



Behavioral change in response to a statewide tobacco tax increase and differences across socioeconomic status



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ABSTRACT

Background: Tobacco use is a leading behavioral risk factor for morbidity and mortality, and the tobacco epidemic disproportionately affects low-socioeconomic status (SES) populations. Taxation is effective for reducing cigarette use, and it is an effective population-based policy for reducing SES-related tobacco disparities. However, progress in implementing cigarette excise taxes has stalled across the United States, and there is a dearth of research on the full spectrum of behavioral shifts that result from taxes, particularly among low-SES populations. This project documents the impact of Minnesota's \$1.75 cigarette tax increase implemented in 2013.

Methods: Data come from the 2014 Minnesota Adult Tobacco Survey. Descriptive analyses and Latent Class Analysis (LCA) were used to provide a typology of the tax impact.

Results: From the LCA, six classes were identified, and 42% of respondents were classified as reporting action-oriented behavioral change related to the tax—8% reported sustained smoking abstinence. We found differential behavior change across levels of SES. Low-SES and medium/high-SES individuals were equally likely to report complete tobacco cessation, but the prevalence of daily smokers who reported action-oriented behavior without sustained cessation was nearly double for low-SES individuals.

Conclusions: Smokers report a range of behavioral changes in response to cigarette taxes, with differences across SES. The majority of smokers, and particularly low-SES smokers, report behavioral steps toward quitting or achieving sustained tobacco cessation in response to cigarette taxes. Complementary population-based programs geared toward assisting individuals, especially low-SES individuals, to achieve continuous tobacco cessation could increase the reach and effectiveness of cigarette taxes.

1. Introduction

Tobacco use is a leading behavioral risk factor for disease worldwide and the number one preventable cause of morbidity and mortality in the United States (Lim et al., 2013; McAfee, Davis, Alexander, Pechacek, & Bunnell, 2013). The tobacco epidemic also disproportionately affects people of low socioeconomic status (SES). Smoking prevalence among U.S. adults who are at or above the federal poverty level is 17% versus 28% for those below the poverty line (Centers for Disease Control and Prevention, 2014). Smoking accounts for half of mortality disparities associated with SES among men, and a similar effect is emerging among women (Gregoraci et al., 2016; Jha et al., 2006). There are a range of mechanisms that underlie the relationship between SES and smoking, including direct and indirect effects

associated with income and education. Mechanisms include: stress associated with social position and deprivation; limited access to health information and health education opportunities; differential levels of human capital and subsequent self-efficacy and agency; neighborhood and community effects (e.g., tobacco companies target low-income neighborhoods for outdoor and point-of-sale advertising); and dynamics associated with social networks (see Pampel, Krueger, & Denney, 2010).

Cigarette taxation that results in higher prices is one of the most effective population-level strategies for reducing tobacco use (Chaloupka, Yurekli, & Fong, 2012; Warner, 2014). Moreover, cigarette taxation can reduce SES-related smoking disparities among adults (Brown, Platt, & Amos, 2014; Siahpush, Wakefield, Spittal, Durkin, & Scollo, 2009). However, tax increases have become less common across the United States (Holmes,

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King, & Babb, 2016). Between 2010 and 2014, only six states increased their rate by \$1.00 or more, and of those, only Minnesota and New York increased their tax rates by \$1.50 or more (Holmes et al., 2016). These trends have negative implications for the *Healthy People 2020* objective of increasing cigarette excise taxes by at least \$1.50 per pack in all 50 states by 2020 (Holmes et al., 2016, p. 3), as well as continuing to reduce preventable tobacco-related morbidity and mortality (Marynak et al., 2016).

As smoking prevalence rates decline, research on the impact of cigarette taxes and how taxes should be implemented will be needed to achieve maximum effectiveness (Bader, Boisclair, & Ferrence, 2011). Specifically, further research is needed to (1) build on previous literature by outlining how cigarette taxes influence behavior change, and (2) to delineate the effects of taxes on smoking cessation among subpopulations. There is substantial documentation of price elasticity and estimates of broad population-based change in regards to smoking prevalence; for instance, a 10% increase in the price of cigarettes is associated with a three to 5% reduction in cigarette use (e.g., see Chaloupka, Cummings, Morley, & Horan, 2002; Chaloupka et al., 2012).

Yet there is a dearth of population-based research on the full spectrum of behavioral shifts—i.e., the full stages-of-change continuum and heterogeneity of responses along that continuum—that result from taxes, particularly among subpopulations such as the socioeconomically disadvantaged (Choi & Boyle, 2013; Grace, Kivell, & Laugesen, 2014). According to theory rooted in a stages-of-change perspective (see Prochaska, Redding, & Evers, 2008; Weinstein, Sandman, & Blalock, 2008), in general smokers change their behavior in successive stages (e.g., contemplation, action), and smokers move along a spectrum of behavioral change (forward and backward) as they work toward achieving maintenance (i.e., complete tobacco cessation). Delineating patterns of these behavioral changes would inform efforts to expand the effectiveness of statewide tobacco taxes, offering potential avenues to strategically reach priority subpopulations and further evidence supporting tax implementation as a form of tobacco control.

