

Monitoring polytobacco use among adolescents: Do cigarette smokers use other forms of tobacco?

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The extent of concurrent use of cigarettes and one or more other tobacco products (polytobacco use) is important to explore because users may be at an increased risk for adverse health effects and nicotine dependency. We determined national population estimates of current cigarette and current polytobacco use for at least 50,000 students from the 2002 and 2004 National Youth Tobacco Surveys. We identified which tobacco products were most often used in conjunction with cigarettes and used multivariate analyses to identify factors associated with polytobacco use. The overall prevalence was 16.0% for current cigarette smoking among all respondents and 15.0% for current cigarette smoking among respondents with complete information on concurrent cigarette and other tobacco product use: 8.1% used cigarettes only, and 6.9% were polytobacco users. Among current male cigarette smokers, 62.0% used other tobacco products; among current female cigarette smokers, 30.9% did. Among current cigarette smokers using one other tobacco product, cigars or smokeless tobacco were the most frequently used products. In multivariate analysis, polytobacco use was associated with being male; being in middle school; residing in the Midwest, South, or West; being able to obtain cigarettes from a retailer; being subject to peer influence; having favorable beliefs about tobacco; being willing to use tobacco promotional items; being exposed to tobacco advertisements; and having higher levels of lost autonomy (an indicator of nicotine dependency). Youth interventions need to broaden their focus to address the use of all tobacco products, paying particular attention to adolescent males and youth living outside of the Northeast.

Introduction

In 2004, more than one-fourth of all U.S. high school students were current users of at least one form of tobacco. For individual product use, cigarettes were the most commonly used tobacco product (21.7%), followed by cigars (12.9%), smokeless tobacco (5.5%), pipes (3.2%), bidis (2.7%), and kreteks (2.5%); Centers for Disease Control and Prevention [CDC], 2005). Cigarette use among adolescents has been associated with the use of cigars, smokeless tobacco, pipes, bidis, and kreteks (American Legacy Foundation, 2003; Delnevo & Hrywna, 2006; Frazier, Fisher, Camargo, Tomeo, & Colditz, 2000; Gilpin & Pierce, 2003;

Goebel, Crespo, Abraham, Masho, & Glover, 2000; Soldz, Huyser, & Dorsey, 2003; Tercyak & Audrain, 2002). Despite these associations, few studies have examined polytobacco use among youth (Bombard, Pederson, Nelson, & Malarcher, 2007; Gilpin & Pierce, 2003), which we define as the use of cigarettes in conjunction with cigars, smokeless tobacco, pipes, bidis, and/or kreteks. Polytobacco use is important to examine because users of multiple forms of tobacco may be at greater risk for adverse health effects and nicotine addiction, compared with sole users of individual tobacco products.

Four studies have described the prevalence of cigarette use combined with the use of other tobacco products among youth. In a 2000 Virginia baseline sample for a cohort study ($N=1,107$), Tercyak and Audrain (2002) found that nearly half of 9th-grade cigarette smokers used cigars, smokeless tobacco, pipes, bidis, and/or kreteks. In an analysis of data from a 2001 Massachusetts convenience sample ($N=5,016$), Soldz et al. (2003) found that, among middle and high school students who currently used any other tobacco product (cigars, bidis, kreteks, and/

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or smokeless tobacco), 62% currently smoked cigarettes as well. In a 1999 California study among adolescents aged 12–17 years old ($N=6,090$), 40% of current cigarette smokers used smokeless tobacco, cigars, and/or bidis (Gilpin & Pierce, 2003). Finally, in a national study based on data from the 1997 Youth Risk Behavioral Survey, Everett, Malarcher, Sharp, Husten, and Giovino (2000) found that almost 20% of all U.S. high school students were currently using more than one type of tobacco product (cigarettes, cigars, smokeless tobacco) and that the use of cigarettes and cigars was more prevalent than the use of cigarettes and smokeless tobacco.

