Published in final edited form as:

Am J Health Behav. 2018 May 01; 42(3): 102–113. doi:10.5993/AJHB.42.3.10.

Adolescent Smoking Susceptibility in the Current Tobacco Context: 2014–2016

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Abstract

Objectives: We examined perceptions and behaviors associated with smoking susceptibility among adolescents in the current tobacco landscape.

Methods: Participants were 8th and 10th grade never-smokers of conventional cigarettes (N = 19,853) from Monitoring the Future surveys (2014–2016). Using weighted multivariable logistic regression, we examined risk factors for smoking susceptibility: alternative tobacco product use (e-cigarettes, large cigars, little cigars/cigarillos, and flavored little cigars/cigarillos), ownership of tobacco promotional items (TPIs), access to cigarettes, perceived influence of antismoking advertisements, and perceived addictiveness of conventional cigarette smoking.

Results: Among never-smokers of conventional cigarettes, 16.7% were susceptible to smoking, 6.2% were past 30-day alternative tobacco product users, and 3.5% owned TPIs. Alternative tobacco product use, ownership of TPIs, and easy access to cigarettes were associated with increased likelihood of smoking susceptibility. Perceived great influence by antismoking ads and higher perceived addictiveness of conventional cigarette smoking were associated with lower odds of smoking susceptibility.

Conclusion: Alternative tobacco product use, ownership of TPIs, easy access to cigarettes, low influence by antismoking ads, and low perceptions of the addictiveness of conventional cigarettes are significant and actionable risk factors for smoking susceptibility among today's adolescents.

Keywords

smoking susceptibility; e-cigarette use; tobacco promotional items; addictiveness; antismoking ads; access restriction

A major goal of tobacco control interventions is to protect children and adolescents from initiating cigarette smoking at developmental periods when they are most vulnerable to

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Human Subjects Approval Statement

The study was determined to be exempt from oversight by the University of Texas at Austin Institutional Review Board.

Conflict of Interest Statement

All authors of this article declare they have no conflicts of interest.

nicotine addiction. Protective regulatory measures to address smoking behavior among adolescents in the United States (US) have contributed to a continuous decline in smoking prevalence – from 21% in 1996 to 3% in 2016 among 8th graders, and 36.4% in 1997 to 10.8% in 2015 among high school students.^{1,2} Currently, 11% of US adolescents become regular smokers of conventional cigarettes by the end of high school.¹ A well-established predictor of conventional smoking among adolescents is smoking susceptibility, defined as lack of a firm commitment not to smoke conventional cigarettes in the near future.^{3–6} Smoking susceptibility is a construct that helps identify adolescent never-smokers who have smoking intentions or are unable to commit to a smoke-free future.^{7,8} Achieving further declines in adolescent smoking prevalence entails identifying and addressing actionable risk factors that predict susceptibility to conventional cigarette smoking despite regulatory measures.

Adolescent smoking susceptibility is an important predictor of future conventional cigarette smoking. Based on the theory of planned behavior,⁹ behavioral intention predicts behavior and is the most proximal antecedent to behavior.^{9,10} Behavioral intention is in turn predicted by attitudes, subjective norms, and perceived behavioral control.^{9,10} Background factors such as personality traits, demographics, prior experiences, and media exposures also can predict behavioral intention indirectly.¹⁰ Adolescents who are susceptible to smoking (as measured by smoking intention) are more likely than those who are not to initiate conventional cigarette smoking in the future.^{3,5,6} Thus, characterizing the predictors of smoking susceptibility in the current tobacco landscape will help to identify adolescent would-be smokers before they initiate smoking and enhance smoking prevention efforts accordingly.

