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Trends in cigarette, cigar, and smokeless tobacco use among New York City public high school youth smokers, 2001–2013

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ABSTRACT

Objective. This study aimed to describe the recent trends in youth smoking behaviors, and examine cigar and smokeless tobacco use patterns among youth smokers in New York City.**Methods.** Data, analyzed in 2014, were from the New York City Youth Risk Behavior Survey, a cross-sectional survey conducted bi-annually since 1997 in a representative sample of New York City public high school students (2001–2013), $n = 59,122$.**Results.** Cigarette smoking declined 53%, from 17.6% in 2001 to 8.2% in 2013 ($p < 0.001$). The proportion of cigar use among smokers doubled, from 22.2% in 2001 to 45.9% in 2013 ($p < 0.001$), while the proportion of smokeless tobacco use among smokers increased by 400% between 2001 and 2013 (4.2% vs. 21.2%, $p < 0.001$).**Conclusions.** Youth cigarette smoking rates in New York City decreased, while cigar smoking and smokeless tobacco use among smokers increased considerably. These data highlight trends in youth smoking behaviors within the context of New York City's comprehensive tobacco control program and stress the need for additional activity to spur further declines in cigarette smoking and reverse the trends in cigar and smokeless tobacco use among New York City youth. Results demonstrate the need for continuous surveillance and action by the public health community to counteract tobacco industry promotion of other products.Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Tobacco use is a leading cause of preventable death in the U.S. and NYC³ (Goodarz et al., 2009; New York City Department of Health and Hygiene, 2011). Since most adult smokers become regular smokers by age 18 (Biener and Albers, 2004), ongoing surveillance of youth tobacco use is critical to track progress made by tobacco control programs and to identify areas requiring additional public health intervention. Further, while broad tobacco control programs target the general population, there may be a differential impact on youth compared to adult tobacco users (Tworek et al., 2010). Youth cigar and smokeless tobacco use has not previously been studied among NYC youth or youth smokers. These data are of interest given the recent tobacco industry marketing strategies aimed at counteracting tobacco control policies (American Lung

Association). For example, since federal regulations prohibit flavored cigarettes, manufacturers have shifted to producing flavored cigars (Villanti et al., 2013), which are frequently designed to mimic cigarettes (Delnevo and Hrywna, 2006). Further, smokeless tobacco products, often flavored (Villanti et al., 2013), are promoted as safer alternatives to cigarettes (American Lung Association). Marketing of such products by the tobacco industry has increased over the years: between 2001 and 2011 advertising and promotion dollars spent by the tobacco industry on the marketing of smokeless tobacco products rose from \$234 million to over \$450 million (Federal Trade Commission, 2015).

To reduce the burden of tobacco-related morbidity and mortality, in 2002 NYC implemented a tobacco control strategy consisting of: taxation, legislation, cessation, public education, and evaluation (Frieden et al., 2005a). Concurrent with NYC's tobacco control plan, youth cigarette smoking decreased 52%, from 18% to 9% between 2001 and 2011 (Kilgore et al., 2014), while the national youth smoking prevalence has continuously declined from 28.5% in 2001 to the current 2013 prevalence of 15.7% (Centers for Disease Control and Prevention, 2014).

Characterization of tobacco use trends in the broader context of such tobacco control efforts across all age groups is relevant as it can serve as a reference for other localities considering similar approaches (Kilgore et al., 2014). Though cigarette trends in the adult and youth population have been reviewed (Kilgore et al., 2014; Frieden et al., 2005b),

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Cigarette Smoking Trends among NYC Youth, 2001–2013

