. Excise taxes reduce the base for income and payroll taxes because they are a business expense for companies required to pay them. Therefore, an increase in excise taxes results in decreases in taxable income somewhere in the economy (depending on whether companies pass the expense on to their workers or their customers), which produces a loss of government revenues from income and payroll taxes that partly offsets the revenues collected from the higher excise taxes themselves. For more details, see Congressional Budget Office, *The Role of the 25 Percent Revenue Offset in Estimating the Budgetary Effects of Legislation* (January 2009); and Joint Committee on Taxation, *The Income and Payroll Tax Offset to Changes in Excise Tax Revenues*, JCX-59-11 (December 23, 2011). Throughout this chapter, any references to changes in excise tax receipts are net of those associated losses in income and payroll tax receipts.
4. Another, far smaller, example of additional revenues related to improved health is a reduction in tax credits for the purchase of insurance through the health insurance exchanges.

- Cost estimates apply to proposed legislation, which typically includes specific language about how a proposal will be designed and implemented. Such specifics have a significant impact on the estimates.
- Cost estimates generally focus on a 10-year budget window and do not usually include a detailed analysis of long-term budgetary effects, which CBO has included in this study.
- The estimates described here represent an attempt to trace the impact of smoking cessation on a large number of federal programs and revenue sources that would be affected by it. Traditional cost estimates do not generally include so many budgetary effects, especially when those effects are minimal or very indirect.
- Cost estimates assume that GDP will be unchanged by the policy proposal; this analysis does not include that assumption.

## Budgetary Impact Through 2021

A reduction in the number of people who smoke or are exposed to secondhand smoke would have budgetary effects on a range of federal health care programs—including Medicaid, Medicare, subsidies offered through health insurance exchanges, the Federal Employees Health Benefits Program, and health care for military service members and veterans—as well as on Social Security's retirement and disability benefits. Such a reduction would also affect the federal government's revenues from various sources (in addition to its effects on tax credits offered through the health insurance exchanges). Those various budgetary effects are displayed in Table 6-1 on page 52.

### Medicaid

CBO estimates that the decline in smoking resulting from the illustrative tax increase would reduce federal spending for Medicaid by a total of \$563 million over the 2013–2021 period (about \$120 million in 2021 alone, or 0.02 percent of the total federal outlays expected for Medicaid in that year).<sup>5</sup> Those estimates incorporate

5. The federal government pays a share of the costs that states incur for providing health care services through the Medicaid program. The decrease in federal spending projected in this analysis implies a decrease in states' Medicaid spending as well.

savings for current enrollees that reflect their lower annual health care expenditures as well as costs that reflect their increased longevity. The estimates also include two types of savings that warrant further explanation: savings that would occur because fewer low-birth-weight babies would be born to pregnant women covered by Medicaid and savings that would occur because fewer children enrolled in the program would be exposed to secondhand smoke.<sup>6</sup>

**Pregnancy Outcomes.** Nearly half of all pregnancies are covered by Medicaid, CBO estimates. By decreasing smoking among pregnant women, a 50-cent per pack increase in the cigarette tax is projected to produce a net reduction of \$95 million in federal spending for Medicaid over the 2013–2021 period. Lower smoking rates would reduce spending on maternal and infant health by decreasing the likelihood that women would give birth to low-weight babies or experience various complications during pregnancy. Those savings would be partially offset by costs associated with additional live births as the number of miscarriages declined.

**Children’s Exposure to Secondhand Smoke.** Reducing the number of adult smokers would cause fewer children to be subject to SHS at home. Children covered by Medicaid are more likely to live in homes with smokers than other children are.<sup>7</sup> Using data from the Current Population Survey, CBO estimates that almost two-thirds of adults in households where someone is enrolled in Medicaid live with children—a ratio that CBO expects to decline following the Medicaid expansion set for 2014, when more childless adults will join the program. Following the steps described in Chapter 5, CBO estimated that a reduction in SHS exposure at home would lower federal spending for Medicaid by \$103 million over the 2013–2021 period.

### Medicare

Spending for Medicare would also be lower through 2021 under the cigarette tax increase, reflecting lower annual health care expenditures for people who stopped smoking

or being exposed to SHS, partly offset by additional costs resulting from those people’s greater longevity. CBO estimated the net savings in Medicare outlays at \$251 million over the 2013–2021 period (\$50 million in 2021, or 0.006 percent of projected Medicare outlays in that year, net of beneficiaries’ premiums and certain amounts paid by states).

CBO assumed that nearly all people age 65 or older who quit smoking or were no longer exposed to SHS because of the tax increase would be enrolled in Medicare. The \$251 million in net savings can be broken down into savings that result from lower Medicare spending per capita and increased costs that result from greater longevity:

- To estimate the change in Medicare outlays from lower annual spending for people who quit smoking because of the policy, CBO used the results from the modeling described in Chapter 5 for individuals in the Medicare age group. The percentage difference in annual per capita health care spending between current law and the policy, applied to CBO’s estimate of per capita Medicare spending under current law, yields savings for the program (net of changes in offsetting receipts) of \$444 million through 2021.
- At the same time, Medicare beneficiaries who quit smoking as a result of the tax increase would be likely to live longer. CBO applied its estimates of age-adjusted per capita spending for people affected by the policy (calibrated to CBO’s estimate of per capita Medicare spending under current law) to calculate a cost for each additional participant in Medicare under the policy. Greater longevity would result in more people participating in the program in a given year, raising spending for Medicare (net of changes in offsetting receipts) by about \$193 million over the 2013–2021 period.

### Subsidies Through Health Insurance Exchanges

Beginning in 2014, federal subsidies for health insurance purchased through insurance exchanges will become available for individuals and families who meet income and other eligibility criteria. Those subsidies will take two forms:

- Subsidies to help people pay their health insurance premiums will be structured as refundable tax credits. In keeping with established practice for refundable credits, the portions of those credits that reduce

6. This analysis does not incorporate any effects on federal spending for the Children’s Health Insurance Program. That program is subject to annual caps on spending, which typically are binding. As a result, small increases or decreases in cost for certain individuals are not likely to change overall spending for the program.

7. Douglas Levy, Nancy Rigotti, and Jonathan Winickoff, “Medicaid Expenditures for Children Living with Smokers,” *BMC Health Services Research*, vol. 11, no. 125 (May 2011), p. 125.

**Table 6-1.**

**Estimated Budgetary Impact Through 2021 of the Illustrative Increase in the Cigarette Tax**

(Millions of dollars)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total, 2013- 2021
<b>Effects on Outlays<sup>a</sup></b>										
Health Care Programs (Excluding military)										
Medicaid	-9	-23	-35	-48	-62	-74	-89	-103	-120	-563
Medicare	-2	-8	-14	-23	-30	-35	-42	-47	-50	-251
Subsidies through health insurance exchanges	0	-1	-2	-5	-9	-13	-17	-22	-27	-95
Federal Employees Health Benefits Program	*	-1	-1	-2	-2	-2	-3	-3	-3	-17
Income Security Programs										
Social Security <sup>b</sup>										
Old-Age and Survivors Insurance	*	*	2	4	8	15	24	38	55	147
Disability Insurance	*	*	*	-1	-1	-1	*	*	1	-1
Supplemental Security Income	*	*	*	*	*	*	*	*	1	*
Civil Service Retirement	*	*	*	1	1	2	3	5	7	19
Military Programs										
Military retirement	*	*	*	1	1	2	3	4	6	17
Veterans' compensation	*	*	*	1	1	2	3	4	6	17
DoD health care system (Tricare)	*	*	*	*	*	*	*	*	*	-3
<b>Total Effects on Outlays</b>	<b>-12</b>	<b>-33</b>	<b>-51</b>	<b>-72</b>	<b>-93</b>	<b>-104</b>	<b>-117</b>	<b>-123</b>	<b>-124</b>	<b>-730</b>

Continued

people's tax liability will be recorded in the budget as reductions in revenues, and the portions that exceed people's tax liability will be classified as outlays.