Alternative tobacco products (such as e-cigarettes, hookah, large cigars, regular and flavored little cigars/cigarillos, and novel smokeless tobacco products) constitute an emergent challenge to the effort to reduce adolescent tobacco use primarily because of their association with conventional cigarette smoking.^{11–14} For example, adolescent never-smokers of conventional cigarettes who use e-cigarettes (the most commonly used alternative tobacco products among adolescents) are more likely to progress to conventional cigarette smoking than their peers who do not.^{11,12} Similarly, use of other alternative tobacco products including cigars and hookah also have been linked to smoking initiation among US adolescents.^{13,14} However, the pathway through which use of alternative tobacco products progresses to conventional cigarette smoking remains unclear. For example, most studies that examined the prospective association between e-cigarette use and conventional cigarette smoking among adolescents did not account for background smoking susceptibility.^{11,15–17} A logical first step in explaining the link between alternative tobacco product use and initiation of conventional cigarette smoking is to investigate whether or not the use of alternative tobacco products is associated with smoking susceptibility (an important predictor of conventional cigarette smoking among adolescents³).

Empirical evidence for the association between alternative tobacco product use and smoking susceptibility is growing.^{18,19} Most existing studies have largely focused on e-cigarettes, for example, a study conducted using the National Youth Tobacco Survey (NYTS) 2011–2013 found that 43.9% of adolescent e-cigarette users (compared with 21.5% of non-users) who

had never smoked conventional cigarettes were susceptible to smoking.¹⁸ Similarly, a prospective association was found between e-cigarette use and smoking susceptibility among adolescents who participated in the Dartmouth Media, Advertising, and Health Study.¹⁹ However, these reported studies were conducted prior to the recent surge in popularity of adolescent e-cigarette use.^{18,19} During 2013–2015, the prevalence of past 30-day e-cigarette use among middle school students increased from 1.1% to 5.3% and among high school students from 4.5% to 16%.²⁰ Although the prevalence of e-cigarette use decreased slightly in 2016 (to 4.3% among middle school students and 11.3% among high school students),²¹ it is not yet clear whether the decline will continue. An important feature of the current tobacco landscape is that e-cigarettes are now more popular than conventional cigarettes among adolescents.^{21,22} Additional evidence is needed to characterize the association between e-cigarette use and susceptibility to conventional cigarette smoking when e-cigarette use has become increasingly normative among adolescents. Also, how other alternative tobacco products (such as cigars), which are also increasing in popularity among adolescents,²³ influence smoking susceptibility warrants further investigation.

An additional known risk factor for susceptibility to conventional cigarette smoking is exposure to tobacco marketing such as tobacco promotional items (TPIs). TPIs are a form of indirect tobacco marketing that include tobacco branded clothing, hats, and bags.^{24,25} Along with e-cigarettes, TPIs are a constantly fluctuating presence in the tobacco landscape. Although tobacco control policies now prohibit distribution of tobacco branded merchandise,²⁶ imagery associated with these promotional items remains in popular culture and is commonly replicated in clothing and paraphernalia. For example, a quick search for “Joe Camel,” the famous cartoon character representing Camel Cigarettes, on [eBay.com](https://www.ebay.com) generated over 2000 promotional items for sale bearing the Joe Camel image. Furthermore, promotional items for other tobacco products such as e-cigarettes are increasingly common and may constitute new risks for adolescent smoking susceptibility.²⁷

The role of TPIs in adolescent smoking susceptibility has not been examined in recent studies.^{6,28} Most studies demonstrating associations between ownership of TPIs and adolescent smoking susceptibility were conducted a decade or more ago.^{29–32} These studies informed the enactment and implementation of policies to protect children and adolescents from indirect forms of tobacco marketing such as TPIs.²⁶ Following over a decade of policy implementation, which has reduced, but not eliminated promotional items for conventional cigarettes, and the emergence of newer tobacco products such as e-cigarettes, which are also now marketed through promotional items,²⁷ it is important to investigate the extent to which ownership of TPIs remains a risk factor for adolescent smoking susceptibility.