1.1. Current study

In 2013 the state of Minnesota implemented a \$1.75 (U.S. dollars) tax increase on cigarettes and little cigars, and an increased tax on other tobacco products from 70% to 95% of wholesale price. The implementation of these policies occurred approximately one year (a minimum of seven months) prior to a 2014 population-based survey of Minnesota adults (Minnesota Adult Tobacco Survey [MATS]), providing a unique opportunity to study smoking behavior change in response to a statewide tobacco tax. Utilizing methods geared toward classifying behavior patterns, we aim to document a detailed typology of tax responses in line with a stages-of-change perspective, focusing on responses for both current smokers and former smokers. We also assess how behavior changes in response to the tax are differentially distributed across low-SES and high-SES subpopulations. A central goal is to inform prevention programs geared toward expanding taxes' effectiveness for reducing smoking prevalence and smoking-related disparities.

2. Methods

2.1. Data

Data come from the 2014 MATS, a statewide, cross-sectional telephone survey that assessed tobacco use among 9304 Minnesotans aged 18 or older. A landline and cellphone random-digit-dial (RDD) sampling method was used. Sampling consisted of a two-step process: a household screening questionnaire to identify households, followed by sampling within the household. The combined response rate was 71%. The MATS survey is weighted to account for sampling and geographical stratification in order to ensure statewide representativeness (see ClearWay Minnesota & Minnesota Department of Health, 2014).

2.2. Sample

The study sample consisted of smokers at time of cigarette tax increase and who had smoked within the past 12 months, and individuals who had not smoked within the 12 months prior to MATS but reported quitting between 12 and 24 months prior (Overall sample $n = 1569$). We included former smokers because tobacco taxes can serve as a “commitment device” for cessation maintenance (e.g., Gruber & Koszegi, 2004), and because individuals quit in preparation for tax increases (e.g., Reed, Anderson, Vaughn, & Burns, 2008). List-wise deletion was used for missing data; < 5% of the sample was removed. Supplementary analyses that used pair-wise deletion exhibited nearly identical results.

2.3. Measures

2.3.1. Self-reported response to tax

MATS included a question about the tax increase that asked, “Taxes on the purchase of tobacco products have increased in the past 12 months in Minnesota. What effects, if any, did this price increase have on your smoking?” Four subsequent questions asked if the tax helped respondents to: (1) think about quitting, (2) cut down on cigarettes, (3) make a quit attempt, and (4) maintain a quit. Following a stages-of-change perspective (see Prochaska et al., 2008; Weinstein et al., 2008), we scored each individual according to the highest ordered behavioral stage reported.

In accordance with theory and previous research (see Kingsbury, Parks, Amato, & Boyle, 2016), we used three mutually exclusive, ordered categories of “no action” (no response and contemplation), “action” (cigarette reduction and quit attempt), and “maintenance” (maintained quit attempt). Individuals labeled as maintenance reported their highest level of behavior change as “maintained a quit attempt”; alternatively, if the highest level of change reported was reduced amount of cigarettes or made a quit attempt, then respondents were labeled as “action.” If individuals reported no response or thought about quitting, they were labeled as “no action” in accordance with action being a distinct stage compared to contemplation and pre-contemplation (Prochaska et al., 2008).

2.3.2. Smoking-related behavior

Following past research (Choi & Boyle, 2013; Dunlop, Perez, & Cotter, 2011), we employed three measures of smoking behavior: Current smoking status, smoking status 12 months prior to MATS, and engaging in price minimizing behaviors. Current smoking status was measured using established definitions of: (1) daily smoker (> 100 cigarettes in lifetime and currently smoker every day), (2) smoking some days (> 100 cigarettes in lifetime and currently smoke some days), (3) former smoker (> 100 cigarettes in lifetime, does not smoke at all currently and has not smoked in past 30 days), and (4) current experimenter (< 100 cigarettes in lifetime but has smoked in past 30 days). Prior smoking was measured as smoking status 12 months prior to survey: (1) smoking daily, (2) smoking some days, (3) not smoking at all, and (4) had quit 12 to 24 months prior to survey.

For price minimization behaviors, respondents were asked, “In the past 12 months, have you done any of the following things to try and save money on cigarettes: buy cheaper brand of cigarettes, roll own cigarettes, use other form of tobacco, use coupons/rebates/or other special promotions, buy cartons instead of individual packs, find less expensive places to buy cigarettes, smoke fewer cigarettes, shared fewer cigarettes with others, saved half a cigarette for later, or ‘other’.” The dichotomous measure captured whether respondents had engaged in one or no behaviors to save money on cigarettes in previous 12 months versus two or more money-saving behaviors in previous 12 months (0 = no price minimization behavior; 1 = price minimization behavior). The cutoff for two behaviors was chosen because more than one behavior was more indicative of price minimization compared to a single act (e.g., using a coupon once).

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