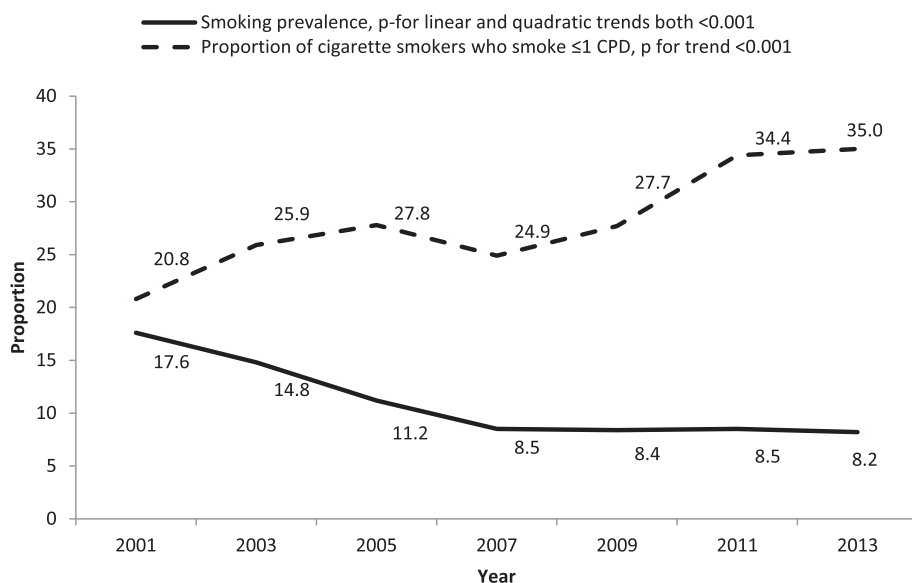


Fig. 1. Cigarette smoking trends among NYC youth, 2001–2013.

additional tobacco related behaviors in NYC youth have not previously been described. Further, as most elements of tobacco control efforts in NYC have historically targeted cigarette smoking (Frieden et al., 2005b), characterization of trends in alternative tobacco use, which are limited (Fix et al., 2014), concurrent with tobacco control strategies is also warranted. Using a NYC population based cohort of high school students, the current study seeks to investigate trends in youth tobacco and poly-tobacco use within the context of a long-standing tobacco control strategy. Specifically, our objectives were: (1) to assess current trends in NYC youth smoking behaviors, and (2) to characterize trends in cigar and smokeless tobacco use among NYC youth by smoking status.

Methods

Sample and survey design

Data came from the NYC YRBS⁴, years 2001–2013 ($n = 59,122$), a cross-sectional bi-annual study monitoring health risk behaviors among NYC youth. The NYC YRBS is conducted by the NYC Health Department and the NYCDOE⁵, in partnership with the CDC⁶. The NYC YRBS is a regional version of the national YRBS; methods are based on the national YRBS protocol, and it is designed to be representative of NYC public high school students. Study methods, described elsewhere (New York City Department of Health and Mental Hygiene, 2012), were approved by the NYC Health Department and NYCDOE Institutional Review Boards.

Measures

Cigarette experimentation was defined as ever trying cigarette smoking, even one or two puffs. Smoking was defined as smoking

cigarettes on one or more days during the past 30 days. Individuals reporting smoking less than one CPD⁷ on the days smoked during the past 30 days were categorized as such. Cigar smoking was defined as smoking cigars, cigarillos, or little cigars on one or more days in the past 30 days (not asked in 2011). Smokeless tobacco use was defined as using chewing tobacco, snuff, or dip on one or more days in the past 30 days.

Statistical analyses

Demographic characteristics (age, sex, grade, and race/ethnicity) were assessed in the overall sample. For each survey year, the prevalence of cigarette experimentation, cigarette smoking, and smokers smoking less than one CPD was estimated. The prevalence of cigar and smokeless tobacco use was assessed overall and by smoking status. Changes between years were assessed using *t* tests for proportions. Proc ratio was used to test for linear and quadratic trends. Data were analyzed using SUDAAN software (version 11.0; Research Triangle Institute, Research Triangle Park, North Carolina).

Results

Between 2001 and 2013, most (91%) NYC public high school youth were aged 14–17; about half were female; 62% were 9th and 10th graders; and 14% were white, 34% black, 36% Hispanic and 13% Asian.

Cigarette experimentation declined from 58.0% in 2001 to 26.8% in 2013 ($p < 0.001$, p -trend < 0.001). Cigarette smoking (Fig. 1) decreased significantly from 17.6% in 2001 to 8.2% in 2013 ($p < 0.001$, p -linear and quadratic trends < 0.001). The proportion of smokers who reported smoking less than one CPD increased significantly from 2001 to 2013 (20.8% to 35.0%, $p < 0.001$, p -trend < 0.001).