Tobacco control programs aim to educate adolescents on the addictiveness of conventional cigarettes, recognizing that adolescents’ perceptions of the addictiveness of conventional cigarette smoking can be distorted.^{33,34} For example, adolescents have a limited understanding of what it means to be addicted to nicotine,³⁵ and adolescent smokers often underestimate their personal risk of becoming addicted to nicotine.^{34,36} A 2004 study conducted among Californian adolescents found a significant association between perception of addictiveness of conventional cigarette smoking and smoking susceptibility.³³ However, this study is not nationally representative, and did not take into account additional

associated predictors of smoking susceptibility such as access to cigarettes and influence of antismoking ads.^{37,38} National studies that adequately control for potential confounders and reflect the current tobacco landscape are needed to determine whether these prior findings are generalizable to today's US adolescent population.

Additional elements of the current national tobacco control policy include antismoking media campaigns and restriction of sales of tobacco products to minors. Given the ever-changing tobacco control landscape, the extent to which these efforts have influenced adolescent smoking susceptibility warrants continuous monitoring. For example, in the past few years, e-cigarette companies have invested millions of dollars in targeted online marketing.³⁹ This has resulted in the proliferation of e-cigarette media advertisements, particularly on websites popular among adolescents (eg, YouTube).⁴⁰ Similarly, cigars are aggressively marketed to youth on social media and evidence suggests that adolescents in African-American neighborhoods are particularly targeted with cheap and fewer sticks cigar sales.^{41–43} Celebrity endorsements of cigar use is also prominent in existing cigar advertisements.⁴³ These ads, which may increase adolescents' susceptibility to conventional cigarette smoking,^{27,44} are currently not counteracted by existing antismoking ads or prohibited by national policies.⁴⁵ Adolescents' perceptions of the influence of current antismoking ads on their smoking behavior may provide insights into the extent to which they have been impacted by public health efforts to counter the influence of tobacco product advertising. Also, conflicting reports on the impact of access restriction policies on adolescent smoking behavior support the need for more research on the effectiveness of these policies.^{37,46}

The current study aims to assess adolescents at risk of initiating conventional cigarette smoking in the current tobacco landscape. Specifically, we investigate tobacco-related behaviors and perceptions as predictors of susceptibility to conventional cigarette smoking in a 2014–2016 national sample of adolescents.

METHODS

Study Participants

National samples of 8th and 10th grade students were obtained from Monitoring the Future (MTF) surveys from 2014 to 2016.⁴⁷ Data were accessed via the Inter-University Consortium for Political and Social Research (www.icpsr.umich.edu). The current study was restricted to adolescents who had never smoked conventional cigarettes. Adolescents were excluded if they responded “yes” to the item “Have you ever smoked cigarettes?” or responded, “already tried” to the item “If you have never smoked, do you think you will try smoking cigarettes sometime this year?” Moreover, only participants who identified as white, black, or Hispanic were included, as all other racial/ethnic groups are coded “missing” in the publicly available data file. A total of N = 19,853 (weighted) participants were eligible and included in this study. Table 1 shows the demographic characteristics of our sample.

Measures

The dependent variable was susceptibility to conventional cigarette smoking and was measured using a single item: “If you have never smoked, do you think you will try smoking cigarettes sometime this year?” Response was on a 4-point scale: 1 = “I definitely will” 2 = “I probably will” 3 = “I probably will not” 4 = “I definitely will not.” Consistent with previous studies, smoking susceptibility was defined as the lack of a firm commitment not to smoke in the current year among never-smokers.^{3–6} Thus, responses were dichotomized, with the response “I definitely will not” indicating firm intention not to smoke cigarettes (non-susceptible adolescents), and other responses suggesting otherwise – susceptible to smoke cigarettes in the current year (susceptible adolescents).

Independent variables were past 30-day alternative tobacco product use, ownership of tobacco promotional items, access to cigarettes, perceived influence of antismoking ads, and perceived addictiveness of conventional cigarette smoking.

