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Longitudinal predictors of cigarette use among students from 24 Texas colleges

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Abstract

Objective—The purpose of this study is to examine differences between current and non-current cigarette users, focusing on sociodemographic factors, non-cigarette tobacco product use, parental and friend use, and alcohol and marijuana use; and to identify predictors of cigarette use six months later.

Participants—Participants included young adults (n = 4,296) from 24 Texas colleges, participating in a young adult cohort study, beginning in fall 2014.

Methods—Mixed effects logistic regressions were conducted accounting for school-level variability.

Results—Cigarette users were older, more likely to report use of non-cigarette tobacco products and peer use of cigarettes than non-current users. Wave 1 cigarette and non-cigarette tobacco product use, marijuana use and binge drinking, and peer use all uniquely predicted cigarette use at wave 2.

Conclusions—Colleges need prevention programs targeting multiple tobacco products, because non-cigarette tobacco use and other risky behaviors appear to be independent risk factors for cigarette use in young adults.

Keywords

College students; cigarettes; non-cigarette alternative products; e-cigarette; hookah; tobacco

Introduction

Exploring tobacco use trends in young adulthood is critical as nearly all use begins before age 26, and tobacco use during this time predicts future use.^{1,2} Despite increasing use of non-cigarette tobacco products, including cigars, smokeless tobacco, hookah, and electronic

cigarettes,³ combustible cigarettes remain the most prevalent product used by young adults.⁴ Cross-sectional studies of young adults⁵ and college students⁶ consistently reveal cigarettes to be the most common first tobacco product used. Among college students that had ever used any tobacco product, being female, having parents that smoked cigarettes, and initiating before 18 years old were all positively associated with initiating cigarette use.⁶

Cross-sectional studies suggest sociodemographic characteristics may be associated with cigarette use and initiation; however, few contemporary studies have used longitudinal data to identify predictors of cigarette use among young adults. One such longitudinal study found that 18–24 year olds, Hispanic/Latinos, and current marijuana users were more likely to initiate cigarette smoking by the 12-month follow-up.⁶ Another longitudinal study of 18–21 year olds found being male, baseline smoking status, and peer use to be predictive of cigarette initiation over the seven periods of data collection.⁷ Additional longitudinal research has found similar sociodemographic predictors, as well as baseline smoking, to be the strongest predictors of subsequent cigarette smoking initiation.⁸ However, these studies did not examine predictors of current (i.e., past 30-day use) use of cigarettes. Furthermore, prior longitudinal studies were largely among racially homogenous samples [e.g., 60%⁶ and 89%⁷ non-Hispanic White samples]; therefore few data are available on diverse groups of young adults, who may have different predictors of current tobacco use.

Developmentally, young adulthood is a critical time to study tobacco product use.⁹ Although nearly all tobacco product use begins by early adulthood, the establishment of initiation occurs throughout adulthood,^{6–8} with 99% of initiation occurring prior to age 26.² Patterns of behavior are solidified during young adulthood,¹⁰ when young adults are vulnerable to environmental influences, including from family members and peers.¹¹ Further, Problem Behavior Theory posits that behaviors rarely occur in isolation, and risk behaviors may cluster together,^{12,13} even during young adulthood.¹⁴ Clustering of risk behaviors is evident among young adults who have the highest prevalence of both cigarette and non-cigarette product use¹⁵ and who often use multiple tobacco products concurrently.¹⁶ Additionally, other high-risk behaviors such as marijuana and alcohol use peak during young adulthood, and research shows that tobacco product use is associated with alcohol, marijuana, and other drug use among young adults.¹⁷ Although previous research has focused on tobacco use and sociodemographic differences in the initiation of various types of tobacco products,^{5,6} there is limited longitudinal research examining the role of other high-risk behaviors in past 30-day use of cigarettes among young adults, particularly in the current, rapidly changing tobacco landscape which includes many non-cigarette tobacco products.

