Addictive Behaviors 45 (2015) 104–109

Contents lists available at ScienceDirect

Addictive Behaviors

The relation between tobacco taxes and youth and young adult smoking: What happened following the 2009 U.S. federal tax increase on cigarettes?

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HIGHLIGHTS

- The U.S. federal cigarette tax increased by $0.62 (159%) on April 1, 2009.
- We model the impact of this increase on adult smoking outcomes.
- We used state-level data from the 2002–2011 National Survey on Drug Use and Health.
- The tax increase reduced initiation and prevalence of youth and young adult smoking.
- The impact varied by subpopulation.

ARTICLE INFO

Available online 19 January 2015

Keywords:
Tobacco
Youth smoking
Young adult smoking
Tax

ABSTRACT

Background: On April 1, 2009, the federal government raised cigarette taxes from $0.39 to $1.01 per pack. This study examines the impact of this increase on a range of smoking behaviors among youth aged 12 to 17 and young adults aged 18 to 25.
Methods: Data from the 2002–2011 National Survey on Drug Use and Health (NSDUH) were used to estimate the impact of the tax increase on five smoking outcomes: (1) past year smoking initiation, (2) past-month smoking, (3) past year smoking cessation, (4) number of days cigarettes were smoked during the past month, and (5) average number of cigarettes smoked per day. Each model included individual and state-level covariates and other tobacco control policies that coincided with the tax increase. We examined the impact overall and by race and gender.
Results: The odds of smoking initiation decreased for youth after the tax increase (odds ratio (OR) = 0.83, $p < 0.0001$). The odds of past-month smoking also decreased (youth: OR = 0.83, $p < 0.0001$; young adults: OR = 0.92, $p < 0.0001$), but the odds of smoking cessation remained unchanged. Current smokers smoked on fewer days (youth: coefficient = −0.97, $p = 0.0001$; young adults: coefficient = −0.84, $p < 0.0001$) and smoked fewer cigarettes per day after the tax increase (youth: coefficient = −1.02, $p = 0.0011$; young adults: coefficient = −0.92, $p < 0.0001$).
Conclusions: The 2009 federal cigarette tax increase was associated with a substantial reduction in smoking among youths and young adults. The impact of the tax increase varied across male, female, white and black subpopulations.

1. Introduction

Tobacco use remains the leading preventable cause of death and disease in the United States (US DHHS, 2014). Data from the National Survey on Drug Use and Health (NSDUH) show that among youths aged 12 to 17 who had not smoked cigarettes prior to the past year

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http://dx.doi.org/10.1016/j.addbeh.2015.01.023
0306-4603/

(i.e., youths at risk for initiation), the incidence rate in 2012 was 4.8%. The prevalence of current cigarette smoking was 31.8% among young adults aged 18 to 25 (SAMHSA, 2013a). Both the rate of youth initiation to cigarette smoking and the prevalence of current smoking among young adults are well above the goals set by the U.S. Department of Health and Human Services in its Healthy People 2020 objectives (US DHHS, 2012a).

One of the most effective policies for reducing tobacco use is to increase the price of tobacco products, which is most commonly achieved by increasing state and federal excise taxes (Guide to Community Preventive Services, 2012). Several recent systematic reviews have found that higher cigarette prices lead to a reduction in smoking prevalence and intensity among youth and young adults (Bader, Boisclair, & Ferrence, 2011; Chaloupka, Straif, & Leon, 2011; IARC, 2011; Rice, Godfrey, Slack, Sowden, & Worthy, 2009). Tauras (2005) found that, among young adults, an increase in the price of cigarettes led to transitions from daily smoking to no smoking, from moderate daily to light daily smoking, and from heavy daily smoking to moderate daily smoking. Several studies also conclude that higher prices resulting from higher taxes increased the number of quit attempts and the probability of successful cessation among youth and young adults (DeCicca, Kenkel, & Mathios, 2008; Tauras, 2004; Tauras & Chaloupka, 2001; US DHHS, 2012b; Zhang, Cohen, Ferrence, & Rehm, 2006). Evidence suggests that youth and young adults are more sensitive to cigarette price and tax increases than adults (Chaloupka, 2001; Chaloupka et al., 2011; Chaloupka & Wechsler, 1997; Farrelly & Bray, 1998; US DHHS, 2012b). While higher taxes and prices may not altogether prevent young adolescents from experimenting with cigarettes, regular uptake of smoking typically also occurs at younger ages. Higher taxes therefore do have the potential to reduce smoking rates in the longer term (Ross & Chaloupka, 2003).