Some evidence indicates that adolescents who use multiple tobacco products differ from those who smoke only cigarettes. Gilpin and Pierce (2003) found that adolescents who smoked cigarettes and concurrently used smokeless tobacco, cigars, and/or bidis were more likely to engage in problem behaviors (e.g., cutting class, risky activities), be influenced by peer use of other tobacco products, be influenced by cigarette advertising, and either have used or be willing to use tobacco promotional items, compared with adolescents who smoked only cigarettes. Other studies found that adolescents who smoked cigarettes and used smokeless tobacco were more likely (a) to be influenced by peer use of smokeless tobacco (Horn, Gao, Dino, & Kamal-Bahl, 2000), (b) to engage in problem behaviors, (c) to use other substances such as marijuana, cocaine, or alcohol (Coogan, Geller, & Adams, 2000; Kerby, Brand, & John, 2003; Simon, Sussman, Dent, Burton, & Flay, 1993), and (d) to have been suicidal, experienced pressure to be sexually active, and suffered from mental health problems (Coogan et al., 2000). Similar characteristics were found to have a stronger association among concurrent users of smokeless tobacco, cigars, and cigarettes, compared with cigarette-only users (Everett et al., 2000).

Using nationally representative data from the 2002 and 2004 National Youth Tobacco Surveys, this study attempts to add to the limited amount of literature on polytobacco use by providing recent estimates of (a) the national prevalence of current polytobacco use among adolescent cigarette smokers, (b) the frequency with which adolescent cigarette smokers use various combinations of other tobacco products, and (c) the extent to which various predictor variables are associated with current polytobacco use among adolescents.

Method

Data source and study population

The National Youth Tobacco Survey (NYTS) collects nationally representative information on the use of tobacco products among middle and high

school students, as well as on other factors related to tobacco use, such as exposure to tobacco advertising, peer use of tobacco, and attitudes toward smoking. The NYTS has been conducted biennially since 2000. In the current analyses, we combined the data from the 2002 and 2004 surveys to have adequate sample sizes to examine polytobacco use among different racial/ethnic groups, explore the different combinations of product use, and conduct multivariate logistic regression analyses.

The NYTS used a three-stage cluster sample design to produce a nationally representative sample of U.S. public and private schools for students in grades 6–12 (sampling frame). The NYTS was stratified by census region, by metropolitan statistical area (MSA) status, and by state. Black, Hispanic, and Asian students were oversampled. At the first-stage sampling frame, primary sampling units (i.e., groups of counties or large counties) were selected from strata, and schools were selected from these sampling units with the probability of their selection proportional to their size in the second stage of sampling. At the third sampling stage, classes were selected from each school (about 5 classes and 125 students) from a variety of subjects (e.g. English, Social Studies). Additional details of the NYTS design can be found elsewhere (CDC, 2007a).

In 2002, 298 schools in 100 primary sampling units were selected. Of 296 eligible schools, 246 (83.1%) participated in the survey; of 28,858 students who were sampled, 26,149 (90.6%) completed the questionnaire for an overall response rate of 75.3%. In 2004, 288 schools in 91 primary sampling units were selected. Of these 288 schools, 267 (92.7%) participated in the survey; of 31,774 students who were sampled, 27,933 (87.9%) completed the questionnaire for an overall response rate of 81.5%.

Participation in the NYTS was anonymous and voluntary, school-specific parental permission procedures were followed, and students recorded their responses on a computer-scannable sheet. The study was approved by the institutional review boards of the CDC and the contractors that collected the data.

Definitions of variables

Current cigarette use, current polytobacco use. We defined current cigarette smokers as respondents who indicated using cigarettes during the previous 30 days (CDC, 2005), and we defined current polytobacco users as current cigarette smokers who reported also using cigars, smokeless tobacco, pipes, bidis, and/or kreteks during the previous 30 days. We defined polytobacco users this way because of the high prevalence of other tobacco product use among cigarette smokers and to compare our findings with

those from previous studies (Backinger et al., 2008; Bombard et al., 2007; Gilpin & Pierce, 2003).