The purpose of this study is to examine differences between current cigarette-using young adult college students and non-current users of cigarettes, focusing on sociodemographic factors, non-cigarette tobacco product use, parental and friend use, and alcohol and marijuana use; and to identify predictors of cigarette use six months after wave 1 data were collected. Based on Problem Behavior Theory and prior research, it was hypothesized that current cigarette smokers at wave 2 would be more likely, at wave 1, to have used cigarette and non-cigarette products, marijuana, and alcohol; and would be more likely to have had friends and parents who smoke cigarettes. These factors were also hypothesized to be unique

predictors of subsequent cigarette smoking six months later, when controlling for wave 1 cigarette smoking and a variety of socio-demographic variables.

Methods

Participants

Participants were 4,296 students attending one of 24 2- and 4-year colleges in Texas and involved in the first two waves of the Marketing and Promotions Across Colleges in Texas Project (Project M-PACT). Project M-PACT is a rapid response surveillance study that includes a cohort of 5,482 college students who were 18-29 years old at wave 1 (November 2014-February 2015). Of the 5,482 students, 79% participated six months later at wave 2 (n=4,326), but 30 had missing data used in models in the present study. The 4,296 students were initially 18-29 years old (mean age at wave 1=20.49; standard deviation=2.36) and more than half were female (63.4%). Regarding race/ethnicity, 36.3% of students were non-Hispanic White, 31.1% were Hispanic/Latino, 8.1% were African-American/Black, 16.9% were Asian, and 7.5% reported another race/ethnicity or reported 2 or more races/ethnicities. The Institutional Review Board at the University of Texas at Austin approved study protocols and procedures.

To participate in the project, participants were required to be full- or part-time degree- or certificate-seeking undergraduate students attending a 4-year college or a vocational/technical program at a 2-year college. Recruitment at 2-year colleges was limited to students enrolled in vocational/technical programs (e.g., welding, air conditioning and heating, etc.) because they have an elevated prevalence of cigarette use¹⁸ and use of non-cigarette tobacco products compared to 4-year college students.^{15,19} Participants were also required to be 18-29 years old. However, for those who were 26-29 year olds, recruitment was restricted to lifetime tobacco users. Lifetime tobacco use was defined by having ever smoked at least 100 cigarettes, or at least 20 cigars, or having ever used smokeless/spit/chewing tobacco at least 20 times. Because the larger project aimed to examine transitions in tobacco use, and initiation is unlikely to occur after the age of 26,² lifetime non-tobacco users over the age of 26 were excluded from participation.

Procedure

The 24 colleges were recruited from five counties that included the four largest metropolitan areas in Texas (Austin, Dallas/Fort Worth, Houston, and San Antonio). Three colleges of each type (4-year or 2-year) were selected from each city to comprise a total of 24 colleges. All 2-year colleges and nine (of the 12) 4-year colleges were public institutions.

Eligible students attending the 24 colleges were recruited to participate in the online survey via email invitation. The email addresses of students attending 15 colleges were obtained directly from the college through open records requests. Once obtained, project personnel sent students an invitation email via a secure server. The remaining nine colleges did not release email addresses. Rather, the nine colleges sent an email invitation on the project's behalf to eligible students through their own internal communication channel. Students who were emailed directly by project personnel received an introductory email invitation and 2

email reminders 5 days after the first invitation and again 6 days later (11 days after the first invitation). Students who were emailed through their respective colleges were sent at least one invitation email and students at three of these nine colleges received one additional reminder email.

The email invitation described the purpose of the study and included a link to an eligibility survey. The eligibility survey confirmed potential participants' student status as degree/certificate seeking undergraduates, and contained questions on lifetime use of tobacco (i.e., lifetime cigarette, cigar, and chewing tobacco) and age. Eligible students who wished to participate in the study provided informed consent and then completed the online survey, which took on average 34 minutes to complete. Upon completion of the surveys, each student received a \$10 e-gift card and all students were entered into a drawing to win one of twenty \$50 e-gift cards. A total of 13,714 students were eligible to participate in the study and of these, 5,482 students (40%) provided consent and completed the survey. This rate of participation is similar to, or exceeds, other online studies of college students.^{20,21}

Measures

Measures for the current study were modeled after existing surveys^{22,23} and were initially reviewed by nine tobacco control experts who provided guidance on revisions. Final item modifications were conducted through an iterative process of cognitive interviewing²⁴ with 25 young adults who were not part of the present study.²⁵

Variables

Dependent variable—Current use of cigarettes was assessed at both waves by asking “on how many days of the past 30 days did you smoke cigarettes?” Students who reported smoking cigarettes at least 1 day in the past 30 days were coded as a “current user,” and those that reported smoking cigarettes on 0 days in the past 30 days were coded as a “non-current user.”