- Subsidies to help people pay their cost-sharing amounts, such as copayments and deductibles, will be classified as outlays.

Both types of subsidies would be lower under the illustrative tax increase because people in the subsidized population who would be affected by the policy or no longer subject to SHS because of it would experience better health. Part of the savings from those improvements in health would be offset because increases in longevity would enable a larger number of people to receive subsidies through the exchanges in a given year. The net effect of those savings and costs would be to reduce federal outlays by \$95 million between 2014 and 2021, CBO estimates—reflecting decreases of \$83 million in outlays for premium tax credits and of \$12 million in cost-

sharing subsidies. (The reduction in premium tax credits would also increase revenues by a total of \$10 million over that period.)<sup>8</sup>

**Federal Employees Health Benefits Program**

The federal government offers health insurance to its current workers and retirees and their families through the

8. The average change in annual health care spending for people affected by the policy was assumed to generate an equivalent change in spending by private health insurance for those people, which in turn was estimated to reduce private health insurance premiums overall. The overall reduction in premiums was then calibrated to the number of people affected by (or no longer exposed to SHS because of) the policy who were assumed to receive premium credits and cost-sharing assistance through health insurance exchanges and was estimated to be proportional to the subsidies those people would be expected to receive. As in the estimate for Medicaid, this estimate includes a reduction in low-birth-weight babies and miscarriages among women with private health insurance and a reduction in SHS exposure among children with such insurance.

Table 6-1.

Continued

## Estimated Budgetary Impact Through 2021 of the Illustrative Increase in the Cigarette Tax

(Millions of dollars)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total, 2013- 2021
<b>Effects on Revenues</b>										
Cigarette Tax Receipts <sup>c</sup>	4,599	4,060	4,049	4,081	4,117	4,163	4,205	4,243	4,276	37,793
Effects from Improvements in Health <sup>d</sup>										
Effects of higher labor earnings	18	59	120	193	278	376	483	606	731	2,864
Effects of lower health insurance premiums	6	18	25	30	36	42	49	58	66	330
Effects of lower subsidies through health insurance exchanges	0	*	*	1	1	2	2	2	3	10
<b>Total Effects on Revenues</b>	<b>4,623</b>	<b>4,137</b>	<b>4,194</b>	<b>4,305</b>	<b>4,432</b>	<b>4,583</b>	<b>4,739</b>	<b>4,909</b>	<b>5,076</b>	<b>40,997</b>
<b>Effects on the Deficit</b>										
Net Decrease (-) in the Deficit <sup>a</sup>	-4,635	-4,170	-4,245	-4,377	-4,525	-4,687	-4,856	-5,033	-5,200	-41,727

Sources: Congressional Budget Office and the staff of the Joint Committee on Taxation.

Notes: The budgetary effects shown here are relative to CBO's March 2011 current-law baseline projections (published in Congressional Budget Office, *Preliminary Analysis of the President's Budget for 2012*).

The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation.

\* = between -\$500,000 and \$500,000; DoD = Department of Defense.

- The outlay effects of the tax increase all result from improvements in health (reflecting changes in longevity and per capita health care spending). The effects shown here apply only to mandatory outlays. In addition, the policy would reduce the costs of operating the portions of the Federal Employees Health Benefits Program, Tricare, and veterans' health care programs that are subject to annual appropriation actions by a total of \$103 million over the 2013–2021 period. The federal government could narrow its budget deficits by that additional amount if appropriations were reduced to reflect those lower costs.
- The cash flows for transactions related to the Social Security trust funds are classified as off-budget.
- An increase in excise taxes reduces revenues from income and payroll taxes; these estimates are net of those reductions.
- These effects are on receipts from income and payroll taxes. A portion reflects changes in payroll taxes for Social Security, which are classified as off-budget.

Federal Employees Health Benefits (FEHB) program. The government typically contributes about 70 percent of the premium costs. Contributions for retirees are mandatory spending, whereas contributions for current employees are discretionary spending. For retirees and their dependents, improvements in health resulting from the higher cigarette tax would reduce federal payments for the FEHB program by \$24 million over the 2013–2021 period, CBO estimates. At the same time, increases in longevity for retirees and their dependents affected by, or no longer exposed to SHS because of, the policy would increase federal spending for the program by \$7 million over that period—for a net reduction of \$17 million in

federal spending for annuitants' health benefits between 2013 and 2021 (\$3 million, or 0.01 percent of the program's mandatory spending, in 2021).

For current federal workers, improvements in the health of people affected by, or no longer exposed to SHS because of, the policy would lower federal contributions for FEHB benefits by another \$24 million through 2021. The government could narrow the budget deficit by that additional amount if appropriations were reduced in a corresponding way. (Those and other discretionary amounts are not shown separately in Table 6-1, but they are summarized in a footnote to the table.) CBO does not

estimate that improvements in longevity would lead to an increase in the size of the federal workforce; in any year, the number of federal workers is subject to the funding provided by the Congress.

### Social Security

The cigarette tax increase would affect spending for both components of Social Security: the Old-Age and Survivors Insurance (OASI) program, which pays benefits to retirees, their eligible spouses and children, and some survivors of deceased workers; and the Disability Insurance (DI) program, which pays benefits to workers who become disabled before reaching the normal retirement age for OASI and to their eligible spouses and children. However, the policy's impact on OASI spending would be far greater than its impact on DI spending.

**Old-Age and Survivors Insurance Program.** The policy's net effect on the OASI program would be to increase spending by a total of \$147 million over the 2013–2021 period, CBO estimates (\$55 million in 2021, or 0.005 percent of total outlays expected for OASI in that year). Most of the change in outlays for the OASI program under the policy would stem from effects on longevity. However, the additional costs for people who would participate in the program longer because of greater longevity would be offset somewhat by a reduction in benefits paid to survivors, who are eligible to claim a benefit (or in some cases a higher benefit) when their spouse or parent dies. (Greater longevity on the part of spouses or parents would reduce the period in which survivors could claim higher benefits.) The net effect of greater longevity would be to increase spending for OASI by \$152 million over the 2013–2021 period, CBO estimates.

In addition, the reduction in smoking induced by the policy would change some people's retirement behavior. CBO assumed that some of the additional earnings that would result under the policy (discussed in Chapter 4) would reflect people who stayed in the workforce longer and retired later. Thus, CBO estimated a small savings (\$10 million) in benefit payments over the 2013–2021 period because some older workers would delay retirement, although those savings would be offset later (by \$5 million during the 2013–2021 period) as those workers' increased earnings translated to higher average retirement benefits.