Demographics and predictor variables. We examined current cigarette use (both cigarette-only use and cigarette use that could include use of other tobacco products) and current polytobacco use by education level (middle school, high school), weekly income from a job and from other sources (none, <US\$1–\$20, \$21–\$100; \$101+), gender (male, female), region (Northeast, Midwest, South, West), and mutually exclusive race/ethnicity categories (White, Black, Hispanic, Asian). Because of small sample sizes and differences in question wording in 2002 and 2004, we were unable to examine other race/ethnicity categories or combinations of categories (e.g., White Hispanic). Among cigarette smokers, 1,355 were not classified by race/ethnicity. The number of smokers with missing data for other demographic variables ranged from 28 to 182.

The predictor variables used in the final analyses were based on the availability of survey variables shown to be associated with the use of cigarettes or the concurrent use of cigarettes and other tobacco products (Gilpin & Pierce, 2003; Tyas & Pederson, 1998). These variables included the availability of cigarettes from a retailer or other source, peer influence on cigarette use (friends' offering of a cigarette), and personal attitudes toward cigarette smoking (think smoke from cigarettes is harmful, believe it is safe to smoke for 1–2 years, and smoking looks cool). We combined data from respondents' answers to multiple related survey questions to form variables on peer use of tobacco (cigarettes and/or smokeless tobacco), willingness to use or buy tobacco promotional items, and exposure to tobacco advertising.

We selected survey questions that measured degree of nicotine dependency as identified in the literature (Difranza et al., 2002; O'Loughlin et al., 2002; O'Loughlin et al., 2003). The following predictor variables were created: "level of lost autonomy" over nicotine use (Difranza et al., 2002) and "level of cigarette smoking intensity." The variable "level of lost autonomy" was based on respondents' answers to two questions ("When you last tried to quit, how long did you stay off cigarettes?" and "How long can you go without smoking before you feel like you need a cigarette?") and the level of true-false responses to two statements ("After not smoking for a while, I feel restless and irritable" and "When I go without a smoke for a few hours, I experience craving"). A 5-point scale was created based on the categories "none," "less-than-moderate," "moderate," "more-than-moderate," and "highest." Respondents' "level of smoking intensity" was based on their responses to the following questions: "During the past 30 days,

on how many days did you smoke cigarettes?" and "During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?" We considered respondents who reported smoking 6–20+ cigarettes/day for 20–30 days as having smoked with the "most intensity," those who reported smoking 6–20+ cigarettes/day for 1–19 days or less than 1 to 5 cigarettes/day for 20–30 days as having smoked with "moderate intensity," and those who reported smoking less than 1 to 5 cigarettes/day for 1–19 days as having smoked with the "least intensity."

Data analyses

We calculated overall and demographic-specific estimates of the prevalence of current cigarette smoking among U.S. middle school and high school students and of polytobacco use among those who were current cigarette smokers. We identified demographic characteristics associated with cigarette use and with polytobacco use through bivariate analyses and estimated the prevalence of the use of different specific combinations of tobacco products used in conjunction with cigarettes, both overall and by education level and gender.

We also used bivariate analyses to identify demographic and additional psychosocial variables associated with polytobacco use among all students and among male and female students separately. Variables were included in backward elimination for the multivariate regressions among all students if the p value was less than or equal to .10, the value recommended for inclusion for multivariate regression (Kennedy & Bancroft, 1971). Using backward stepwise elimination, we removed variables not significantly associated with polytobacco use $p \geq .05$ individually until a final multivariate model remained. Correlation matrices were used to examine multicollinearity among predictor variables, and variables were retained with acceptable levels of correlation ($r < .3$) for multivariate regression modeling (Cohen, 1988).

Survey responses were weighted to adjust for unequal sampling probabilities and nonresponse. Population estimates were weighted up to the sampling frame. SAS v. 9.1 was used to manage and manipulate the data and SUDAAN v. 9 was used to account for the complex survey design and unequal weighting of responses in calculating the standard errors around estimates derived from the NYTS data. Of 54,082 students (unweighted sample) who completed the NYTS in 2002 or 2004, we eliminated 535 because they were either younger than 11 or older than 19 or did not indicate their age. Of the remaining 53,547, we eliminated 1,817 because they had missing information on cigarette use status, leaving us with 51,730 students in our total sample.