Independent variables

Other non-cigarette tobacco product use: Current use of non-cigarette tobacco products, including hookah, e-cigarettes, cigars/cigarillos/little cigars, and smokeless tobacco were coded “yes” if students reported using the product at least 1 day in the past 30 days and were coded “no” if students reported using the product on 0 of the past 30 days. For the cigar, hookah, and e-cigarette questions, language regarding using the product “as intended” was added to make it clear we were asking about use of the product with tobacco or nicotine, and not another substance, like marijuana.

Drug and alcohol use variables: Student drug and alcohol use was assessed using 2 items, current binge drinking and marijuana use. Students who reported having at least 5 drinks in a row at least once in the past 14 days were coded as “binge drinkers,” and students who reported not having had at least 5 drinks in a row or not having at least 1 drink in the past 30 days were coded as “non-binge drinkers.”²⁶ Current use of marijuana was coded as “yes” if students reported using marijuana at least 1 day in the past 30, or “no” if they reported using marijuana on 0 of the past 30 days.

Parental and peer variables: Family and peer cigarette use was assessed using three items. Parental use of cigarettes was a yes/no variable and reported separately for mothers and fathers. Friend use of cigarettes was dichotomized; students who reported “a few,” “some,” or “all” friends using cigarettes were coded as “at least one,” and those who reported “none” were coded as having no friends using cigarettes.

Sociodemographic variables: Sex, age, race/ethnicity, type of college, and parental education were included as covariates.

Statistical analysis—All statistical analyses were conducted using SAS 9.4 (Cary, NC). Mixed effects logistic regression, using a random intercept for school, was performed to assess the unique role of the individual characteristics on subsequent cigarette use six months later. For the mixed effects logistic regressions, we first tested separate models with current cigarette use at wave 2 as the dependent variable and the wave 1 individual characteristic as the only independent variable in each model. Any characteristic that had a p -value $<.10$ was included in multivariable analyses. A multivariable model was built using the results of the individual mixed effects logistic regression, and the adjusted odds ratios (AOR) and their 95% confidence intervals were estimated. A p -value $<.05$ was considered statistically significant.

Attrition analysis—Attrition analyses were conducted to determine if students who were eligible to participate at wave 2 but did not participate were significantly different from those who did participate. A series of independent samples t -tests for continuous variables and Chi-square tests for categorical variables at wave 1 showed that students not participating at wave 2 ($n=1,156$) were more likely than those who participated at both waves ($n=4,296$) to be older ($t[5,452]=2.37, p=.018$), 2-year college students ($\chi^2[1, N=5,452]=9.89, p=.002$), report wave 1 cigarette smoking ($\chi^2[1, N=5,452]=53.38, p<.001$), e-cigarette use ($\chi^2[1, N=5,451]=15.87, p<.001$), smokeless tobacco use ($\chi^2[1, N=5,424]=21.96, p<.001$), hookah use ($\chi^2[1, N=5,448]=18.76, p<.001$), cigar use ($\chi^2[1, N=5,478]=18.71, p<.001$), binge drinking ($\chi^2[1, N=5,449]=50.72, p<.001$), marijuana use ($\chi^2[1, N=5,446]=37.44, p<.001$), and to have friends who smoke cigarettes ($\chi^2[1, N=5,447]=16.47, p<.001$). Further, there were racial/ethnic differences ($\chi^2[4, N=5,452]=42.38, p<.001$), but no differences between the two groups in sex, wave 1 parental use of cigarettes, and wave 1 parental education. Because missing data were related to observed variables, it was assumed that the data were missing at random, and we included all variables in the initial regression models, which represents an acceptable solution to non-response bias.²⁷