Alternative tobacco product use was measured by examining past 30-day use of 4 alternative tobacco products including e-cigarettes, large cigars, regular little cigars/cigarillos, and flavored little cigars/cigarillos. Use of each product was measured via one item: “During the last 30 days, on how many days (if any) have you used ...?” Response was on a 6-point scale ranging from “none” to “20–30 days” but was dichotomized into any use (1) versus no use (0). A 4-level categorical variable was then created from the dichotomized responses namely, (1) e-cigarette and cigar users (used all 4 products at least one day in past 30 days); (2) e-cigarette only users (used only e-cigarettes at least one day in the past 30 days); (3) cigar only users (used any type of cigars, but not e-cigarettes, at least one day in the past 30 days); and (4) non-users (did not use any of the 4 alternative tobacco products in the past 30 days).

Ownership of tobacco promotional items was measured using a single item.—

“Some companies make clothing, hats, bags, or other things with a tobacco brand on it. Do you have a piece of clothing or other thing that has a tobacco brand name or logo on it?” Response options were “No” = 0 or “Yes” = 1. This measure has been used in previous studies.^{24,25}

Access to cigarettes.—Measured via one item: “How difficult do you think it would be for you to get each of the following types of drugs, if you wanted some? Cigarettes.”

Response was on a 5-point scale ranging from 1 = “Probably Impossible” to 5 = “Very Easy”

Perceived influence of antismoking ads.—Measured via one item: “To what extent do you think such ads on TV, radio, billboards or in magazines and newspapers have made you less likely to smoke cigarettes?” Response was on a 5-point scale ranging from 1 = “Not at all” to 5 = “To a very great extent.”

Perceived addictiveness of cigarette smoking.—Measured using 2 items: “How much do you agree or disagree with the following statements?” “I could smoke a pack a day for a year or more and still be able to quit if I wanted to;” and “At my age, smoking is not

too dangerous because you can always quit later.” Responses for each measure were on a 5-point scale ranging from 1 = “disagree” to 5 = “agree.” The 2 items were significantly positively correlated ($r = .31$, $p < .001$), and were reverse coded and averaged, such that higher scores indicated higher perceived addictiveness.

Control variables were peer smoking, risk-taking propensity, race/ethnicity, grade, sex, US census region, and parental education.

Peer smoking. Measured via one item.—“How many of your friends would you estimate smoke cigarettes?” Responses were on a 5-point scale ranging from 1 = “None” to 5 = “All.”

Risk-taking propensity: Measured via 2 items: “I get a real kick out of doing things that are a little dangerous” and “I like to test myself every now and then by doing something a little risky.” Each of the 2 items had responses on a 5-point scale ranging from 1 = “Disagree” to 5 = “Agree.” The 2 items were averaged to create the measure of risk-taking propensity.

Race/ethnicity was classified into white non-Hispanic, black non-Hispanic, and Hispanic; grade (8 or 10); sex (male/female); US census region (North-East, North-Central, South, and West).

Parental education.—Parent education level was measured on a 6-point scale ranging from 1 = “completing grade school or less” to 6 = “graduate or professional school after college.” We determined the average of both parents’ education levels and used single parent’s education level for students with single parents.

Analysis

Chi-square analyses and independent sample t-tests were used to assess significant differences between susceptible and non-susceptible adolescents in response to the independent variables. Multivariable logistic regression was then conducted to examine predictors of susceptibility to smoke conventional cigarettes, while controlling for potential confounders. Chi-square analyses and independent samples t-tests were conducted using the Complex Samples module in SPSS version 24.⁴⁸ Multivariable logistic regression was conducted using Mplus version 7.⁴⁹ Sampling weights were applied to all analyses.⁴⁷ Full information maximum likelihood was used to account for missing data in the logistic regression analyses.

RESULTS

Among adolescent never-smokers of conventional cigarettes, 16.7% were susceptible to conventional cigarette smoking, 6.2% were past 30-day alternative tobacco product users (1.1% used both e-cigarettes and cigars, 4.3% used e-cigarettes only, and 0.8% used cigars only), and 3.5% owned TPIs (Table 2). Adolescents who were susceptible to conventional cigarette smoking were significantly more likely than non-susceptible adolescents to be e-cigarette and cigar users (3.1% vs 0.7%), e-cigarette only users (11.0% vs 3.0%), and cigar only users (2.0% vs 0.6%), respectively. Also, susceptible adolescents were significantly

more likely than non-susceptible adolescents to own TPIs (8.1% vs 2.6%, respectively; see Table 2). Susceptible adolescents had significantly lower mean scores on perceived influence of antismoking ads and perceived addictiveness of conventional cigarette smoking but significantly higher scores on access to cigarettes (Table 2).