Of this total sample, 729 students were missing information concerning their concurrent use of cigarettes with other tobacco products. Prevalence calculations for cigarette-only and for polytobacco use (Table 1) are based on respondents with complete information on concurrent cigarette use with other tobacco products and do not include the 729 students for whom the true status of their cigarette-only or polytobacco use could not be determined. The prevalence calculations for overall cigarette use includes these 729 students, to be consistent with prevalence data produced from NYTS data (CDC, 2005; CDC, 2006). Unweighted sample sizes and weighted prevalence estimates are presented in the tables.

Results

Demographic characteristics

The overall weighted prevalence of current cigarette use (including other tobacco product use) among all respondents was 16.0% (Table 1). Among respondents with complete information on concurrent cigarette and other tobacco product use (does not include 729 respondents in calculation), the weighted prevalence was 15.0% for current cigarette smoking (data not shown), which represents 7.3 million youth. These included 8.1% who used only cigarettes (Table 1) and 6.9% who were polytobacco users (data not shown). In stratified analyses, we found that females were more likely than males to be cigarette-only users; that students living in the Northeast were more likely to be cigarette-only users than those living in the West; and that both overall cigarette use and cigarette-only use were more common among high school students than among middle school students, more common among White students than among students in other racial/ethnic groups, and more common among those with a weekly income of \$101+ than among those with no income or a lower weekly income.

The overall prevalence of current polytobacco use was 6.9%, an estimated 3.3 million youth (data not shown), among respondents with complete information on concurrent cigarette and other tobacco product use. Among current smokers with complete information on concurrent cigarette and other tobacco product use, the prevalence of polytobacco use was 46.1% (62.0% among male smokers and 30.9% among female smokers; Table 1). In stratified analyses, we found polytobacco use to be significantly more common among males than females; among students in the Midwest, South, and West than among those in the Northeast; and among those with a weekly income of \$101+ than among those with no weekly income (Table 1). The overall

prevalence of other tobacco product use was 4.0% (data not shown).

Current polytobacco use product combinations

Among students who were current smokers, 26.4% (estimated 1.9 million youth) used one tobacco product in combination with cigarettes and 19.7% (estimated 1.4 million youth) used more than one (Table 2). Among those who used only one tobacco product in addition to cigarettes, 68.1% used cigars, 17.1% used smokeless tobacco, and 14.8% used pipes, bidis, or kreteks. A higher percentage of male smokers used smokeless tobacco (23.2% vs. 8.0%), but a higher percentage of female smokers used pipes, bidis, or kreteks (21.5% vs. 10.3%). The use of cigarettes with pipes, bidis, or kreteks was more common among middle school students (20.1%) than high school students (13.2%). Among cigarette smokers who used two other tobacco products, cigars and smokeless tobacco and cigars and pipes were the two most frequent combinations (data not shown).

Characteristics of polytobacco users

We found little difference in the extent to which various factors were associated with polytobacco use among males and among females in our bivariate analysis; therefore, the groups were combined for multivariate regression analyses. Because of the strong correlation between intensity of cigarette smoking and lost autonomy ($r = .51183$), we excluded intensity of smoking from the multivariate models. None of the other predictor variables were highly correlated with one another (range $r = .00243$ – $.26909$); the remaining variables were included in the models during backward stepwise elimination.

The final multivariate model (Table 3) indicated that polytobacco users were more likely than cigarette-only users to be male ($OR = 3.6$, 95% $CI = 3.0$ – 4.3); in middle school ($OR = 1.3$, 95% $CI = 1.1$ – 1.6); live in the Midwest ($OR = 1.4$, 95% $CI = 1.1$ – 1.9), South ($OR = 2.1$, 95% $CI = 1.6$ – 2.7), or West ($OR = 2.4$, 95% $CI = 1.9$ – 3.2); have bought a pack of cigarettes from a retailer ($OR = 1.3$, 95% $CI = 1.0$ – 1.6); be influenced by peers' offering of a cigarette ($OR = 1.8$, 95% $CI = 1.3$ – 2.5); not think secondhand smoke is harmful ($OR = 1.4$, 95% $CI = 1.1$ – 1.8); think it is safe to smoke for 1–2 years and then quit ($OR = 1.4$, 95% $CI = 1.1$ – 1.7); believe smoking looks cool ($OR = 1.3$, 95% $CI = 1.1$ – 1.6); use or be willing to use tobacco promotional items ($OR = 1.6$, 95% $CI = 1.3$ – 1.9); receive more exposure to tobacco advertisements ($OR = 1.3$, 95% $CI = 1.1$ – 1.5); and have either more-than-moderate lost autonomy ($OR = 1.7$, 95% $CI = 1.1$ – 2.5) or the highest level of lost autonomy ($OR = 2.4$, 95% $CI = 1.6$ – 3.4).