Sensitivity analyses—Prior to testing study hypotheses, sensitivity analyses were conducted to evaluate model bias resulting from the disproportionate sampling probabilities between the primary sample and the oversamples (18-25 year olds selected for lifetime use [$n=347$] and those 26 and older [$n=261$]). Young adults in the oversamples were disproportionately tobacco users (i.e., models will estimate a larger proportion of tobacco users than expected from a random sample); however, because we are primarily interested in evaluating relationships between variables, our oversample analysis evaluated the possibility

that the associations between the independent variables and the outcome varied across the primary and oversamples, by adding two-way interactions to the models. Results from these analyses indicated there was minimal threat of model bias; among the thirteen models that were fit for each oversample, there were only 2 significant interaction effects: cigarette smoking at wave 1 x tobacco oversample ($t=-2.81$, $p=.029$) and friends' use of cigarettes x tobacco oversample ($t=-2.90$, $p=.004$). Therefore all participants were included in the analyses.

Results

Chi-square and t -tests indicated there were significant differences between wave 2 current and non-current cigarette smokers on all wave 1 individual characteristics, except parental education and type of institution (2-year vs. 4-year; see Table 1). Among current cigarette smokers at wave 2, use of tobacco products at wave 1 was common: 73% were current cigarette smokers, 41% were current e-cigarette users, 35% were current hookah users, 22% were cigar smokers, and 8% were current smokeless tobacco users. Although use of tobacco products at wave 1 was significantly more prevalent among wave 2 current cigarette users, it is notable that 12% of non-cigarette users reported hookah use and 11% reported e-cigarette use. Additional findings indicated that current cigarette users at wave 2 were older than non-current cigarette users ($p<.001$), more likely to report being current users of non-cigarette tobacco products ($p<.001$), more likely to report binge drinking at wave 1 ($p<.001$), more likely to report marijuana use at wave 1 ($p<.001$), and more likely to have at least one friend who uses cigarettes ($p<.001$) than non-cigarette users. Independent mixed effects logistic regression models indicated that all potential covariates were predictors of current cigarette smoking at wave 2 ($p<.01$), except wave 1 parental education and type of institution (Table 2).

A multivariable analysis including only the statistically significant covariates from the univariate analyses indicated that wave 1 current use of cigarettes, hookah, or e-cigarettes; wave 1 binge drinking or marijuana use; and having at least 1 friend who smoked cigarettes at wave 1 increased the odds for cigarette use at wave 2, after adjusting for all other variables (see Table 2). The odds of smoking at wave 2 were 17.26 (95% CI: 13.72, 21.71) times greater for students who reported wave 1 cigarette smoking than non-cigarette smokers at wave 1. Among non-cigarette products, the odds of smoking at wave 2 were highest for those who reported wave 1 e-cigarette use and hookah use, 1.50 (95% CI: 1.16, 1.94) and 1.55 (95% CI: 1.19, 2.01), respectively. Wave 1 peer use was the strongest predictor of cigarette smoking at wave 2 when adjusting for all other variables, besides wave 1 cigarette smoking. Sex, race/ethnicity, current use of cigars or smokeless tobacco at wave 1, and parental use did not predict wave 2 current smoking.

Comment

This study is one of the first to describe predictors of cigarette use in the modern landscape of cigarettes and non-cigarette tobacco products and among this generation of young adults and college students using two waves of longitudinal data. Results of this study indicate that cigarettes are the most commonly used tobacco product among college students, and that

many students use other tobacco products (cigars, hookah, smokeless tobacco, and e-cigarettes) concurrently with cigarettes, which is consistent with Problem Behavior Theory.^{11,12} As hypothesized, there were differences between current cigarette smokers and non-current smokers; current smokers were more likely to use non-cigarette tobacco products and marijuana, to binge drink, and to have parents and peers who use cigarettes. Further, results from our multivariable model indicated that wave 1 use of cigarettes, e-cigarettes, and hookah; marijuana use; binge drinking; and peer use of at least one of these substances, uniquely predicted cigarette use six months later.