This is the first study to examine changes in youth and young adult smoking behavior before and after the passage of the Children's Health Insurance Program Reauthorization Act of 2009, which raised the federal excise tax on a pack of cigarettes from $0.39 to $1.01 per pack, an increase of 158% (GPO, 2009). This represented the largest increase in U.S. federal excise taxes to date. As a result, cigarette prices jumped by 9.4% between March and April of 2009 (U.S. Department of Labor, 2009). The federal tax increase was also the only major tobacco control policy that affected smokers across the U.S. between 2008 and 2009. During this period, average state-level excise taxes on cigarettes remained more or less the same (CDC, 2009), and no other tobacco control policies were implemented uniformly across states.

The objective of our study was to estimate the effect of the federal cigarette tax increase on a wide range of smoking behaviors, including: (1) cigarette smoking initiation, (2) the prevalence of current cigarette use, (3) the number of days cigarettes were smoked among current smokers, (4) the average number of cigarettes smoked per day among current smokers, and (5) smoking cessation. We estimated the effect of the tax on youths aged 12–17 and young adults aged 18–25, by sex and race/ethnicity.

2 . Methods

2.1 . Sample

The National Survey on Drug Use and Health (NSDUH) was used to examine the smoking behavior of youth and young adults from 2002 to 2011. NSDUH is an annual cross-sectional, national- and state-based survey on the use of tobacco products, alcohol, illicit drugs, and mental health status among the U.S. civilian, non-institutionalized population aged 12 or older (SAMHSA, 2013a). The survey has been conducted since 1971 and collects data quarterly through face-to-face interviews. NSDUH employs a state-based design with an independent probability sample within each state and the District of Columbia. This study used data from the 2002–2011 NSDUH. Data prior to 2002 were not used because of the methodological changes introduced to the survey design in 2002, which affected respondent reporting of substance use (Kennet & Gfroerer, 2005). Annual sample sizes are around 3600 for each of the eight states with the largest populations and around 900 for each of the remaining states and the District of Columbia. Youth and young adults were oversampled to achieve roughly equal numbers of respondents aged 12 to 17, 18 to 25, and 26 or older each year. This corresponds to annual sample sizes of about 1200 for each age group in large states and 300 per age group in small states. The percentage of eligible households that completed the initial screening was 90.7% in 2002 and declined to 87.0% in 2011. Interview response rates among youth and young adults were 90.0% and 85.2%, respectively, in 2002, and declined somewhat to 85.0% and 80.5%, respectively, in 2011. The 2002–2011 study sample contained data on 226,315 youths and 226,228 young adults.

2.2 . Smoking measures

Cigarette smoking was assessed using five NSDUH indicators. The first indicator was *initiation of cigarette smoking* which is defined as having smoked the first lifetime cigarette during the 12 months before the survey interview. The measure is not defined for those who had a first lifetime cigarette more than 12 months before the survey interview. The second indicator was *past-month cigarette smoking* which is defined as having smoked all or part of a cigarette during the 30 days before the interview. This measure is defined for all respondents. The third indicator was *smoking cessation* which is defined as ever having smoked daily and smoked during the period 13 to 24 months ago, but not having smoked during the past 12 months. This measure is defined only for those who reported having been a daily smoker (i.e., having smoked 30 consecutive days) at some point in their lifetime and who reported smoking during the 13 to 24 months before the survey interview. The fourth indicator was a quantity measure among past-month smokers, in terms of the *number of days smoked during the past month*. The fifth indicator was the *number of cigarettes* smoked among past-month smokers on a typical day during the past month.

2.3 . Individual and state-level characteristics

In the statistical models for youth and young adults we controlled for the following set of respondent characteristics: sex, race/ethnicity, age, presence of parents in the household, birthplace (U.S. or not), household income, county type (e.g., metropolitan), religious service attendance, importance of religion, school enrollment, privacy during the survey interview, attitudes toward risky behavior, frequency of seatbelt use, and having moved 2 or more times during the past 5 years. In the models for youth, we also included two control variables measuring the perception of parents' attitude toward smoking one or more packs of cigarettes per day and perceived risk of smoking. In the models for young adults we included control variables for pregnancy, education, employment status, and health insurance status.

Several state-level covariates were used to account for differences in tobacco control policies and antismoking sentiment across states. State excise taxes on a pack of 20 cigarettes were obtained from the Tax Burden on Tobacco (Orzechowski & Walker, 2012), which contains annual averages that were converted to quarterly numbers through linear interpolation. Quarterly indices for the presence of a smoke-free law in bars, restaurants, and private workplaces as covariates were also included. These were collected from the ImpacTeen project (ImpacTeen, 2013) and CDC's State Tobacco Activities Tracking and Evaluation (STATE) system (CDC, 2013). The values that each index assumed were “no restrictions,” “some restrictions,” and “complete smoking ban.”

An annual measure of the lack of compliance with laws prohibiting the sale of tobacco products to individuals younger than 18 was also included. Following the Synar Amendment of 1992, states were required to enact and enforce such laws and conduct annual, unannounced inspections of