The prevalence of cigar use increased between 2001 and 2013 overall (5.1% vs. 7.7%, $p < 0.001$, p -trend = 0.091), in non-cigarette smokers (1.1% vs. 3.3%, $p < 0.001$, p -trend < 0.001), and in cigarette smokers (22.2% to 45.9%, $p < 0.001$, p -trend < 0.001), Fig. 2. Smokeless tobacco

⁴ YRBS: Youth Risk Behavior Survey.

⁵ NYCDOE: New York City Department of Education.

⁶ CDC: Centers for Disease Control and Prevention.

⁷ CPD: Cigarettes per day.

Cigar and Smokeless Tobacco Use Trends among NYC Youth Smokers 2001–2013

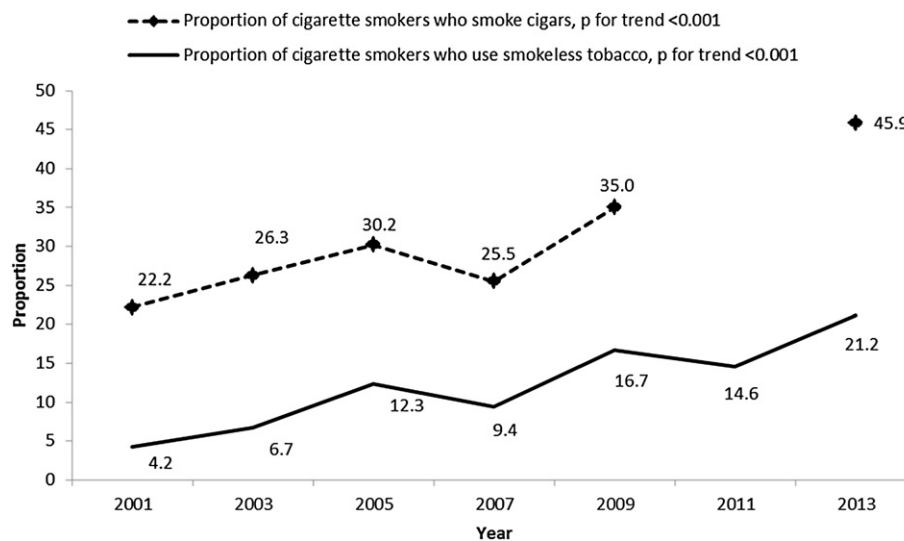


Fig. 2. Cigar and smokeless tobacco use trends among NYC youth smokers, 2001–2013.

use also increased between 2001 and 2013 overall (1.1% to 4.4%, $p < 0.001$, p -trend < 0.001), among non-cigarette smokers (0.2% to 1.9%, $p < 0.001$, p -trend < 0.001) and among cigarette smokers (4.2% to 21.2%, $p < 0.001$, p -trend < 0.001).

Discussion

Smoking among NYC youth declined 53% since 2001. However, since 2007, youth smoking rates in NYC have plateaued. This is an interesting finding considering cigarette experimentation has continued to decline since 2007; it would be expected that smoking rates would mimic rates of cigarette experimentation (Arrazola et al., 2010). Since 2007, the proportion of smokers who report smoking less than one CPD increased 41%. These data indicate that though smoking rates have plateaued, since 2007 fewer youth are experimenting with cigarettes and youth who do smoke are smoking fewer CPD.

The substantial decline in youth cigarette smoking coincides with implementation of NYC's comprehensive tobacco control plan (Frieden et al., 2005a). Taxation, a key element of the plan, is one of the most effective interventions in reducing tobacco use (Jha and Chaloupka, 2000), with youth being particularly price sensitive (Townsend et al., 1994; Rieder, 1998). Between 2001 and 2014, a series of tax hikes made cigarettes in NYC one of the most expensive in the nation (Federation of Tax Administrators, 2014). Given youth sensitivity to cigarette pricing (Townsend et al., 1994; Rieder, 1998), and the implementation of other tobacco control measures such as smoke-free air laws and the regular airing of hard-hitting anti-tobacco media campaigns (Biener and Albers, 2004), the large decline in cigarette experimentation, smoking, and CPD smoked since 2001 is no surprise. In 2014, NYC passed two bills that set the minimum cigarette purchase price to \$10.50 (The New York City Council, 2013) and raised the minimum cigarette and e-cigarette purchase age to 21 (The New York City Council, 2013). Though it will take more time to fully characterize the potential impact of such recent policies on youth smoking in NYC, low youth smoking rates in Needham, Massachusetts compared with the rest of the state have been attributed to similar legislation passed in 2005 (The Needham Board of Health, 2008).