Estimates in the current study are similar to national estimates of cigarette use in college students.²⁸ The 2013 National Survey on Drug Use and Health indicated that in 2013 21.0% of college students (aged 18–22) used cigarettes in the past 12 months, compared to 21.2% in this study.²⁸ Additionally, the current study shows that even among non-current cigarette users, the prevalence of hookah and e-cigarette use is greater than 10%, highlighting the popularity of these products among college students. Importantly, this study showed that both e-cigarette use and hookah use were prospectively associated with current cigarette smoking, six months later, which supports the hypothesis that non-cigarette products may lead to cigarette use.²⁹

Consistent with the study hypotheses and limited longitudinal research,^{6–8} wave 1 use of cigarettes, e-cigarettes, and hookah; peer use of cigarettes; marijuana use; and binge drinking predicted subsequent use of cigarettes six months later. Cigarette smoking continues to be part of a constellation of risky behaviors, as suggested by Problem Behavior Theory. Richardson et al.⁶ found that younger age, Hispanic ethnicity, and past 30-day use of marijuana predicted initiation of cigarette smoking, in a nationally representative sample of 18–34 year olds. Bernat et al.⁷ found that initiation of smoking was predicted by male gender, living in a metropolitan area, and peer use in a representative sample of Minnesota young adults, aged 18–21. Wetter et al.⁸ determined that among those who were occasional smokers at baseline gender, smoking outcome expectancies, and affect regulation expectations predicted smoking behavior change, in a sample of 548 college students. Unlike these studies, the current study predicted both current use of cigarettes within and across waves, instead of only predicting initiation of smoking. Each of these studies, including the current study, reinforce the idea that cigarette smoking rarely occurs in isolation, and that other risk behaviors, including use of non-cigarette tobacco products and drugs, predict cigarette smoking in young adults.

Strengths and limitations

Importantly, this study supports e-cigarette and hookah use as significant predictors of cigarette use among young adults. Further, the concurrent use of other tobacco products, including e-cigarettes, cigars, and hookah, is high among cigarette smokers. Data from this longitudinal study are drawn from the four major metropolitan areas in Texas, and equal numbers of schools in each city, which increases diversity in the sample. Other longitudinal studies of young adult tobacco users sample 4 year college students who have lower prevalence of tobacco use; Project M-PACT includes vocational and 2-year college students. However, while the sample includes students from 2-year and 4-year colleges, most students

are from four-year universities. Further, the study sample is only in Texas, and therefore results of the study may not be generalizable.

Conclusion

The current study provides important information regarding the current use of cigarettes among college students, including identifying predictors of cigarette use in a tobacco product landscape that is changing. Multicomponent prevention programs are needed to address not only combustible cigarette use but non-cigarette tobacco product use, given the high prevalence during this period of life. According to the Centers for Disease Control and Prevention (CDC), comprehensive tobacco control programs including college policies and interventions should be multi-faceted, coordinated efforts. Recommended program components include creating a tobacco-free normative environment; restricting tobacco sales, advertising, and promotion; increasing and enforcing tobacco-related rules and policies; and offering tobacco education and cessation programs designed for college students.³⁰ Published literature on the implementation of multicomponent prevention programs for tobacco on college campuses is limited since the majority of prevention efforts have focused on adolescent populations. Most tobacco prevention programs on college campuses have focused on implementing smoke-free (eliminates the use of smoke-producing tobacco) or tobacco-free (eliminates the use of all tobacco) policies, since implementing these policies is low cost and wide-reaching. The presence of tobacco-free policies has been shown to be associated with fewer students reporting smoking on campus, seeing smoking on campus, and secondhand smoke exposure.³¹ Colleges and universities play a crucial role in improving the health of students and other members of the campus community. An important first step in addressing student tobacco use is for colleges to implement campus-wide tobacco-free policies or strengthen existing policies. The present study found that cigarette users were significantly more likely to use other non-cigarette products, compared to non-cigarette users. Implementing a comprehensive tobacco-free policy would eliminate the use of any tobacco products, including innovations in tobacco products such as e-cigarettes.