**Disability Insurance Program.** The policy's net effect on the DI program would be to reduce spending by a total of about \$1 million over the 2013–2021 period, CBO estimates, although annual spending would start increasing in 2020. CBO estimated those effects by comparing the rates at which the population potentially affected by, or no longer exposed to SHS because of, the policy would become eligible for the DI program or would die under current law and under the policy. Because a disproportionate share of DI beneficiaries have mental illnesses, and those beneficiaries may be less inclined than others to quit smoking when faced with higher cigarette prices, CBO reduced the share of the DI population assumed to quit in response to the policy by 25 percent for this estimate. Likewise, because many DI beneficiaries are deemed disabled because of multiple conditions, some of which are unrelated to smoking and would not improve if a beneficiary quit, CBO also reduced by 25 percent its estimate of the extent to which the policy would reduce the number of new DI awards.

### Supplemental Security Income

The Supplemental Security Income (SSI) program provides income support payments to elderly and disabled people with very low income. The effects of a higher cigarette tax on spending for SSI are estimated to be extremely small: less than \$500,000 over the 2013–2021 period.

Because of similarities between the SSI and Disability Insurance programs, CBO based its estimate for SSI on the DI estimate described above, adjusting the change in DI spending for three factors:

- The ratio of SSI outlays for blind or disabled adults to DI outlays (to account for the different sizes of the programs);
- The ratio of SSI's share of beneficiaries with mental illnesses to DI's share of beneficiaries with mental illnesses (to account for the lower likelihood that people with serious mental illnesses will stop smoking); and
- The ratio of SSI's share of beneficiaries with cancer, other lung diseases, or heart disease to DI's share of beneficiaries with those illnesses (to account for a greater likelihood that SSI recipients would still become disabled at some point even if they quit smoking).<sup>9</sup>

The SSI estimate also incorporates an adjustment to account for fewer low-birth-weight babies, similar to the adjustment for Medicaid discussed above. However, CBO reduced that estimated effect, on the basis of administrative data from SSI about primary and secondary diagnoses, to reflect the fact that people can qualify for SSI for a number of different reasons. Thus, CBO's estimate is based on a projected reduction in SSI caseloads for infants who would be eligible for the program solely because of low birth weight. At the same time, CBO estimated a small rise in SSI caseloads under the policy because of the assumption that a decrease in miscarriages would lead to an increase in live births.

### Civil Service Retirement

The greater longevity resulting from a reduction in smoking would affect retirement programs for federal civilian employees. On net, that longevity effect would increase spending on federal retirement benefits by \$19 million over the 2013–2021 period, CBO estimates (\$7 million, or 0.008 percent of projected outlays, in 2021).

### Military Programs

Reductions in smoking from a cigarette tax increase would affect programs of the Department of Defense (DoD) and the Department of Veterans Affairs (VA) in multiple ways. DoD provides retirement benefits to veterans who served long enough to qualify for military retirement, and VA provides benefits to veterans with varying lengths of service. In addition, both departments operate numerous hospitals and clinics and provide health benefits to qualified beneficiaries. The increase in the cigarette tax would affect military retirement benefits and veterans' disability compensation only through its impact on longevity.<sup>9</sup> In contrast, the policy would affect the costs of DoD's and VA's health care systems through its impact on annual health care spending per capita as well as on longevity.

To estimate the number of program beneficiaries affected by the policy or no longer exposed to SHS because of it,

9. The percentage of disabled SSI recipients who are disabled because of conditions that medical research has linked to smoking—and thus who might not be disabled if they quit smoking—is less than half the percentage of DI beneficiaries with similar disabling conditions.
10. Unlike DI benefits, veterans' compensation benefits are provided only for disabilities directly related to military service. Such disabilities are unlikely to change if beneficiaries stop smoking.

CBO estimated the percentage of the relevant populations that would participate in the applicable DoD and VA programs. CBO then adjusted that percentage upward to account for veterans' higher-than-average propensity to smoke.

**Military Retirement and Veterans' Compensation.** CBO estimates that the policy would increase spending for military retirement by \$17 million over the 2013–2021 period (\$6 million, or 0.009 percent, in 2021) and raise spending for veterans' compensation by the same amounts during those years. Funding for both programs is classified as mandatory. CBO's estimate reflects the impact of increased longevity among the eligible populations on the average annual cost of military retirement payments and veterans' compensation. As with its estimate for the OASI program, CBO adjusted that average annual cost to account for the decrease in survivors' benefits that would occur if military retirees and other veterans lived longer.

### Department of Defense Health Care System (Tricare).

Part of the funding for DoD's health care system is classified as mandatory and part is subject to appropriation each year. The mandatory spending portion of that system serves beneficiaries who are eligible for Medicare. On average, those beneficiaries rely on DoD for less than one-third of their medical expenses. For that population, the increase in program costs stemming from greater longevity would be more than offset by savings from a reduction in per capita health care spending (consistent with CBO's estimates for Medicare, described above). As a result, the policy would decrease mandatory spending for DoD's health care system by \$3 million through 2021, CBO estimates.

The portion of that system whose spending is subject to appropriation serves active-duty personnel, most military retirees too young to qualify for Medicare, and family members. Almost all of those beneficiaries are below age 65, including a large number of children and young adults, and they rely on DoD for the majority of their medical expenses. Because of the younger population, CBO estimates that savings in per capita health care spending would have a much greater impact on that portion of DoD's health care system than changes in longevity would, reducing costs by \$61 million over the 2013–2021 period (not shown in Table 6-1). The government could narrow budget deficits by that amount if appropriations were reduced correspondingly.

**Veterans Health Administration.** The VA health system, all of whose funding is subject to appropriation, serves a population that spans a variety of age groups, although about half of the beneficiaries are over the age of 65. CBO estimates that the increase in the cigarette tax would reduce costs for that system by a total of \$18 million through 2021. (Again, annual appropriations would need to be lowered accordingly to realize those savings.)

### Revenues

A policy that raised the federal excise tax on cigarettes would increase excise tax receipts and, as a result of improvements in health, affect other federal revenues as well. CBO and the staff of the Joint Committee on Taxation (JCT) estimate that, on net, those effects would increase federal revenues by a total of \$41 billion over the 2013–2021 period, with most of that rise resulting from the impact on excise tax receipts (see Table 6-1).<sup>11</sup>

**Cigarette Tax Receipts.** The federal government currently collects roughly \$17 billion a year in revenues from tobacco-related excise taxes and fees, including the tax of \$1.01 per pack on cigarettes and small cigars. JCT estimates that raising that tax by 50 cents (indexed for inflation) would directly add about \$38 billion to projected federal revenues over the 2013–2021 period (about \$4 billion, or 0.018 percent of gross domestic product, in 2021 alone).