Table 3 shows the results of the logistic regressions. After controlling for peer smoking, risk-taking propensity, race/ethnicity, sex, grade, US census region, and parental education, past 30-day alternative tobacco product use, ownership of TPIs, easy access to cigarettes, lower perceived influence of antismoking ads, and lower perceived addictiveness of conventional cigarette smoking all significantly predicted susceptibility to conventional cigarette smoking. Adolescent never-smokers who used both e-cigarettes and cigars, compared to non-users, were almost 3 times more likely to be susceptible to conventional cigarette smoking in the current year (AOR = 2.74, 95% CI: 1.85–4.06). Also, e-cigarette only users and cigar only users were more likely than non-users to be susceptible to conventional cigarette smoking (AOR = 2.88, 95% CI: 2.39–3.47; AOR = 2.43, 95% CI: 1.59–3.72, respectively). Likewise, adolescent never-smokers who owned TPIs, compared to those who did not, were twice as likely to be susceptible to conventional cigarette smoking in the current year (AOR = 2.13, 95% CI: 1.70–2.66). Easy access to conventional cigarettes was associated with higher likelihood of being susceptible to conventional cigarette smoking (AOR = 1.14, 95% CI: 1.10–1.19). Higher perceived influence by antismoking ads and higher perceived addictiveness of conventional cigarette smoking were associated with lower likelihood of susceptibility to conventional cigarette smoking (AOR = 0.79, 95% CI: 0.77–0.82; AOR = 0.77, 95% CI: 0.74–0.81, respectively). Results also show that grade 8 adolescents were more likely than their grade 10 counterparts to be susceptible to conventional cigarette smoking. Boys were less likely than girls, Blacks were less likely than Whites, and Hispanics were more likely than Whites to be susceptible to conventional cigarette smoking (Table 3).

DISCUSSION

Our study describes tobacco-related behaviors and perceptions that predict susceptibility to conventional cigarette smoking in the current tobacco landscape. In this national sample of 8th and 10th grade never-smokers of conventional cigarettes, a notable proportion (16.7%) were susceptible to smoking conventional cigarettes. Susceptible adolescents were more likely to be alternative tobacco product users, own TPIs, have easy access to conventional cigarettes, have not been influenced by antismoking ads, and have low perceptions regarding the addictiveness of conventional cigarette smoking. These findings, generated from the most current national data, may increase our ability to identify adolescent never-smokers who are likely to initiate conventional cigarette smoking and design interventions to dissuade them prior to smoking initiation.

This study adds to the body of literature on the potential unintended consequences of alternative tobacco products that are increasingly becoming more popular in the current tobacco landscape.^{21,22} Adolescent alternative tobacco product users are at a nearly 3-fold risk of being susceptible to conventional cigarette smoking, after controlling for potential confounders. Current tobacco prevention efforts should be directed at preventing adolescents

from initiating the use of alternative tobacco products and halting the progression from alternative tobacco product use to conventional cigarette smoking. The US Food and Drug Administration (FDA) began regulating alternative tobacco products (including e-cigarettes and cigars) and restricting their sales to minors in 2016, which may help to explain the slight decrease in prevalence of adolescent e-cigarette use in 2016.²² Additional interventions to discourage e-cigarette use among adolescents, such as the announced plan by the FDA to expand antismoking ads to include messages on risks associated with e-cigarette use,⁵⁰ are timely efforts to reduce predisposition to conventional cigarette smoking. Eliminating flavors in tobacco products (eg, laws banning flavored cigars in the state of Maine⁵¹ and cities such as Providence, Rhode Island⁵²) may be effective in discouraging adolescent use of alternative tobacco products.