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Table 1

Independent regression models of wave 2 current and non-current cigarette users by wave 1 socio-demographic and behavioral factors (n=4,296).

Characteristic % (95% CI) or Mean $\pm$ SD	Non-current cigarette user, wave 2 n=3547	Current cigarette user, wave 2 n=749	p-value [#]
Age (yrs.), wave 1	20.3 $\pm$ 2.2	21.2 $\pm$ 2.8	<.001
Gender			<.001
Male (n=1532)	33.6 (32.0, 35.1)	45.6 (42.0, 49.2)	
Female (n=2763)	66.4 (64.9, 68.0)	54.4 (50.8, 58.0)	
Type of Institution			0.066
2-year (n=295)	6.5 (5.7, 7.4)	8.4 (6.4, 10.4)	
4-year (n=4001)	94.5 (92.7, 96.3)	91.6 (89.6, 93.6)	
Race & ethnicity			<.001
White (n=1547)	34.9 (33.3, 36.5)	41.3 (37.7, 44.8)	
Hispanic (n=1304)	29.9 (28.4, 31.4)	32.7 (29.4, 36.1)	
African-American (n=330)	8.2 (7.3, 9.1)	5.5 (3.8, 7.1)	
Asian-American (n=795)	19.9 (18.6, 21.2)	11.9 (9.6, 14.2)	
Other (n=320)	7.2 (6.3, 8.0)	8.7 (6.7, 10.7)	
Wave 1 Tobacco, Alcohol, and Other Drug Use behaviors			
Current cigarette use(n=820)	7.7 (6.8, 8.6)	73.0 (69.9, 76.2)	<.001
Current e-cigarette use (n=696)	11.0 (10.0, 12.1)	40.8 (37.3, 44.3)	<.001
Current hookah use (n=672)	11.6 (10.5, 12.6)	34.9 (31.5, 38.3)	<.001
Current cigar use (n=376)	6.1 (5.3, 6.9)	21.5 (18.6, 24.4)	<.001
Current smokeless (n=103)	1.2 (0.9, 1.6)	8.1 (6.2, 10.1)	<.001
Current binge drinking (n=1175)	22.6 (21.2, 24.0)	50.0 (46.4, 53.6)	<.001
Current marijuana (n=974)	17.4 (16.1, 18.6)	47.9 (44.3, 51.4)	<.001
Parental Education			
<i>Mother</i>			0.791
No high school (n=214)	5.2 (4.5, 5.9)	4.5 (3.0, 6.0)	
Some high school (n=221)	5.3 (4.5, 6.0)	5.0 (3.4, 6.6)	
Graduated high school (n=630)	15.1 (13.9, 16.3)	14.1 (11.6, 16.6)	
Vocational/Technical School (n=130)	3.1 (2.5, 3.7)	3.0 (1.8, 4.2)	
Some College (n=972)	22.5 (21.1, 23.9)	25.2 (22.0, 28.3)	
Associate's Degree (n=345)	8.0 (7.1, 8.9)	8.8 (6.8, 10.8)	
Bachelor's Degree (n=1170)	27.7 (26.2, 29.2)	27.3 (24.1, 30.6)	
Graduate Degree (n=548)	13.1 (12.0, 14.2)	12.2 (9.8, 14.5)	
<i>Father</i>			0.649
No high school (n=251)	6.1 (5.3, 7.0)	6.1 (4.3, 7.8)	
Some high school (n=307)	7.4 (6.5, 8.3)	7.9 (5.9, 9.8)	
Graduated high school (n=621)	15.1 (13.9, 16.3)	15.6 (13.0, 18.2)	
Vocational/Technical School (n=159)	3.6 (3.0, 4.3)	5.1 (3.5, 6.7)	
Some College (n=563)	13.8 (12.7, 15.0)	13.2 (10.8, 15.7)	
Associate's Degree (n=215)	5.4 (4.7, 6.2)	4.4 (2.9, 5.9)	