**Revenue Effects from Improvements in Health.** By reducing smoking and improving health, the increase in the cigarette tax would result in another \$3.2 billion in revenues during the 2013–2021 period, CBO estimated. Most significantly, CBO projected that the number of people in the labor force would be higher under the policy, both because improvements in health would cause some people to participate in the labor force longer than they would have otherwise and because increases in longevity would mean that some people would be alive and still participating in the labor force who otherwise would have died because of smoking. CBO also projected that earnings for people who would be in the workforce under either current law or the policy would be higher under the policy, on average, because the higher price of cigarettes would cause some of them not to smoke or be exposed to SHS. The increased income resulting from

those effects on earnings would raise revenues from income and payroll taxes by \$2.9 billion through 2021, CBO estimated.<sup>12</sup>

In addition, lower annual per capita health care spending would lead to lower health insurance premiums, which in turn would reduce the amount that employers contribute for their workers' premiums. CBO projected that the savings on health insurance premiums, which are not subject to income or payroll taxes, would ultimately accrue to workers in the form of higher taxable compensation. As a result, revenues from income and payroll taxes would be about \$330 million higher over the 2013–2021 period. As mentioned above, lower health insurance premiums would also reduce the amount of premium assistance tax credits for health insurance purchased through exchanges, resulting in a revenue increase of about \$10 million through 2021.<sup>13</sup>

### Budgetary Impact Over the Long Term

The budgetary effects of a policy, such as a cigarette tax increase, that changed health behaviors would not be fully realized within the standard 10-year budget window. Moreover, in some cases, the direction of those effects could change in later years (for instance, going from a decrease in spending to an increase). For those reasons, despite the considerable uncertainty inherent in long-term projections, CBO estimated the effects of the illustrative tax increase on mandatory spending and revenues through 2085. Those estimates indicate that budget deficits (excluding interest payments on federal debt held by the public) would be slightly lower throughout that period as a result of the policy.<sup>14</sup>

11. JCT is responsible for estimating the revenue effects of changes to the Internal Revenue Code.

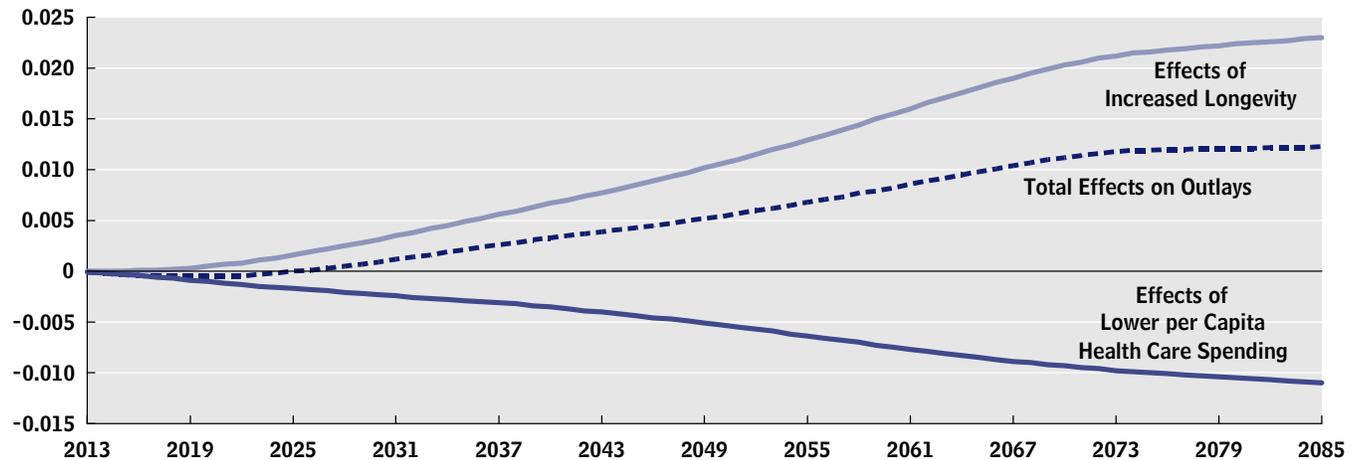
12. The increased income would result in higher amounts of GDP. Additional revenues related to higher amounts of GDP are generally not included in estimates of the budgetary impact of legislative proposals being considered by the Congress because, by long-standing practice, JCT and CBO assume for such estimates that legislative proposals would not affect the nation's overall economic output. JCT and CBO separately produce estimates of the effects of certain proposals on overall output.

13. Those effects of lower health care spending on revenues would be considered too indirect to include in a standard cost estimate of any cigarette excise tax legislation under consideration by the Congress.

14. Estimates of the policy's budgetary effects from 2022 to 2085 are relative to the long-term projections under the extended baseline scenario published in Congressional Budget Office, *CBO's 2011 Long-Term Budget Outlook* (June 2011, corrected February 2012).

**Figure 6-1.****Effects on Outlays of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)



Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

The outlay effects of the tax increase all result from improvements in health. The effects shown here apply only to mandatory outlays.

CBO's long-term estimates incorporate a slight adjustment to the policy assumed through 2021. Because people's income tends to rise over time with growth in productivity, a larger tax increase would probably be needed to produce the same effect on smoking over the years. Thus, for the long-term estimates, CBO assumed that the 50-cent per pack inflation-adjusted rise in the excise tax on cigarettes and small cigars that was modeled for the 2013–2021 period would be further indexed after 2021 to keep pace with growth in average real (inflation-adjusted) income.

**Spending**

Although long-term projections are even more uncertain than 10-year estimates, CBO's model of changes in annual health care spending per capita and longevity offers various insights into the pattern and magnitude of the budgetary impact of the tax increase over the longer run. (The uncertainty of CBO's estimates is discussed in detail at the end of this chapter.) Over time, the savings from reductions in annual per capita health care costs would increase, as would the number of people alive who would otherwise have died. In addition, a growing share of the population would consist of people born after the policy took effect, with an increasing proportion who never took up smoking as a result of the policy. At the

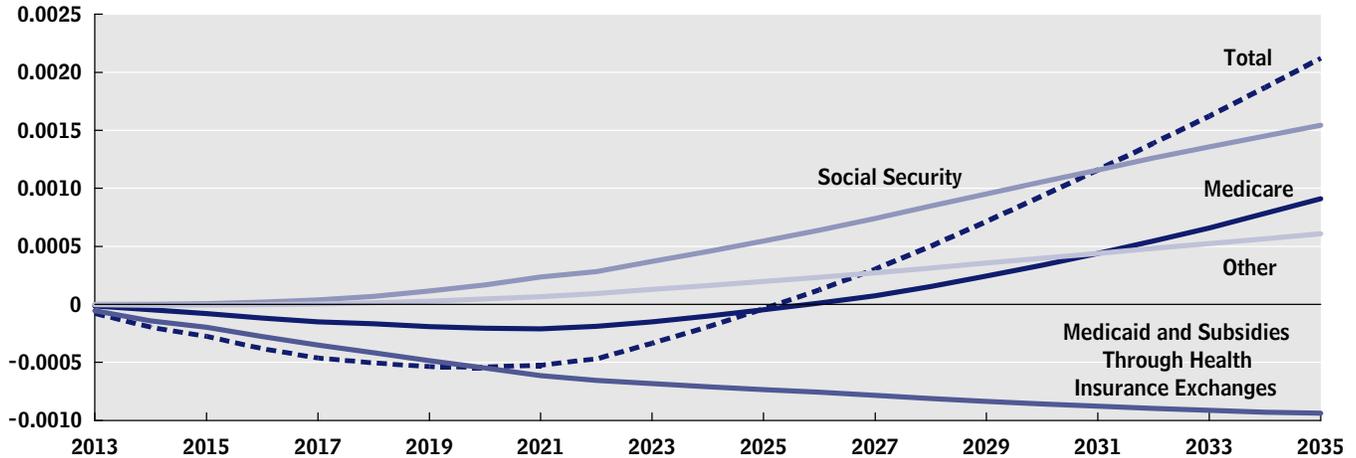
same time, greater longevity from reductions in smoking would increase the percentage of older people in the population disproportionately.

