

Which Nicotine Products Are Gateways to Regular Use?

First-Tried Tobacco and Current Use in College Students

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Background: The potential for emerging tobacco products (ETPs) to be gateway products for further tobacco use among youth is of significant concern.

Purpose: To examine use of various nicotine-containing products on a tobacco-free college campus and whether the first product tried predicts subsequent tobacco use.

Methods: Undergraduate students (N=1,304) at a large university completed an online survey of past/current use of cigarettes; smokeless tobacco (SLT); hookah; ETPs (dissolvables, snus, and electronic cigarettes); and nicotine replacement therapy (NRT). Data were collected from September 2012 to May 2013 and analyses were conducted from June to September 2013. Students were classified as single, dual, or poly tobacco users.

Results: The sample consisted of 79.5% non-users, 13.8% single, 4.4% dual, and 1.5% poly users. Overall, 49.4% of participants reported trying a tobacco product. Hookah was the most tried product (38%), but cigarettes were most often the first product ever tried (51%). First product tried did not predict current tobacco use and non-use, but individuals who first tried SLT or cigarettes (rather than hookah or ETPs) were more likely to be poly tobacco users. Current tobacco users who first tried ETPs or hookah were largely non-daily users of hookah; current tobacco users who first tried cigarettes or SLT were largely non-daily or daily users of cigarettes/SLT.

Conclusions: Hookah and ETPs are increasingly becoming the first tobacco product ever tried by youth; however, uptake of ETPs is poor, unlike cigarettes and SLT, and does not appear to lead to significant daily/non-daily use of cigarettes and SLT.

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Introduction

Tobacco use is the leading cause of premature death in the U.S., with cigarettes killing approximately 443,000 Americans¹ and 6,200 Oklahomans² each year. A projected 87,000 Oklahoman children alive today will eventually die prematurely of smoking-related causes.²

Although youth smoking rates declined historically, rates among high school students stalled at around 19.5%–21.9% and only recently declined to 18.1%.^{3,4} Most adult daily smokers (88%) report trying their first cigarette by age 18 years.¹ The tendency for early experimentation with tobacco products highlights young adults as an important population to monitor for tobacco use initiation and uptake patterns. One way of examining these patterns is by assessing which products individuals first try and whether they go on to use tobacco regularly.

Many public health officials and tobacco control researchers are concerned about how emerging tobacco products (ETPs), such as electronic cigarettes (e-cigarettes), dissolvable tobacco, and snus, affect youth tobacco use.^{5,6} Recent reports indicate that the number of high school students who have tried e-cigarettes

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doubled in just 1 year, from 4.7% in 2011 to 10% in 2012.⁷ Furthermore, 2.2% of high school students reported using both e-cigarettes and conventional cigarettes in the past 30 days.⁷ It is important to examine whether trying ETPs as well as other tobacco products makes it easier to go on to more harmful tobacco products or regular tobacco use. In other words, can certain products, that are perceived to be less harmful, create a pattern of nicotine addiction that leads users to eventually graduate to more effective, but also more harmful, nicotine delivery devices like cigarettes, in order to get nicotine more effectively (i.e., serve as gateway products)?

Similar to e-cigarettes, use of hookah has been increasing among U.S. college students, with reports of lifetime use ranging from 43.0% to 61.1%.⁸ Although approximately 36% of hookah users report occasionally smoking cigarettes, up to 65% of have never smoked cigarettes, making it unclear as to which product was used first.⁸ Nonetheless, there is concern that hookah, as well as other emerging products, may appeal to non-smokers or become a potential gateway product to regular or dual tobacco use.^{8,9} Additionally, there are no studies examining hookah as a gateway product that the authors are aware of.

Concerns about gateway products have not been limited to ETPs and hookah. The potential for smokeless tobacco (SLT) products to lead to future cigarette smoking has been debated for years, with past evidence reporting that it may^{10,11} and newer evidence reporting that it likely does not.^{12,13} Though the gateway hypothesis for SLT remains unclear, continued surveillance of SLT use by youth is vital, especially as these products evolve.¹⁴

Given that most tobacco users begin in adolescence, it is important to understand (1) the impact of experimental tobacco use on subsequent use and (2) whether trying specific products may increase the risk for future use of any tobacco product(s). With the rise in hookah use and ETPs in the U.S., research on how these new products may affect tobacco use is warranted. The present study aims, first, to explore the tobacco use patterns associated with separate tobacco products in young adults on a tobacco-free college campus and, second, to determine the utility of specific first-time tobacco products in predicting subsequent regular use, poly use, or non-use and current use of cigarettes and SLT.