Despite progress in reducing smoking among NYC youth, examination of other tobacco use trends revealed different patterns. Among cigarette smokers, cigar use has doubled and smokeless tobacco use has

increased by 400%. The increase in polytobacco use in the form of cigarette plus cigar use and cigarette plus smokeless tobacco use is problematic for a number of reasons. First, polytobacco use may increase the risk of nicotine dependence. Research has also suggested that polytobacco use may be associated with alcohol use (Wetter et al., 2002)—more so than cigarette smoking alone, as well as higher risk taking behaviors (Fix et al., 2014). Though secular trends reveal that rates of polytobacco use among young populations (under 26) have increased (Fix et al., 2014), reported increases in national estimates are much more modest than what was seen by the current analysis and likely do not fully explain the trends seen in NYC.

It is well-established that the tobacco industry has employed strategies such as couponing and multi-pack discounts to boost cigarette consumption in response to higher excise taxes (Chaloupka et al., 2002). More recently, little cigars have been increasingly marketed (Delnevo, 2006). Little cigars are designed to look like cigarettes, but are not subject to the same regulations and taxes as cigarettes (Delnevo and Hrywna, 2007). In the setting of NYC's high cigarette tax, youth smokers may turn to cigars and little cigars as a supplement or cheaper alternative to cigarettes (Connolly, 2008). In addition, the general increase in promotion of smokeless tobacco products, and specifically, tobacco company marketing of these products as an alternative to cigarettes in smoke-free areas may explain the increase in use among youth smokers (Federal Trade Commission, 2015). Ultimately, these data emphasize the need for public health efforts focus on consumption of other tobacco products, such as cigars and smokeless tobacco (Freiberg, 2012). To address this issue, in August 2014, NYC introduced a policy equalizing the price of little cigars to that of cigarettes, making it more difficult for youth to gain access to these products (Freiberg, 2012; The New York State Department of Taxation and Finance, 2014). Future studies will be needed to assess the impact of such legislation.

As the tobacco industry often attempts to counteract tobacco control efforts (Chaloupka et al., 2002), monitoring trends in tobacco use and identifying the impact of and gaps in tobacco control policy over time is critical (Gostin et al., 2004). With one of the highest cigarette prices in the nation (Federation of Tax Administrators, 2014), and a 'best-practices' tobacco control program (Centers for Disease Control and Prevention, 2014), tobacco use trends in NYC are particularly relevant as lessons learned may serve as a point of reference to help inform policy in other localities (Kilgore et al., 2014).

Limitations

This analysis is not without limitations. Given white adolescents are more likely to smoke (Ellis et al., 2006) and are under-represented in NYC public schools (33.6% of the NYC population is white vs. only 14% of public high school youth) (New York State Department of Health), smoking prevalence estimates from NYC YRBS are likely underestimated. Additionally, the current analysis could not characterize use of other products like e-cigarettes or the use of water pipes as these data were unavailable. Finally, this analysis was not a formal evaluation of tobacco policies and did not control for secular trends, though trends in national youth smoking rates reveal different patterns (e.g. the national smoking rate is still declining) (Centers for Disease Control and Prevention, 2014).

Conclusion

Overall NYC has experienced substantial declines in youth smoking since the implementation of its comprehensive tobacco control policies in 2002. But while the youth smoking rate has stalled since 2007, the prevalence of cigar and smokeless tobacco use among youth smokers has increased considerably. These data highlight the importance of tobacco control policies in curbing cigarette smoking and the need for additional measures to target use of other tobacco products among youth.

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Conflict of interest statement

The authors declare that there are no conflicts of interests.

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