The relative impact of those various changes would differ by program. For some programs, such as Medicaid, the effect of lower annual per capita health care spending would reduce spending in all years. For others, such as OASI, civil service and military retirement, and veterans' compensation, the effect of greater longevity would increase spending in all years. And for still others, such as Medicare, spending would decline initially but then rise over time as the effect of increased longevity became more dominant.

Taking all of those effects on different programs into account, CBO estimates that total federal spending (excluding interest payments) would be about the same in 2025 under the illustrative tax increase as under current law, because the effects of lower per capita health care spending and increased longevity would offset one another (see Figure 6-1). Thereafter, the effect of greater longevity would grow quickly, before starting to slow in about 2070, and federal spending would rise accordingly. CBO projects that the policy would increase noninterest

**Figure 6-2.**  
**Effects on Outlays of the Illustrative Increase in the Cigarette Tax, by Program**

(Percentage of gross domestic product)



Source: Congressional Budget Office.

Notes: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

The outlay effects of the tax increase all result from improvements in health. The effects shown here apply only to mandatory outlays.

spending by about 0.002 percent of GDP in 2035 and by 0.012 percent of GDP in 2085.

More-detailed estimates follow for the largest federal programs affected by the policy. For each program, the estimating approach used for the projections through 2021 was extended for the long-term projections, with simplifying assumptions where necessary.

**Medicare.** Reduced annual per capita spending on healthier beneficiaries would initially be the dominant factor in Medicare, lowering program spending relative to the spending projected under current law (see Figure 6-2). That outcome would be reversed in the mid-2020s, however, as the effect of longevity became dominant. The policy would have little impact on annual Medicare spending in 2025, CBO estimates, but it would increase spending by about 0.001 percent of GDP (or 0.02 percent of net program spending) in 2035 and by 0.007 percent of GDP (or 0.07 percent of net program spending) in 2085.<sup>15</sup>

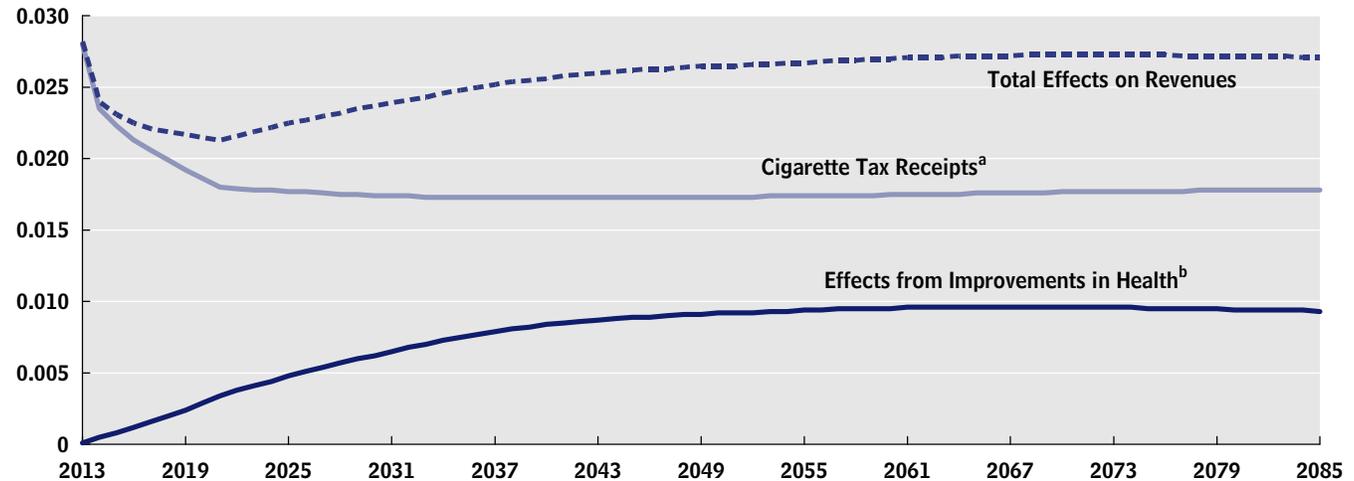
15. Net program spending is Medicare spending net of beneficiaries' premiums and amounts paid by states from savings on Medicaid prescription drug costs.

**Medicaid and Exchange Subsidies.** For Medicaid and federal subsidies for the purchase of health insurance through exchanges, the savings in annual health care costs per capita would always outweigh the costs of increased longevity, reflecting the younger populations typically served by those programs. As a result, the increase in the cigarette tax would reduce federal spending for Medicaid and exchange subsidies each year through 2085—by no more than 0.001 percent of GDP, CBO estimates. (Relative to projected spending for those programs, the reduction would equal 0.02 percent in 2025, 0.03 percent in 2035, and 0.02 percent in 2085.)

**Social Security.** As a result of the longevity effect, a higher cigarette tax would increase outlays for retirement and disability benefits under Social Security throughout the long-term period. As individuals lived longer, they would collect retirement benefits for more years, and they would postpone retirement and spend more time working, thus qualifying for larger retirement benefits later on. The increased outlays from those effects would be offset slightly by a reduction in spending for survivors' benefits. (As workers lived longer before dying, their dependents would receive survivors' benefits for shorter periods.) CBO estimates that, on net, the policy would boost outlays for Social Security by less than 0.001 percent of GDP

**Figure 6-3.****Effects on Revenues of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)



Sources: Congressional Budget Office and the staff of the Joint Committee on Taxation.

Note: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

- a. An increase in excise taxes reduces revenues from income and payroll taxes; these estimates are net of those reductions.  
 b. These effects are on receipts from income and payroll taxes.

(or 0.01 percent of program spending) in 2025, by less than 0.002 percent of GDP (or 0.03 percent of program spending) in 2035, and by 0.005 percent of GDP (or 0.07 percent of program spending) in 2085.

**Revenues**

An increase in the federal excise tax on cigarettes and small cigars would have effects on revenues from excise taxes and from income and payroll taxes in the long term. CBO estimates that, overall, the policy would raise revenues by 0.022 percent of GDP in 2025, by 0.025 percent of GDP in 2035, and by 0.027 percent of GDP in 2085. As in the 2013–2021 period, the bulk of those revenues would come directly from higher collections of cigarette taxes (see Figure 6-3). In 2025, that direct effect on revenues would be about four times as large as the effect on revenues from improvements in health, decreasing to more than two times as large in 2035 and about twice as large in 2085.

