Original article

Patterns of Current Use of Tobacco Products Among U.S. High School Students for 2000—2012—Findings From the National Youth Tobacco Survey

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A B S T R A C T

Purpose: The purpose of this study was to assess patterns and trends of tobacco use among high school students to better understand which products are used individually or concurrently.
Methods: Data from the National Youth Tobacco Survey from 2000 through 2012 were used to assess patterns and trends of current tobacco use (cigarettes, cigars, smokeless tobacco, and other tobacco products) among U.S. high school students. We assessed use of products individually and concurrently.
Results: During 2000—2012, overall linear declines were observed in current use of any tobacco product from 33.6% to 20.4% ($p < .05$), current use of only 1 tobacco product, from 18.8% to 10.5% ($p < .05$), and current poly tobacco use, from 14.7% to 9.9% ($p < .05$), among high school students. Overall current use of only cigarettes had both a linear decline, from 14.0% to 4.7%, as well as a quadratic trend.
Conclusions: During 2000—2012, the most significant overall decline observed was for students who reported smoking only cigarettes. The results suggest that more data on the use of multiple tobacco products, not just cigarettes, is needed to guide tobacco prevention and control policies and programs.
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IMPLICATIONS AND CONTRIBUTION

Recent declines in current tobacco use among U.S. high school students appear to be driven by those who smoke cigarettes. To achieve greater declines, policies and programs focused on cigarettes may consider expanding to all tobacco products. Monitoring of all tobacco use among youth provides information to prevent initiation.

Tobacco use continues to be the single leading preventable cause of death and disease in the United States [1], and most tobacco use begins before the age of 18 [2]. Cigarette smoking remains prevalent among youth, with approximately one of five high school students reporting current smoking in 2011 [3]. Although declines in youth smoking rates were observed over the past two decades, more recently, the decline in current cigarette smoking is occurring at a slower rate than was observed during 1997—2003 [4]. The rates

observed for use of other tobacco products (e.g., cigars, smokeless tobacco) have not changed during this period [5].

A conclusion from the 2010 Surgeon General's Report supports previous findings that nicotine is the key compound that produces the addictive effects of tobacco products [6], and all tobacco products contain nicotine [7]. The concurrent use of multiple tobacco products is a public health concern, especially during adolescence when young people may experiment with various tobacco products [2], which may increase their risk of nicotine dependence. Research has suggested that use of multiple tobacco products concurrently may lead to greater addiction among users of these products [2]. Furthermore, among high school students, use of tobacco in the past 30 days is associated with the use of alcohol and other illegal substances [8], and the relationship is even stronger when students report using two or more tobacco products [9]. These findings indicate a need to monitor the use of all types of tobacco products, both individual and concurrently, because young people who use

multiple tobacco products are potentially increasing their exposure to nicotine and their risk of dependence on nicotine [10].

Given that the rate of decline has slowed in recent years for current use of cigarettes but not for other tobacco products (e.g., cigars, smokeless tobacco) among young people [2], researchers need to understand better the use of multiple products over time among youth. At present, limited information exists on the current use of specific tobacco products that high school students use individually or concurrently. The purpose of this study is to assess the prevalence of the current use of cigarettes, cigars, smokeless tobacco, pipe tobacco, bidis, and kreteks alone or in combination with one another and to identify any changes over time.

Methods

Data source and study population

We used data from the National Youth Tobacco Survey (NYTS) from 2000 through 2012. The NYTS is a school-based, cross-sectional survey that collects information on key tobacco indicators, such as behaviors and attitudes, from middle school (grades 6–8) and high school (grades 9–12) students and provides national estimates on these indicators. A more comprehensive description of the NYTS and its methodology can be found at http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm.

Our study focused on patterns and trends in tobacco use among high school students for six specific products: cigarettes, cigars, smokeless tobacco, pipe tobacco, bidis, and kreteks. We limited our analysis to high school students who responded to all questions about their use of these products in the past 30 days; those with missing responses were excluded. Initial sample sizes ranged from 19,350 (highest) students in 2000 to 9,720 (lowest) in 2011 (Table 1). For our study, sample sizes ranged from 18,219 (highest) students in 2000 to 9,198 (lowest) in 2011.