Characteristic % (95% CI) or Mean $\pm$ SD	Non-current cigarette user, wave 2 n=3547	Current cigarette user, wave 2 n=749	p-value [#]
Bachelor's Degree (n=1107)	27.1 (25.6, 28.6)	26.8 (23.5, 30.0)	
Graduate Degree (n=876)	21.5 (20.1, 22.8)	21.0 (18.0, 23.9)	
Parental Cigarette Smoking, wave 1			
Household use-Mother (n=641)	13.4 (12.3, 14.5)	22.0 (19.1, 25.0)	<.001
Household use-Father (n=1416)	31.7 (30.1, 33.2)	39.1 (35.6, 42.6)	<.001
Friend use of cigarettes, wave 1			<.001
None (n=1409)	38.1 (36.5, 39.7)	7.9 (6.0, 9.8)	
At least 1 (n=2883)	61.9 (60.3, 63.5)	92.1 (90.2, 94.0)	

[#] Indicates p-value from the chi-squared analysis (for categorical outcomes) or t-test (for continuous outcomes).

Table 2

Multivariable regression model of wave 1 socio-demographic and behavioral predictors of current cigarette use at wave 2 (n=4,266).

Covariate	Unadjusted Odds Ratio (95% CI) p-value*	AOR [†] (95% CI) p-value
Age (yrs.), wave 1	1.14 (1.11–1.18) <.001	1.07 (1.02, 1.11) .003
Sex		
Female (reference)	–	–
Male	1.69 (1.44–1.99) <.001	1.18 (0.95, 1.48) .138
Type of Institution		
2-year	–	N/A
4-year	0.77 (0.53–1.14) .195	N/A
Race & ethnicity		
White (reference)	–	–
Asian/Pacific Islander	0.52 (0.40–0.68) <.001	0.89 (0.63, 1.26) .523
Black	0.54 (0.38–0.77) .007	0.93 (0.58, 1.49) .757
Hispanic	0.86 (0.71–1.05) 0.136	0.94 (0.73, 1.21) .631
Other	0.98 (0.73–1.33) .914	0.95 (0.63, 1.43) .797
Current cigarette smoking, wave 1: yes v. no	32.26 (26.30–39.58) <.001	17.26 (13.72, 21.71) <.001
Current hookah use, wave 1: yes v. no	4.07 (3.38, 4.89) <.001	1.55 (1.19, 2.01) .001
Current e-cigarette use, wave 1: yes v. no	5.43 (4.53–6.51) <.001	1.50 (1.16, 1.94) .002
Current cigar, wave 1: yes v. no use	4.11 (3.29–5.15) <.001	0.96 (0.70, 1.30) .769
Current smokeless, wave 1: yes v. no	7.20 (4.80–10.78) <.001	1.26 (0.75, 2.13) .389
Current binge drinking, wave 1: yes v. no	3.68 (3.11–4.35) <.001	1.34 (1.07, 1.69) .012
Current marijuana, wave 1: yes v. no	4.52 (3.81–5.36) <.001	1.48 (1.17, 1.88), .001
Parental Education, wave 1		
Mother	1.02 (0.98–1.07) .803	N/A
Father	1.00 (0.97–1.04)	N/A

Covariate	Unadjusted Odds Ratio (95% CI) p-value*	AOR [†] (95% CI) p-value
	.892	
Parental Cigarette Smoking, wave 1		
Household use-Mother	1.72 (1.41–2.10)	1.12 (0.85, 1.49)
	<.001	.417
Household use-Father	1.36 (1.16–1.61)	1.20 (0.95, 1.50)
	<.001	.127
Friend use of cigarettes, wave 1		
None(reference)	–	–
At least one	6.99 (5.31–9.21)	2.26 (1.64, 3.12)
	<.001	<.001

Note: Wave 1 data were collected 6 months prior to wave 2.

CI=confidence Interval

* Odds Ratio are from univariate analyses that included only characteristic (independent variable) and current smoking at wave 2 (dependent variable) in the model. Characteristics with a p-value <.01 were selected to be included in the multivariable model.

[†]AOR=adjusted odds ratio; results are from the multivariable logistic regression model with each variable in the table as an independent variable, and dependent variable is current use of cigarettes at wave 2.