CBO projects that the additional excise tax receipts (net of declines in income and payroll tax receipts because excise taxes reduce the base for income and payroll taxes) would equal about 0.018 percent of GDP per year

throughout the long-term period, roughly the same as in 2021. That path reflects CBO's assumption that the tax increase would be indexed for real income growth as well as for inflation after 2021.

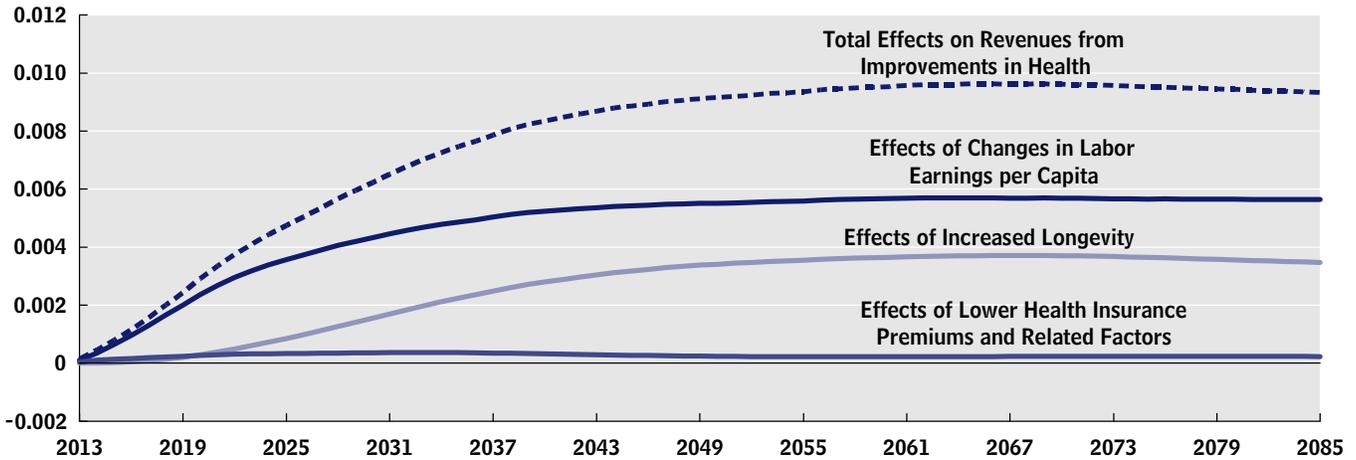
Improvements in health because of the policy would also boost revenues throughout the long-term period by increasing earnings. The rise in earnings would occur mainly because people who otherwise would have smoked or been exposed to SHS would work more, on average (because better health and greater longevity would let them participate in the labor force longer), and would have higher earnings per hour worked. In addition, the policy would result in lower premiums for employment-based health insurance than would otherwise be the case, thus slightly raising the taxable share of compensation.<sup>16</sup> Although the sum of those health-related effects on revenues would initially be small relative to the additional excise tax receipts, that sum would grow steadily: from about 0.005 percent of GDP in 2025 to

16. As discussed earlier in the context of the estimates through 2021, lower health insurance premiums would also reduce the size of tax credits for the purchase of insurance through the exchanges, resulting in a very small increase in revenues.

**Figure 6-4.**

## Health-Related Effects on Revenues of the Illustrative Increase in the Cigarette Tax

(Percentage of gross domestic product)



Source: Congressional Budget Office.

Note: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

0.007 percent in 2035 and 0.009 percent in 2085 (see Figure 6-4).

### Deficit

Relative to current law, the illustrative increase in the cigarette tax would lower federal spending until about 2025 but raise it thereafter. The policy would increase revenues in all years, and that increase would exceed the rise in spending even in the later years of the long-term projection period (see Figure 6-5). Consequently, CBO projects, the deficit (excluding interest payments) would be lower each year than it would be under current law. Those reductions in the deficit would be fairly small, however: equal to 0.023 percent of GDP in 2025 and 2035 and to 0.015 percent in 2085.

Focusing only on the policy’s health-related effects reveals that, on net, improvements in health (and thus in longevity) would reduce the deficit for about the first five decades of the policy (see Figure 6-6). That effect would be reversed after the mid-2060s, when increases in spending, fueled by the growing impact of greater longevity, would exceed health-related increases in revenues.

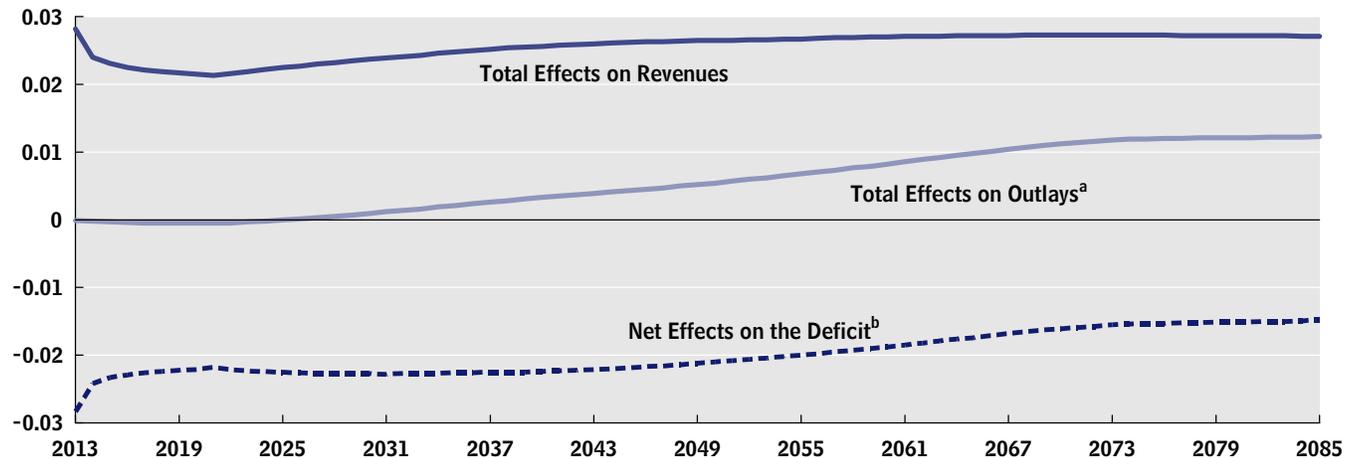
### Uncertainty of the Estimates

Estimating the budgetary impact of federal policies that affect the health of the population inevitably involves a significant amount of uncertainty. In the case of this analysis, that uncertainty results from the various challenges inherent in making budget projections under current law and from the many estimates about the effects of an increase in the cigarette tax that CBO developed on the basis of its statistical analyses and distillation of the research literature. Those estimates included the effects of an increase in the cigarette tax on smoking; the effects of reductions in smoking on per capita health care spending, longevity, and earnings; and the effects of changes in those factors on federal spending and revenues. Budget estimates become even more uncertain the farther they go into the future, because key factors that affect them might evolve over time in unanticipated ways. For example, with this analysis, unexpected changes might occur in technologies for treating smoking-related diseases, in the underlying health of the population, in health care delivery, or in workers’ productivity.

To assess the implications of uncertainty for the findings of this study, CBO reexamined some of the most

**Figure 6-5.****Total Budgetary Effects of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)



Sources: Congressional Budget Office and the staff of the Joint Committee on Taxation.