Methods

Undergraduate students (N=1,304) enrolled in psychology and speech courses requiring participation in research studies completed a voluntary online survey for 1 hour of research credit during the 2012–2013 academic semesters. The institution was a

large, tobacco-free, public university in Oklahoma. Students viewed and enrolled in the study from a list of studies available to them online. All students provided informed consent prior to study completion. The university's IRB approved procedures for the current study.

Measures

Participants were asked to identify the nicotine-containing product that they first tried (e.g., conventional cigarettes, SLT/chew, dissolvable tobacco, snus, "roll your own" cigarettes, hookah, e-cigarettes, or nicotine replacement therapy [NRT]). NRT was included to fully capture all potential use of nicotine-containing products. Past use of each nicotine-containing product was assessed by the item, *Please select which answer best describes your experience with the following products: never tried—not even once, tried it before, occasionally use, and use daily.* Given the small number of participants who had tried dissolvable tobacco, snus, and e-cigarettes, these three products were combined and categorized as ETPs for the primary analyses. Similarly, "roll your own" cigarettes were categorized as traditional tobacco cigarettes. Tobacco users were classified by number of different products used either daily or non-daily: (1) single users (one product); (2) dual users (two products); or (3) poly users (three or more). Non-users were classified as those who have never tried a tobacco product or those who have tried a tobacco product(s), but did not endorse current occasional or daily use.

Data Analytic Plan

Analyses were conducted from June to September 2013 using SPSS, version 20 (IBM Corp, Armonk NY). Descriptive statistics were used to explore first-tried tobacco products and variables potentially associated with current tobacco use (Aim 1). Additionally, use frequency of different forms of tobacco and current and past tobacco use as a function of first product ever tried were calculated.

Based on similar studies,^{13,16–19} multinomial logistic regression was used to evaluate whether first-used tobacco product predicted subsequent tobacco use (Aim 2). The main independent variable, the first-tried tobacco product, comprised four categories: cigarettes, SLT, hookah, and ETPs. Dummy coding was used to determine the probability of current tobacco use based on first-tried tobacco category.^{20–22} Cigarettes and SLT were used as the reference groups (separate analyses are reported for each), as statisticians recommend that the reference group be a well-defined category with a relatively large sample size compared to the other groups.²¹ Dual and poly use groups were collapsed into one group—poly use—owing to the small sample size of the poly-only group. For the dependent variable in the first set of analyses, current use of any tobacco product, single users and poly users were compared to non-users. Sex and ethnicity served as covariates (coded white/non-white) to control for different tobacco use patterns based on demographic characteristics (documented primarily with SLT use).^{15,23} A second set of binary logistic regressions were used to determine whether first product tried predicted current use specifically of cigarettes, SLT, and both groups combined (i.e., cigarettes, SLT, or both). These analyses add to the prior analyses by examining more specifically whether first product tried predicts more harmful use of cigarettes/SLT, compared to ETPs/hookah.

Table 1. Demographic characteristics of the study sample as a function of first tobacco product tried (N= 1,304), n (%) unless otherwise noted

	Never tried tobacco	First tried cigarettes	First tried SLT	First tried ETP	First tried hookah	First tried NRT	Missing data (n)
Total	562 (43.1)	326 (25.0)	97 (7.4)	59 (4.5)	156 (12.0)	6 (0.5)	98
Gender							
Male	140 (30.8)	117 (25.8)	81 (17.8)	21 (4.6)	63 (13.9)	1 (0.07)	31
Female	422 (49.6)	209 (24.6)	16 (1.9)	38 (4.5)	93 (10.9)	5 (0.4)	67
Ethnicity							
White	452 (43.2)	245 (23.4)	82 (7.8)	47 (4.5)	131 (12.5)	6 (0.5)	82
African American	31 (50.0)	12 (19.4)	3 (4.8)	6 (9.7)	8 (12.9)	0 (0.0)	5
Hispanic	16 (34.8)	19 (41.3)	4 (8.7)	0 (0.0)	6 (13.0)	0 (0.0)	1
Asian	16 (40.0)	7 (17.5)	5 (12.5)	4 (10.0)	4 (10.0)	0 (0.0)	5
Native American	30 (44.4)	27 (39.7)	3 (4.4)	1 (1.5)	4 (5.9)	0 (0.0)	3
Multi-racial	11 (47.8)	11 (47.8)	0 (0.0)	1 (4.3)	0 (0.0)	0 (0.0)	0
Other	6 (38.5)	5 (31.2)	0 (0.0)	0 (0.0)	3 (18.8)	0 (0.0)	2