Table 1. Prevalence and characteristics associated with current use of cigarettes among adolescents and current polytobacco use among adolescent cigarette smokers, 2002–2004 NYTS.

Characteristic	Cigarette use (includes other tobacco product use)				Cigarette-only use				Polytobacco use (cigarette plus use of at least one other tobacco product)			
	Sample size	Percent of total	OR ^a	95% CI	Sample size	Percent of total	OR ^b	95% CI	Sample size	Percent of cigarette users	OR ^c	95% CI
Total	7553	16.0	—	—	3583	8.1	—	—	3241	46.1	—	—
Gender												
Female	3585	15.8	Referent	—	2204	10.5	Referent	—	1139	30.9	Referent	—
Male	3940	16.3	1.0	1.0–1.1	1370	5.7	0.5	0.5–0.6	2091	62.0	3.7	3.2–4.2
Education												
Middle school	2225	8.9	Referent	—	989	4.2	Referent	—	968	48.6	Referent	—
High school	5290	22.0	2.9	2.6–3.2	2586	11.4	3.2	2.8–3.7	2261	45.2	0.9	0.8–1.0
Race												
White only	4026	18.1	Referent	—	2022	9.4	Referent	—	1786	45.9	Referent	—
Black only	844	10.0	0.5	0.4–0.6	397	4.9	0.5	0.4–0.6	328	44.8	1.0	0.8–1.2
Hispanic only	1147	13.9	0.7	0.6–0.9	503	6.3	0.6	0.5–0.8	489	48.1	1.1	0.9–1.3
Asian only	181	8.2	0.4	0.3–0.5	97	4.0	0.4	0.3–0.5	70	48.0	1.1	0.6–1.9
Region												
Northeast	1099	14.3	Referent	—	646	8.7	Referent	—	379	36.2	Referent	—
Midwest	1795	18.7	1.4	1.1–1.7	935	9.9	1.2	0.9–1.5	746	44.5	1.4	1.1–1.8
South	3190	18.2	1.3	1.1–1.7	1413	8.4	1.0	0.8–1.3	1461	50.4	1.8	1.4–2.3
West	1469	11.5	0.8	0.6–1.0	589	4.9	0.5	0.4–0.7	655	51.9	1.9	1.5–2.5
Weekly income												
None	719	7.7	Referent	—	387	4.1	Referent	—	274	44.0	Referent	—
<\$1–20	2373	11.5	1.6	1.4–1.7	1218	6.2	1.6	1.4–1.8	976	42.6	0.9	0.8–1.2
\$21–100	2858	23.1	3.6	3.2–4.0	1392	12.0	3.5	3.0–4.0	1271	46.1	1.1	0.9–1.3
\$101+	1421	33.7	6.1	5.3–6.9	564	15.2	5.1	4.3–6.0	704	52.5	1.4	1.1–1.8

Note. NYTS, National Youth Tobacco Survey; *OR*, odds ratio; *CI*, confidence interval. Prevalence calculations for cigarette-only and for polytobacco use do not include respondents with missing information on the concurrent use of cigarettes with other tobacco products. ^aCigarette use compared with non-cigarette use. ^bCigarette-only use compared with non-cigarette use. ^cPolytobacco use compared with cigarette only use. Unweighted *n* and weighted percent are presented.

Table 2. Prevalence of current use of cigarettes only, cigarettes plus one product, cigarettes plus two or more products among adolescent cigarette smokers, 2002–2004 NYTS.