Note: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

a. The effects shown here are on mandatory outlays.

b. Excludes debt-service costs.

significant aspects of the analysis. CBO concluded that some of the possible inaccuracies in the estimates, resulting from particular sources of uncertainty, might affect the size, direction (positive or negative), and trajectory of the budgetary effects over time, whereas others might affect only the size of the effects but not their sign or trajectory. Of particular importance are CBO's estimates of the prevalence of smoking under current law, the responsiveness of smokers to the price of cigarettes, the timing of improvements in health when smokers quit, and the permanence of quitting, as well as possible inaccuracies in the conclusions from the regression analyses, and the potential effects of reducing smoking rather than quitting.

Even under a range of plausible alternative assumptions, however, the following general conclusions about an increase in the cigarette tax would continue to apply:

- The changes in federal spending that would result from improved health because of a decrease in the number of smokers would be quite small relative to the size of the affected programs.

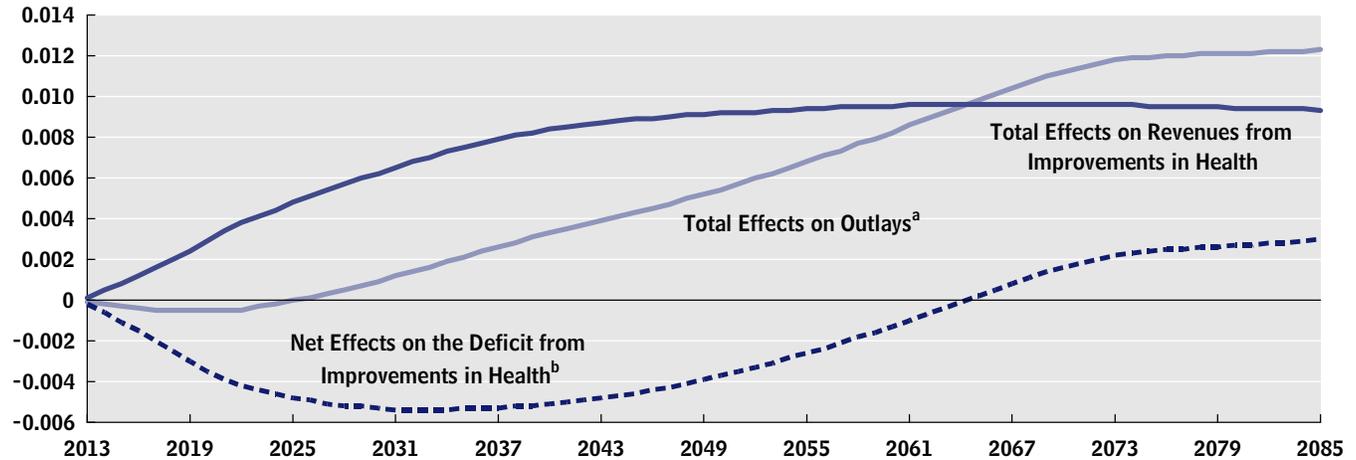
- Federal spending would be reduced throughout the first decade that the tax increase was in effect but would be increased beginning in the second or third decade.
- The effects of improved health would increase revenues on an ongoing basis.
- The health effects of the tax increase would produce a very small net decline in the annual budget deficit for roughly five decades.
- The increased excise tax receipts would exceed the health-related effects of the policy on both revenues and outlays for at least 75 years, with the overall result being a net decrease in the deficit.

**Baseline Estimates of Smoking**

In forecasting how the prevalence of smoking would evolve if current law remained unchanged, CBO estimated that the percentage of adults in the United States who smoke would continue to decline slowly and then level off at around 15 percent beginning about 2035 (see Figure 1-1 on page 3). However, the baseline prevalence

**Figure 6-6.****Health-Related Effects on Revenues, Outlays, and the Deficit of the Illustrative Increase in the Cigarette Tax**

(Percentage of gross domestic product)



Source: Congressional Budget Office.

Note: The illustrative tax increase modeled in this analysis is a 50-cent per pack rise in the federal excise tax on cigarettes and small cigars, beginning in 2013 and indexed each year thereafter to keep pace with inflation (and, after 2021, to keep pace with the growth of inflation-adjusted income).

- a. The outlay effects of the tax increase all result from improvements in health. The effects shown here apply only to mandatory outlays.  
 b. Excludes cigarette tax receipts and debt-service costs.

of smoking could fall more quickly and level off at a lower percentage. If that happened, the estimated budgetary effects of the policy would be smaller—although the general pattern would be the same—because fewer smokers would remain to be affected by the tax increase.

Alternatively, if prevalence under current law remained near its 2010 level of 19 percent for the indefinite future, the policy would affect a larger number of people, and the budgetary impact would be greater.

**Smokers' Response to Changes in the Price of Cigarettes**

Assumptions about how responsive smokers or would-be smokers are to changes in the price of cigarettes (including the federal excise tax) are key to this analysis. If CBO and JCT's assumed elasticity for the effect of changes in price on the number of people who smoke is too high, the estimates of the changes in the federal budget that would result from changes in the health of the population are also too high. Alternatively, if CBO and JCT's assumed elasticity is too low, the direction of that discrepancy will be reversed.

**Variations by Age.** Any inaccuracies in the choice of elasticity might differ for people of different ages. If, for example, the actual elasticity for adults was about 70 percent of the value used by CBO (a value within the range of plausible estimates) but the elasticity assumed for teenagers and young adults was correct, the net result would be a reduction of up to 30 percent in the number of people who would not smoke because of the policy. Estimates of the budgetary effects of improvements in health through 2021 would be as much as 30 percent lower, although the general direction and pattern of effects would not change. Over time, that difference would narrow: As people who were teenagers when the policy took effect became older and represented a growing share of the population, budgetary estimates under that alternative set of elasticities would ultimately be the same as those under the elasticities used by CBO.

**Variations by Income.** Price elasticity might vary by income as well as age, with lower-income smokers being more sensitive to changes in cigarette prices. CBO did not vary elasticities by income group in any given year, but it did account for differences in the prevalence of

smoking among people who are at different income levels and thus are more or less likely to be beneficiaries of various programs. For example, Medicaid beneficiaries (who must generally have low income to be eligible for the program) were assigned higher smoking rates in CBO's modeling than the overall population; the increase in the excise tax therefore had a disproportionately large effect on that program. If CBO had assumed a higher price elasticity for those beneficiaries as well, the effects on Medicaid spending would have been even larger. However, if CBO had maintained its assumed average elasticity while raising the assumed elasticity for lower-income people, changes in other programs that reach higher-income populations would generally have smaller budgetary effects than estimated here, because the higher elasticities for lower-income people would have been combined with lower elasticities for higher-income people.

**Speed of Response to Price Changes.** CBO assumed that it would take a year for the increase in the cigarette tax to have its full impact on the share of current smokers who would choose not to smoke. That yearlong period was built into the estimates to reflect the idea that it might take time for people to fully recognize that cigarette prices had risen and to adjust their behavior accordingly. Depending on the actual timing of the behavioral response, the health and budgetary effects would take either more or less time to develop than estimated here.