ETP, emerging tobacco product; SLT, smokeless tobacco; NRT, nicotine replacement therapy.

Results

The sample comprised 1,304 undergraduate students (mean age, 19.57 years). The majority of participants were female (65.2%) and white (80.1%). The sample consisted of 1,037 non-users (79.5%), 180 single users (13.8%), 58 dual users (4.4%), and 19 poly users (1.5%).

Participants reported different trends in the type of tobacco products tried and which were tried first. Approximately 49.4% of participants reported ever trying a tobacco product. Complete demographic data of the study sample as a function of first tobacco product tried is outlined in Table 1. Of those who have tried a product, hookah (37.7%) was the most commonly tried product, followed by cigarettes (32.3%), ETPs (28.9%), and SLT (13.2%). Conversely, cigarettes were the most commonly first-tried product (50.6%), followed by hookah (24.2%); SLT (15.1%); and ETPs (9.2%).

Among the entire sample (those who have and have not tried a tobacco product), non-daily/daily hookah was the most common (11.9%), followed by conventional cigarettes (8.6%), SLT (5.5%), ETPs (3.2%), and NRT (0.6%). Complete data on frequency of use of different forms of tobacco are shown in Figure 1. Current tobacco use as a function of first-tried tobacco product was as follows: 24.5% of individuals who first tried cigarettes were current smokers and 39.0% were tobacco users ($n=127$); 40.2% of individuals who first tried SLT were current SLT users and 52.5% were current tobacco users

($n=51$); 3.4% of individuals who first tried ETPs were current ETP users and 28.8% were tobacco users ($n=17$); 33.3% of individuals who first tried hookah were current hookah users and 34.6% were tobacco users ($n=54$); and none of the individuals who first tried NRT were current NRT users and 16.7% were tobacco users ($n=1$). Complete data on current and past tobacco use as a function of first product ever tried are shown in Table 2.

Results of the multinomial logistic regression analyses are presented in Table 3. As indicated, only sex discriminated between single users and non-users, with the odds of men being almost one and a half times more likely than women to use tobacco (OR=1.49, 95% CI=1.02, 2.19, $p=0.04$). Sex also significantly discriminated poly-users from non-users, with the odds of men being almost twice as likely as women to be poly-users (OR=1.97, 95% CI=1.14, 3.43, $p=0.02$). First-tried tobacco product did differentiate poly-users from non-users in the current sample. Specifically, the odds of individuals who first tried cigarettes were approximately five times more likely than those who first tried hookah to report currently using two or more tobacco products (OR=4.99, 95% CI=1.92, 13.01, $p=0.001$). Though only approaching significance, the odds of individuals who first used cigarettes were more likely than those who first used ETPs to be current poly users (OR=3.29, 95% CI=0.97, 11.12, $p=0.06$).

A second logistic regression model was used to compare the first-tried SLT use group to other first-tried