Product use	Gender						Education			
	Total		Females		Male		Middle school		High school	
	Sample size	Percent	Sample size	Percent	Sample size	Percent	Sample size	Percent	Sample size	Percent
Cigarette-only use	3583	53.9	2204	69.1	1370	38.0	989	51.4	2586	54.8
Polytobacco Use										
Cigarettes+1 product	1844	26.4	740	20.9	1102	32.2	483	25.2	1355	26.8
Cigar ^a	1321	68.1	531	70.5	789	66.5	324	63.6	993	69.5
Smokeless tobacco ^a	243	17.1	50	8.0	192	23.2	64	16.3	177	17.4
Pipe or bidi or kretek ^a	280	14.8	159	21.5	121	10.3	95	20.1	185	13.2
Cigarettes+2 or more products	1397	19.7	399	10.0	989	29.8	485	23.4	906	18.5

Note. NYTS, National Youth Tobacco Survey. Unweighted sample sizes and weighted percentages are presented. ^aRow percentages are for proportions within cigarettes+1 product group.

Table 3. Adolescent characteristics associated with current polytobacco use, 2002–2004 NYTS.

	OR ^a	95% CI	p value
Gender			
Female	Referent	—	—
Male	3.6	3.0–4.3	0.000
Education			
Middle school	1.3	1.1–1.6	0.005
High school	Referent	—	—
Region			
Northeast	Referent	—	—
Midwest	1.4	1.1–1.9	0.014
South	2.1	1.6–2.7	0.000
West	2.4	1.9–3.2	0.000
Availability of cigarettes			
Bought	1.3	1.0–1.6	0.022
Obtained some other way	Referent	—	—
Peer influence			
Yes	1.8	1.3–2.5	0.000
No	Referent	—	—
Personal attitudes			
Think smoke from other cigarettes is harmful			
Yes	Referent	—	—
No	1.4	1.1–1.8	0.003
Think safe to smoke 1–2 years if quit			
Yes	1.4	1.1–1.7	0.003
No	Referent	—	—
Smoking cigarettes looks cool			
Yes	1.3	1.1–1.6	0.004
No	Referent	—	—
Willing to use or buy tobacco			
promotional items			
Yes	1.6	1.3–1.9	0.000
No	Referent	—	—
Exposure to tobacco advertising			
Low exposure	Referent	—	—
More exposure	1.3	1.1–1.5	0.005
Level of lost autonomy			
None	Referent	—	—
Less-than-moderate	1.3	0.9–1.9	0.184
Moderate	1.4	1.0–2.0	0.050
More-than-moderate	1.7	1.1–2.5	0.013
Highest	2.4	1.6–3.4	0.000

Note. NYTS, National Youth Tobacco Survey; OR, odds ratio; CI, confidence interval. ^aIncludes complete data on final covariates; polytobacco use ($n=2,045$) compared with cigarette-only use ($n=2,014$).

Discussion

We estimated that there were 7.3 million adolescent cigarette smokers in the United States in 2002 and 2004 and almost half of them were polytobacco users. Of the estimated 3.3 million polytobacco users, 1.9 million used one other tobacco product and 1.4 million used two or more products. Our finding that the prevalence of polytobacco use was higher among males than among females is consistent with results from previous studies showing polytobacco use to be higher among adult males (Backinger et al., 2008; Bombard et al., 2007) and the use of cigars, smokeless tobacco, pipes, bidis, or kreteks to be higher among adolescent males (CDC, 2005).

We found the more popular combinations to be cigar or smokeless tobacco use combined with cigarettes. These findings also are consistent with other published results from the NYTS; individual use of cigars and individual use of smokeless tobacco is higher than individual use of pipes, bidis, or kreteks (CDC, 2005, 2006). Like Gilpin and Pierce (2003), we found favorable beliefs about smoking, peer influences, exposure to tobacco advertising and willingness to use tobacco promotional items to be predictors of polytobacco use. These and other variables we found to be associated with polytobacco use (e.g., lost autonomy, availability of cigarettes from a retailer) also have been found to be associated with cigarette use (Difranza et al., 2002; Pierce, Choi, Gilpin, Farkas, & Berry, 1998; Tyas & Pederson, 1998).