Measures

The following questions were used to assess current tobacco use: (1) "During the past 30 days, on how many days did you smoke cigarettes?" (2) "During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?" (3) "During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?" (4) "During the past 30 days, on how many days did you smoke tobacco in a pipe?" (5) "During the past 30 days, on how many days did you smoke bidis?" and (6) "During the past 30 days, on how many days did you smoke kreteks?" Note that in 2012 the bidis and kreteks questions changed to "In the past 30 days, which of the following products have you used on at least one day?" and students could select different products of which "bidis (small brown cigarettes wrapped in a leaf)" and "clove cigarettes (kreteks)" were possible selections. We defined "any current tobacco use" as using one or more of these six products on at least 1 day in the past 30 days; respondents who did not use any products on at least 1 day of the past 30 days were categorized as "no current tobacco use" (Figure 1). Because of small sample sizes, we collapsed use of pipe tobacco, bidis, and kreteks in the past 30 days into the category "other tobacco product."

Any current tobacco use was then examined as two mutually exclusive categories: "current use of only 1 tobacco product" and "current poly tobacco use" (Figure 1). Current use of only 1 tobacco product was then examined as four mutually exclusive categories: "current use of only cigarettes," "current use of only smokeless tobacco," "current use of only cigars," and "current use of only 1 other tobacco product" (Figure 1).

Current use of 2 or more tobacco products was categorized as "current poly tobacco use" (Figure 1). Current poly tobacco use was then examined as two mutually exclusive categories: "current use of only 2 tobacco products" and "current use of at least 3 tobacco products" (Figure 1).

Current use of only 2 tobacco products was examined as two mutually exclusive categories: "current use of cigarettes and 1 tobacco product" and "no current use of cigarettes but only 2 tobacco products" (Figure 1). Current use of cigarettes and 1 tobacco product was then examined as three mutually exclusive categories: "current use of only cigarettes and smokeless tobacco," "current use of only cigarettes and cigars," and "current use of only cigarettes and only 1 other tobacco product" (Figure 1).

Current use of at least 3 tobacco products was examined as two mutually exclusive categories: "current use of cigarettes and at least 2 tobacco products" and "no current use of cigarettes but at least 3 tobacco products" (Figure 1). Current use of cigarettes and at least 2 tobacco products was then examined as five mutually exclusive categories: "current use of only cigarettes, cigars, and smokeless tobacco;" "current use of only cigarettes, smokeless tobacco, and at least 1 other tobacco product;" "current use of only cigarettes, cigars, and at least 1 other tobacco product;" "current use of only cigarettes and at least 2 other tobacco products;" and "current use of cigarettes, smokeless tobacco, cigars, and at least 1 other tobacco product" (Figure 1).

Analysis

All analyses took into account this study's multistage probability design. Data were adjusted for nonresponse and weighted to provide nationally representative prevalence estimates of current tobacco use (and each of its stratifications) overall and for selected demographic characteristics. Results where the denominator was less than 50 or the relative standard error was higher than 30% were marked as statistically unstable. We used orthogonal polynomials to perform multinomial logistic regression analyses to simultaneously assess for linear and quadratic trends during 2000–2012.

Our models used the following outcomes: Outcome 1 had two possible outcomes: "no current tobacco use" and "any current tobacco use." Outcome 2 had three possible outcomes: "no current tobacco use," "current use of only 1 tobacco product," and "current poly tobacco use." Outcome 3 had four possible outcomes: "no current tobacco use," "current use of only 1 tobacco product," "current use of only 2 tobacco products," and "current use of at least 3 tobacco products." Outcome 4 had six possible outcomes: "no current tobacco use," "current use of only 1 tobacco product," "current use of cigarettes and 1 tobacco product," "no current cigarette use but only 2 tobacco products," "current use of cigarettes and at least 2 tobacco products," and "no current use of cigarettes but at least 3 tobacco products." Outcome 5 had fifteen possible outcomes: "no current tobacco use," "current use of only cigarettes," "current use of only smokeless tobacco," "current use of only cigars," "current use of only 1 other tobacco product," "current use of only cigarettes and