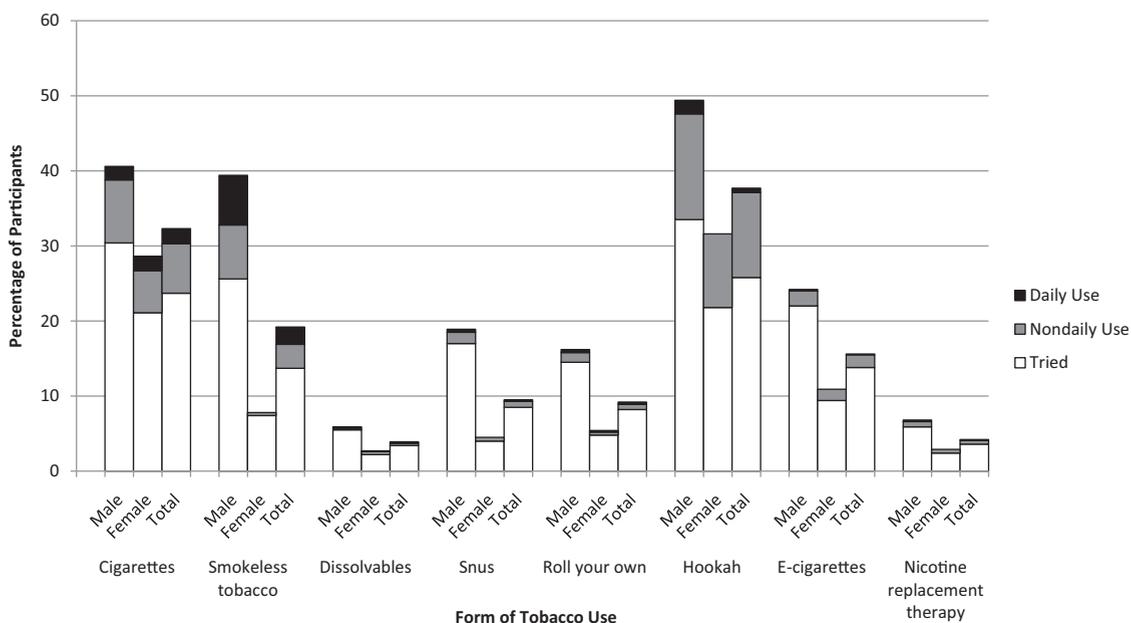


Figure 1. Frequency of use of different forms of tobacco among males, females, and total sample.

tobacco use groups. Similar to the first model, results suggested that only sex—and none of the first-trying tobacco products—discriminated between single users and non-users. In differentiating non-users from poly-users, however, the odds of those who first tried SLT were approximately six times more likely than those who first tried hookah to be current users of multiple tobacco products (OR=6.15, 95% CI=2.11, 17.95, $p=0.001$), and they were four times more likely than those who first tried ETPs to be current users of multiple products (OR=4.05, 95% CI=1.08, 15.10, $p=0.04$). Thus, individuals who initiated tobacco use with SLT were more likely than those who first tried hookah or ETPs to be current users of multiple tobacco products.

Results of an additional multinomial logistic regression are presented in Table 3. Using either first-trying cigarette or first-trying SLT users as the comparison group, none of the examined predictors significantly discriminated current smokers, SLT users, or users of cigarettes and SLT from non-users.

Discussion

The gateway potential of SLTs, hookah, and ETPs is a matter of significant debate and concern. The present study investigated whether the first tobacco product that participants tried predicted current tobacco use, type of product used, and single versus poly use. Of all surveyed students, approximately 49% reported ever trying a tobacco product, and 20% reported current occasional or daily use of any tobacco product. Approximately 17% of ever users reported current cigarette use (daily or

occasional), slightly less than the national average (19.0%).⁷ Though hookah was the most commonly tried product (38%), followed by cigarettes (32%), ETPs (28.9%), and SLT (13%), conventional cigarettes were most often the first product ever tried (51%), followed by hookah (24.2%), SLTs (15.1%), and ETPs (9.2%). These findings show a different pattern of use compared to other recent investigations of prevalence and first product used,²⁴ suggesting that even though conventional cigarettes are still often the first tobacco product tried, ETPs and hookah are increasingly becoming so. Moreover, ETPs such as e-cigarettes are relatively new to the market but are proliferating rapidly, which will likely only increase the number of youth for whom it is the first product tried.

Interestingly, first product tried did not predict whether youth would be a single tobacco product user or a non-user. Fifty-three percent of those who initiated with SLT reported currently using tobacco either occasionally or daily, followed by 39% who initiated with cigarettes, 35% who initiated with hookah, and 29% who initiated with ETPs. Closer examination of the descriptive statistics of tobacco use by first product tried, however, indicated that those who first tried ETPs or hookah were largely occasional users of hookah, whereas those who first tried cigarettes or SLTs were occasional or daily users of cigarettes, SLT, or both. This suggests that youth who first tried either hookah or ETP were more likely to become recreational tobacco users, whereas those who first tried conventional cigarettes or SLT were much more likely to become frequent (daily or occasional) users of tobacco products that are considered to be harmful (i.e., conventional cigarettes and SLT).