Our findings raise several important questions. Given that we found polytobacco users had higher levels of lost autonomy than cigarette-only users, might they also be more susceptible to nicotine dependence and less able to quit smoking cigarettes? We did not measure how much and how often these cigarette smokers use other tobacco products. Are adolescent polytobacco users merely experimenting with other forms of tobacco, or are they established users of these other products? What are the long-term health effects of polytobacco use? Are polytobacco users more likely to be using alcohol and illicit drugs as well? Data suggest that adult polytobacco users are more likely than those who smoke only cigarettes to be using more than moderate levels of alcohol (Bombard et al., 2007).

Why are American youth using multiple tobacco products? Although we found no studies that attempted to answer that question directly, some clues may be found in studies describing the attitudes, beliefs, and characteristics of adolescents associated with their use of tobacco products other than cigarettes (CDC, 1999b; Deckers, Farley, & Heath, 2006; Richter, Pederson, & O'Hegarty, 2006; Soldz & Dorsey, 2005; Taylor & Biener, 2001; U.S. Department of Health and Human Services [USDHHS], 1999). Participants from a 2001 convenience sample of Massachusetts youth reported using cigars, bidis, or kreteks because the products tasted or smelled good, or were something different to try (Soldz & Dorsey, 2005). Adolescents also have described the use of cigars as being more socially acceptable (USDHHS, 1999) and bidis as being cheaper and easier to obtain than cigarettes (CDC, 1999b; Taylor & Biener, 2001). Adolescents also may perceive tobacco products other than cigarettes as a healthier option, less harmful, or more natural than traditional cigarettes (CDC, 1999b; Deckers et al., 2006; Delnevo & Hrywna, 2006; Soldz & Dorsey, 2005; Soldz et al., 2003; Taylor & Biener, 2001;

USDHHS, 1999). Youth participants from Massachusetts and 10 major U.S. metropolitan areas described kreteks as “more natural” and cigars as safer to use than cigarettes (Soldz & Dorsey, 2005; USDHHS, 1999); however, young adults participating in focus groups conducted in Tennessee and Texas indicated they believed kreteks and cigars to be more harmful than cigarettes (Richter et al., 2006). More research is needed on why perceptions of the risk of various tobacco products may vary by demographic characteristics and whether this information can be used to help produce interventions targeting users of specific categories of tobacco products.

The findings in this report are subject to at least three limitations. First, NYTS data apply only to youths who attend middle or high school and are not representative of all American youth. In 2004, approximately 3.8% of U.S. 16-year-olds and 5.2% of U.S. 17-year-olds were not enrolled in a high school program and had not completed high school (Laird, DeBell, & Chapman, 2006). Second, the NYTS questionnaire was offered only in English, which might have influenced responses for those who have difficulty reading English. Finally, because we analyzed previously collected data, we were unable to assess all the variables possibly associated with polytobacco use such as using alcohol and illicit drugs, engaging in problem or risky behaviors, and experiencing mental health problems.

Preventing the initiation of tobacco use among adolescents is critical to ending the burden of tobacco use in the United States (CDC, 2005). Tobacco control interventions aimed at youth typically focus on cigarette use, through counter-marketing media campaigns, policy initiatives such as excise taxes and smoke-free policies, and school- and community-based programs (Tercyak & Audrain, 2002; USDHHS, 1994). Given the high prevalence of polytobacco use that we found among current adolescent smokers, interventions also should address adolescents' use of other tobacco products, paying particular attention to adolescent males and youth living outside of the Northeast. Strategies that may be effective in reducing the use of noncigarette tobacco products among youth include raising the price of all tobacco products, posting health warnings on all noncigarette tobacco products, reducing adolescents' access to all tobacco products, targeting tobacco control media and ad campaigns to users of all tobacco products, health care personnel routinely screening for the use of all tobacco products, and implementing the CDC school-based recommendations for tobacco control (CDC, 1994, 1999a, 2007b; Deckers et al., 2006). It also may be necessary to design, implement, and evaluate innovative approaches that specifically address polytobacco use among youth.

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