### Health Response Lag

Another key assumption underlying these estimates is how quickly people's health improves after they quit smoking (see Figure 3-5 on page 29). Although the general pattern of the lag in health improvement that CBO assumes is not controversial, to quantify that lag, CBO had to pull together the results of studies that focused on different smoking-related diseases and used differing methods. If people's health improves faster than CBO estimates, the pattern of budgetary effects will occur more quickly than described here; the opposite will be the case if people's health improves more slowly than CBO estimates.

Assumptions about the health response lag become less important over time. In the long run, when increasing numbers of people who smoke today will have died, the consequences of the policy will come largely from having dissuaded some young people from starting to smoke. Thus, over the decades, accounting for the number of

years it takes a former smoker to recover from the negative health effects of smoking becomes less important to the estimates.

### Persistence of Quitting Among Individuals

In this analysis, the people who were considered to have stopped smoking because of the policy were assumed to do so permanently. If, however, a significant number of the people who quit because of the policy did so only temporarily, the effects on health and the federal budget would be smaller than estimated here.<sup>17</sup> As discussed above, it takes a number of years for former smokers' health care spending and mortality rates to approach those of nonsmokers. Someone who quits for only a short time will receive less of those benefits; thus, to the extent that a substantial fraction of people who stopped smoking because of the policy were only temporary quitters, the policy would have less impact on the budget.

To get a sense of how a different assumption would affect the estimates, CBO considered an example in which, in any year, 20 percent of the people who quit smoking because of the tax increase resumed smoking the following year (to be replaced by other new nonsmokers who, in turn, would resume smoking the following year). To produce a maximum estimate of the change in the budgetary effects under that alternative, CBO also made the somewhat exaggerated assumption that no health benefits at all would accrue to people who quit smoking for only a year. Under those assumptions, the budgetary effects of the policy could be as much as 20 percent lower than those reported here.

Unfortunately, little appears to be known about the long-term behavior of people who are induced by higher cigarette prices to quit or not take up smoking. A study of that behavior would be hard to design because it would be difficult to distinguish between people who did not smoke because of higher prices and those who did not smoke for other reasons.

17. For this scenario, the elasticity of quitting used by CBO is assumed to be correct. That is, the total number of people who do not smoke because of the policy is assumed to be consistent with what CBO has estimated. The issue here is whether those same people remain nonsmokers over time or whether, although the total number of people who do not smoke because of the policy stays the same, the identities of those people changes over time, with some going back to smoking and being replaced by smokers who also quit temporarily.

### Conclusions from the Regression Analyses

In its analyses, CBO used regression techniques to separate out the effects of smoking from the effects of people's other *measured* characteristics (such as age, sex, education level, and region) that are correlated with smoking and can have their own influence on health care spending, longevity, or earnings. Even so, the estimated effects of smoking could still be incorrect. Besides the statistical uncertainty inherent in drawing inferences from sample surveys, inaccuracies in the estimates are possible if, on balance, *unmeasured* variables exist that are correlated with smoking and also independently influence spending, longevity, or earnings in a particular direction. For example, people who are forward-thinking about their health may have an attribute that is inadequately captured by such measured variables as education level. People with more of that attribute may be less likely to smoke and may also adopt other healthy habits that further reduce their mortality rates. If so, estimates based solely on differences in measured characteristics may overstate the impact of smoking on mortality.

How smoking affects mortality rates is an important determinant of the long-term effects on the deficit of changes in health. CBO estimates that those health effects would boost longevity by enough to increase the deficit in the latter decades of the long-term projection period (see Figure 6-6 on page 62), although the increase in cigarette tax receipts means that the policy would still, on balance, reduce the deficit. Despite the additional amount that healthier people would earn—and pay in tax revenues—during their working years, most of the additional years of life under the policy would come during people's retirement rather than while they were working. As a result, additional outlays, mainly for Medicare and Social Security, would more than offset other program savings and health-related revenue increases in the later decades of the long-term projection period. If the effect of smoking on mortality rates is substantially smaller than CBO estimates, the health effects of the policy might continue to reduce the deficit throughout that period, because the policy would result in fewer additional years of life and lower outlays.<sup>18</sup> The impact of

those health effects on the deficit would remain quite small, however.

In the case of earnings, if CBO has substantially underestimated the impact of smoking on how much people earn, the health effects of the policy might again work toward reducing the deficit throughout the long-term period, because the additional revenues stemming from higher earnings might continue to outweigh the increases in outlays.

### Reducing Smoking Rather than Quitting

In its analyses, CBO attributed no specific changes in per capita health care spending, longevity, or earnings—and hence no budgetary effects—to people who would reduce the number of cigarettes they smoked because of the policy but would not quit entirely. (However, estimates of excise tax receipts under the policy incorporate the effects of reductions in smoking by people who continue to smoke as well as the effects of quitting or never starting to smoke.) As discussed in Chapter 3, the health consequences of cutting back on smoking rather than quitting are unclear, possibly because people who smoke fewer cigarettes tend to smoke each one longer or switch to brands with higher nicotine levels. If people who reduce their cigarette consumption without quitting do experience health benefits, the budgetary effects of the tax increase would be different than CBO estimates. How the pattern of those effects might differ over time is unclear; better information is needed about how cutting back on smoking affects health care spending, mortality rates, or earnings to a different degree, or with different timing, than quitting entirely does.

18. CBO chose to use the effects on mortality rates estimated from the regression analysis in Chapter 3, for several reasons: Those effects stayed fairly constant as additional explanatory variables were added to the analysis, and they are consistent with other estimates in the research literature. By contrast, the measured effect of smoking on earnings was reduced substantially as additional explanatory variables were added; hence, CBO assumed a smaller effect on earnings than was measured by the regression analysis (see Chapter 4). Nonetheless, this section explores how the results would change if various assumptions were different. For per capita health care spending, CBO also used the estimates from the regression analysis described in Chapter 3.

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## About This Document

This Congressional Budget Office (CBO) study was prepared at the request of the Chairman of the Subcommittee on Health Care of the Senate Committee on Finance. In keeping with CBO's mandate to provide objective, impartial analysis, it contains no recommendations.

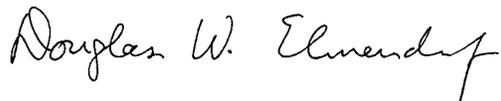
Noelia Duchovny and Ellen Werble played the lead roles in the analysis, under the supervision of James Baumgardner, Linda Bilheimer, Holly Harvey, and Jean Hearne. James Baumgardner wrote the summary. Ellen Werble wrote Chapter 1; coordinated the writing of Chapter 6, with contributions from numerous CBO analysts; and produced the estimates related to Medicaid and secondhand smoke. Mark Booth and Elias Leight (formerly of CBO) wrote Chapter 2. Noelia Duchovny wrote Chapters 3 and 5 and developed the modeling capability for health care spending and longevity described in those chapters. William Carrington wrote Chapter 4 and produced the estimates for labor earnings described in that chapter. Daniel Hoople, Jimmy Jin, and Michael Levine assisted with fact checking. Tom Bradley, Justin Falk, Peter Fontaine, Janet Holtzblatt, Sarah Jennings, Joyce Manchester, Shannon Mok, and Sam Papenfuss provided helpful comments.

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