Annual Healthcare Spending Attributable to Cigarette Smoking

An Update

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Background: Fifty years after the first Surgeon General's report, tobacco use remains the nation's leading preventable cause of death and disease, despite declines in adult cigarette smoking prevalence. Smoking-attributable healthcare spending is an important part of overall smoking-attributable costs in the U.S.

Purpose: To update annual smoking-attributable healthcare spending in the U.S. and provide smoking-attributable healthcare spending estimates by payer (e.g., Medicare, Medicaid, private insurance) or type of medical services.

Methods: Analyses used data from the 2006–2010 Medical Expenditure Panel Survey linked to the 2004–2009 National Health Interview Survey. Estimates from two-part models were combined to predict the share of annual healthcare spending that could be attributable to cigarette smoking. The analysis was conducted in 2013.

Results: By 2010, 8.7% (95% CI=6.8%, 11.2%) of annual healthcare spending in the U.S. could be attributed to cigarette smoking, amounting to as much as $170 billion per year. More than 60% of the attributable spending was paid by public programs, including Medicare, other federally sponsored programs, or Medicaid.

Conclusions: These findings indicate that comprehensive tobacco control programs and policies are still needed to continue progress toward ending the tobacco epidemic in the U.S. 50 years after the release of the first Surgeon General's report on smoking and health.

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Introduction

January 11, 2014, marked the 50th anniversary of the 1964 release of the first Surgeon General's report on smoking and health.[1] The historic report initiated a decades-long effort around the nation to curb the cigarette smoking epidemic. Recently, Holford and colleagues[2] quantified the historic effect of tobacco prevention and control interventions since the release of that report. They concluded that 8.0 million premature deaths were averted and 175 million years of life were saved over the past half century as a result of the efforts that began after the report's publication.

Despite declines in adult cigarette smoking prevalence during the past 50 years, tobacco use remains the nation's leading preventable cause of death and disease.[3] The landmark 1964 report and 30 subsequent Surgeon General's reports on tobacco use have synthesized thousands of studies documenting the tremendous public health and financial burdens caused by tobacco use.[4] For example, during 2000–2004, cigarette smoking and secondhand smoke exposure resulted annually in at least 443,000 premature deaths, 5.1 million years of productive life lost, and $96.8 billion in productivity losses in the U.S.[5]

Smoking-attributable healthcare spending is an important component of overall smoking-attributable economic costs, as studies[6,7] have shown that this spending accounts for an estimated 5%–14% of the

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annual healthcare expenditure in the U.S. For example, using data from the Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) system, a previous analysis conducted by CDC concluded that, during 2000–2004, average annual smoking-attributable healthcare expenditures were approximately $96 billion.[5] More recently, an analysis conducted by the Congressional Budget Office (CBO) suggested that smoking accounted for about 7% of total annual healthcare spending for non-institutionalized U.S. adults during 2000–2008.[7]

The objective of this analysis is to present the latest nationally representative estimate of cigarette smoking–attributable fractions and associated healthcare spending for U.S. adults. It also assesses smoking-attributable fractions and associated healthcare spending by payer (Medicare, Medicaid, other federal, private insurance, out of pocket, and others) and type of medical service (inpatient, non-inpatient, and prescriptions). Updated information on the economic consequences of cigarette smoking is necessary to ensure that the data on which policy decisions are based, and that serve as inputs to research, are not stale.

Methods

Data Source

Data came from the 2006–2010 Medical Expenditure Panel Survey (MEPS) linked to the 2004–2009 National Health Interview Survey (NHIS). The MEPS is a nationally representative survey of civilian non-institutionalized families and individuals, their medical providers, and employers that collects information on individual healthcare utilization and medical expenditures. MEPS respondents can be directly linked to the NHIS because they are drawn from the NHIS household samples from the preceding 2 years. The NHIS, a cross-sectional household interview survey that collects information on the health of the civilian non-institutionalized U.S. population, includes questions about respondents' smoking history.

Study Sample

The final data set was restricted to non-pregnant adults aged ≥18 years at the time of the interview, because information about smoking-attributable maternal and child healthcare expenditures is available elsewhere.[8] After linking the data from the 2004–2009 NHIS, about 41,000 MEPS respondents were identified with complete data on the post-stratification weights to account for the complex survey design of the MEPS.

MEPS respondents were classified into four categories based on the smoking history information from the NHIS: never cigarette smokers; current cigarette smokers (respondents who smoked 100 cigarettes in their lifetime and smoked some days or every day at the time of the interview); former cigarette smokers who quit smoking within the last 5 years; and former cigarette smokers who quit smoking >5 years ago. Former smokers were considered separately by how long ago they had quit, as studies[9–11] have found that recent quitters have higher medical expenditures because smoking cessation may have been prompted by the onset of symptoms or the diagnosis of a disease. The MEPS also asked about current cigarette use in the survey and was used to capture possible relapse or misreporting, but the NHIS smoking questions were needed to classify former smoking status.

Statistical Analysis

This analysis focuses on all-cause healthcare spending because smoking damages every organ in the body and causes or exacerbates a wide range of health conditions.[3] A two-part model was used for the analysis[7,12]:

$$DHCExp_{ijt} = \alpha_j + \gamma_t + \beta SmokingStatus_{ijt} + \delta SocialDemo_{ijt} + \pi HlthBeh_{ijt} + \varepsilon$$

$$HCExp_{ijt} = \alpha_j^{'} + \gamma_t^{'} + \beta^{'} SmokingStatus_{ijt} + \delta^{'} SocialDemo_{ijt} + \pi^{'} HlthBeh_{ijt} + \varepsilon^{'}$$

In each part of the model, annual healthcare spending depends on respondents' smoking status (*SmokingStatus*); sociodemographic characteristics (*SocialDemo*), including gender (male or female), age group (18–24, 25–44, 45–64, 65–74, or ≥75 years), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, or non-Hispanic other), education (less than high school, high school, some college, or college and above), marital status (married or cohabitating, never married and not cohabitating, or divorced/separated/widowed), annual household income as a percentage of federal poverty level (<100%, 100%–124%, 125%–200%, 200%–399%, or ≥400%); and health-related behaviors or attitudes (*HlthBeh*), including alcohol consumption (excessive drinking, binge or heavy drinker; non-excessive drinking, current drinker; or non-drinkers, former or lifetime abstainer and unknown), self-reported BMI (underweight, BMI<18.5; normal weight, BMI 18.5–<25; overweight, BMI 25–<30; or obese, BMI >30), health insurance coverage (yes or no), self-reported receipt of influenza vaccine in the past 12 months (yes or no), self-reported seatbelt use (always/nearly always or sometimes/never), self-reported taking more risks than average person (agree somewhat/strongly or uncertain/strongly disagree), self-reported belief in own ability to overcome illness without medical help (agree somewhat/strongly or uncertain/strongly disagree). Health-related behavior or attitudes factors were used as controls for confounding factors that may be associated with both health expenditures and cigarette smoking. More information on these variables can be found in the Appendix (available online).

A logit model was used in the first part to estimate the probability of having any positive healthcare spending for respondent *i* in region *j* during year *t* ($DHCExp_{ijt}$, an indicator of positive healthcare spending). In the second part of the model, based on the specification tests,[13] a generalized linear model with a log link and gamma distribution was used to estimate annual attributable spending conditional on having positive healthcare expenditures ($HCExp_{ijt}$). The estimates from both parts were then combined to predict the share of the annual healthcare spending (smoking-attributable fraction) that would be reduced if current and former smokers had been never smokers. The attributable fraction was calculated by dividing the total smoking-attributable

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