Despite regulation against TPIs, ownership of TPIs remains a risk to conventional cigarette smoking initiation among US adolescents. In the current study, adolescents who owned TPIs were twice as likely to intend to try smoking conventional cigarettes in the current year, after accounting for other known predictors. Our finding extends the literature by demonstrating that TPIs, which were popular tobacco marketing channels about 2 decades ago, remain relevant predictors of smoking susceptibility in today's tobacco landscape. Existing gaps in current policies aimed at protecting adolescents from being exposed to TPIs should be identified and addressed, particularly given the rise of e-cigarettes and the appearance of their associated promotional items.²⁷

Easy access to cigarettes is also associated with susceptibility to cigarette smoking among adolescent never-smokers. Adolescent never-smokers who perceived cigarettes to be easily accessible were more likely to be susceptible to conventional cigarette smoking in this current national sample. Our finding is consistent with a previous longitudinal study that found an association between easy access to cigarettes and smoking susceptibility among adolescents in Oregon.⁵³ Although findings on the effectiveness of access of restriction policies on adolescent smoking behavior are mixed,^{46,54–56} the Substance Abuse and Mental Health Services Administration's (SAMHSA) Synar program, developed to restrict adolescents' access to tobacco products, has resulted in a sustained decline in non-compliance rates among tobacco retailers.^{1,37,55,56} Despite the success of the Synar program, evidence suggests that a sizable proportion of adolescents still obtain cigarettes from retail sources.² For example, in 2015, 12.6% of regular adolescent smokers aged <18 years reported purchasing cigarettes from gas stations or convenience stores.² Other avenues through which adolescents continue to have access to cigarettes, such as non-retail sources (family and friends),^{57,58} should be investigated further and appropriate measures taken to block potential loopholes in current policies.

Adolescent never-smokers who reported less influence by antismoking ads were more likely to be susceptible to conventional cigarette smoking. This finding suggests that some adolescent never-smokers have not been influenced or adequately reached by current antismoking ads. Although several studies have demonstrated the effectiveness of antismoking ads in reducing adolescent smoking behavior,^{38,59} it is possible that adolescents may be differentially impacted by these ads. For instance, on evaluation of the Truth campaign (national antismoking media campaign), girls and adolescents who live in lower

education zip codes were the least aware of antismoking ads.⁶⁰ Another study found that adolescents were differentially influenced by the ads based on their self-reported peer crowd identity (eg, deviant adolescents were more likely to be persuaded by the ads than academically-inclined adolescents).⁶¹ These suggest that continuous evaluation of the reach and robustness of these ads in effectively conveying the potential harm and addictiveness of tobacco products to diverse populations of adolescents is warranted.

Furthermore, adolescent never-smokers who perceived cigarette smoking to be more addictive were less likely to be susceptible to cigarette smoking than those who perceived it to be less addictive. This is consistent with and extends findings from a previous study of California adolescents³³ to a nationally representative sample of adolescents. Helping adolescents understand the concept of nicotine addiction and accurately judge the addictiveness of conventional cigarette smoking in antismoking ads and health education programs may be effective in discouraging smoking intentions and subsequent tobacco use.

Several sociodemographic differences also were identified in adolescents' susceptibility to conventional cigarette smoking. Adolescents in grade 8 were found to be more susceptible to conventional cigarette smoking than those in grade 10. A possible explanation for this could be that grade 10 adolescents may have passed the typical age of smoking initiation, which is usually around ages 11 to 13 years.⁶² It also could be that grade 10 participants who were previously susceptible to smoking had already initiated smoking and were excluded from the current study sample of never-smokers. Adolescent girls were more likely than boys to be susceptible to conventional cigarette smoking, which is inconsistent with previous studies that found no differences.^{6,63} Our larger sample size and more recent nationally representative data may be potential explanations for the inconsistent finding. The observed racial differences in smoking susceptibility, with Hispanic adolescents being more likely than Whites to be susceptible to conventional cigarette smoking are consistent with findings from a previous national study.⁶

Our study is not without limitations. First, our measure of ownership of TPIs does not specify which tobacco product is branded on the TPIs owned by these adolescents. As a result, we could not ascertain whether the TPIs owned were for conventional cigarettes, e-cigarettes, smokeless tobacco, or cigars. Measures designed to assess ownership of promotional items of specific tobacco products such as e-cigarettes should be developed. Second, hookah and smokeless tobacco use were not examined in the current study due to limited data availability. Data on hookah use was only available for year 2016 and data on smokeless tobacco use was available in only one out of the 2 MTF forms used for this study, resulting in insufficient data. Also, most of our study variables were measured using single-items, a limitation peculiar to large secondary data analyses. However, for some variables (such as perceived addictiveness) we used 2-item measures to increase the robustness of the measure. Furthermore, our measure of perceived influence of antismoking ads does not capture ads disseminated through other channels such as social media. Thus, our findings regarding the association between antismoking ads and adolescents smoking susceptibility do not reflect potential influence of antismoking ads delivered through social media, Web, or mobile channels. Future research is needed on this point. In addition, we could not examine some predictors of adolescent smoking susceptibility (such as parental smoking and

adolescent mental health comorbidities) because such variables were not measured on the same survey form as our other study variables. Also, the dataset for this study was limited to white, African-American, and Hispanic, adolescents; as a result, our findings are not generalizable to other racial minority groups. Finally, the cross-sectional nature of our study does not allow for demonstrating causality; therefore, our findings should be viewed as correlational. However, our large national sample allows for generalization of the study findings to the US 8th and 10th grade white, black, and Hispanic population.

In conclusion, a significant proportion of US adolescents continue to be at risk of initiating conventional cigarette smoking despite current regulatory and preventive efforts. Adolescent never-smokers of conventional cigarettes engage in both emerging (eg e-cigarette use) and ongoing (ownership of TPIs) tobacco-related behaviors that are associated with susceptibility to conventional cigarette smoking. Perceptions of the addictiveness of conventional cigarette smoking, influence of antismoking ads, and easy access to cigarettes are also significant predictors of smoking susceptibility among today's adolescents.

Our results suggest several potential strategies for preventing susceptibility to conventional cigarette smoking. For example, they highlight a need to address potential loopholes in current policies intended to prevent adolescents' exposure to tobacco promotional items and restrict adolescents' access to tobacco products. Promotional items for emerging tobacco products such e-cigarettes should be explicitly included in the existing ban on tobacco promotional items. Also, the new strategic partnership between SAMHSA Synar program and FDA Tobacco Retail Compliance Inspection Contracts is an important step that may be pivotal in addressing non-compliance by tobacco retailers to existing access restriction policies.⁶⁴ Because high school students aged 18 years can be social sources of tobacco products for their peers,⁵⁸ raising the minimum age of purchase to 21 years may be another effective strategy for reducing adolescent access to tobacco products.⁶⁵ Moreover, the effectiveness of antismoking media campaigns among those adolescents who have not responded to existing campaigns may be increased with inclusion of messages on addictiveness of conventional cigarette smoking and potential negative consequences of e-cigarette use. Research on best approaches to crafting effective antismoking messages to prevent adolescent e-cigarette use is evolving,⁶⁶ and should be encouraged and applied in the development of new antismoking ads against e-cigarette use currently planned by the FDA.⁵⁰ Finally, pediatricians and health educators can emphasize the addictiveness of conventional cigarette smoking to adolescents and educate parents and adolescents on the role of e-cigarette use and tobacco promotional items in influencing conventional cigarette smoking.

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Table 1

Demographic Characteristics of Sample, N = 19,853

	N (%)
Sex	
Male	9520 (48.0)
Female	10044 (50.6)
Missing	289 (1.5)
Grade	
Grade 8	10693 (53.9)
Grade 10	9160 (46.1)
Race/ethnicity	
Black	3247 (16.4)
Hispanic	4815 (24.3)
White	11790 (59.4)
U.S Census Region	
North East	3517 (17.7)
North Central	4667 (23.5)
South	7438 (37.5)
West	4230 (21.3)
Maternal Education	
Less than high school	2053 (10.4)
High school	3452 (17.4)
Some college	2743 (13.8)
College or higher	9355 (47.1)
Missing	2249 (11.3)
Paternal Education	
Less than high school	2411 (12.1)
High school	4292 (21.6)
Some college	2258 (11.4)
College or higher	7626 (38.4)
Missing	3265 (16.4)

Table 2
Tobacco-related Behaviors and Perceptions among Susceptible Versus Non-susceptible Adolescents (N = 19,853)

	Susceptibility to Conventional Cigarette Smoking		χ^2	p
	Total (N = 19,853)	Non-susceptible (N = 16,528)		
Alternative Tobacco Product Use				
E-cigarette and cigar use	6.2%	16.1%	141.8	< .0001
E-cigarette only use	1.1%	3.1%	84.0	< .0001
Cigar only use	4.3%	11.0%	292.6	< .0001
Ownership of TPIs				
	0.8%	2.0%	44.3	< .0001
	3.5%	8.1%	168.5	< .0001
	M(SD)	M(SD)	t	p
Perceived Addictiveness of Conventional Cigarette Smoking^a	4.37 (0.92)	4.12 (1.02)	4.42 (0.90)	< .0001
Perceived Influence of Antismoking Ads^a	3.41 (1.56)	2.88 (1.47)	3.52 (1.55)	< .0001
Access to Cigarettes^a	3.55 (1.52)	3.93 (1.32)	3.47 (1.55)	< .0001

Note.

^a: Higher scores indicate higher perceived addictiveness of conventional cigarette smoking, easy access to cigarettes, and greater perceived influence of antismoking ads. Chi-square analyses and independent sample t-tests were used to assess significant differences in proportions and means between susceptible and non-susceptible adolescents.

Table 3
Predictors of Smoking Susceptibility among Adolescent Never-smokers of Conventional Cigarettes, N = 19,853

	B	SE	AOR	95% CI
Alternative Tobacco Users (Reference = Non-users)	---	---	---	---
E-cigarette and cigar users	1.01	0.20	2.74***	1.85 – 4.06
E-cigarette only users	1.06	0.10	2.88***	2.39 – 3.47
Cigar only users	0.89	0.22	2.43***	1.59 – 3.72
Ownership of TPIs (Reference = No)	0.76	0.11	2.13***	1.70 – 2.66
Perceived addictiveness of cigarette smoking^a	-0.26	0.03	0.77***	0.74 – 0.81
Perceived Influence of Antismoking Ads^a	-0.23	0.02	0.79***	0.77 – 0.82
Access to Cigarette^a	0.14	0.02	1.14***	1.10 – 1.19
Peer smoking^a	0.45	0.03	1.56***	1.46 – 1.67
Risk-taking Propensity^a	0.23	0.02	1.25***	1.20 – 1.30
Grade (Reference = Grade 10)	0.12	0.05	1.13*	1.02 – 1.24
Sex (Reference = Female)	-0.31	0.05	0.74***	0.67 – 0.81
Parent Education Level	-0.00	0.02	1.00	0.95 – 1.04
Race/ethnicity (Reference = White)	--	--	---	--
Black	-0.35	0.08	0.70***	0.60 – 0.82
Hispanic	0.39	0.06	1.48***	1.31 – 1.68
Country Region (Reference = West)	---	---	---	---
Northeast	0.05	0.08	1.05	0.90 – 1.23
North Central	0.06	0.08	1.07	0.92 – 1.24
South	-0.03	0.07	0.97	0.85 – 1.10

p < .001

**
p < .01

Note.

AOR: Adjusted Odds Ratio; CI: Confidence Interval

Higher scores indicate higher perceived addictiveness of conventional cigarette smoking, easy access to cigarettes, greater perceived influence of antismoking ads, more smoking peers, and higher risk-taking propensity.

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