Table 2. History of tobacco use as a function of first product ever tried, *n* (%) unless otherwise noted

	n	Cigarettes	SLT	ETPs			
				e-Cigarettes	Snus	Dissolvables	Hookah
First tried cigarettes	326						
Never tried		N/A	205 (62.9)	203 (62.3)	262 (80.4)	304 (93.3)	104 (31.9)
Only tried		245 (75.2)	93 (28.5)	110 (33.7)	54 (16.6)	17 (5.2)	154 (47.2)
Occasionally use		60 (18.4)	14 (4.3)	9 (2.8)	4 (1.2)	1 (0.3)	65 (19.9)
Daily use		20 (6.1)	12 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.6)
First tried SLT	97						
Never tried		37 (38.1)	N/A	67 (69.1)	58 (59.8)	88 (90.7)	36 (37.1)
Only tried		41 (24.3)	52 (53.6)	27 (27.8)	38 (39.2)	9 (9.3)	42 (43.3)
Occasionally use		15 (15.5)	23 (23.7)	3 (3.1)	1 (1.0)	0 (0.0)	18 (18.6)
Daily use		3 (3.1)	16 (16.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.0)
First tried ETPs	59						
Never tried		38 (64.4)	50 (84.7)	48 (81.4)	49 (83.1)	52 (88.1)	14 (23.7)
Only tried		18 (30.5)	6 (10.2)	9 (15.3)	9 (15.3)	5 (8.5)	31 (52.5)
Occasionally use		2 (3.4)	3 (5.1)	2 (3.4)	2 (3.4)	1 (1.7)	14 (23.7)
Daily use		1 (1.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
First tried hookah	156						
Never tried		110 (70.5)	133 (85.3)	124 (79.5)	146 (93.6)	148 (94.9)	N/A
Only tried		40 (25.6)	21 (13.5)	28 (17.9)	5 (3.2)	6 (3.8)	94 (60.3)
Occasionally use		4 (2.6)	1 (0.6)	3 (1.9)	2 (1.3)	1 (0.6)	49 (31.4)
Daily use		1 (0.6)	0 (0.0)	0 (0.0)	1 (0.6)	0 (0.0)	3 (1.9)
NRT	6						
Never tried		5 (83.3)	6 (100)	4 (66.7)	6 (100)	6 (100)	5 (83.3)
Only tried		1 (16.7)	0 (0.0)	2 (33.3)	0 (0.0)	0 (0.0)	1 (16.7)
Occasionally use		0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Daily use		0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

ETPs, emerging tobacco products; N/A, not applicable; NRT, nicotine replacement therapy; SLT, smokeless tobacco.

Predicting Current Tobacco Use

Those who initiated with conventional cigarettes and SLT were more likely to become poly tobacco users. Specifically, those who first tried cigarettes were five times more likely to become a poly tobacco user than those who first tried hookah and three times more likely than those who first tried an ETP; however, the latter finding only approached significance. This marginal significance could be due to a lack of statistical power, as only 59 students reported first trying an ETP. Furthermore, those who first tried SLT were six times more likely than those who first tried hookah to become a current poly tobacco user and four times more likely than

those who first tried an ETP. This is concerning given that dual use is related to greater dependence and poorer tobacco-cessation outcomes, and young adults aged 18–24 years have the highest rates of poly tobacco use.^{24–27}

Consistent with previous research,^{1,27} being male was a unique predictor of whether a student was a non-user, single user, or poly tobacco user. Men were one and a half times more likely than women to be a single user and two times more likely to be a poly user. This finding parallels national estimates showing that smoking is more prevalent among men than women (21.6% vs 16.5%).⁷ Furthermore, recent research suggests that dual tobacco users were most likely to be

Table 3. Predictors of any current tobacco use

	Effect	SE	Wald	<i>p</i>	OR (95% CI)
FIRST-TRIED CIGARETTE USERS AS COMPARISON GROUP					
Single users versus non-users					
Sex	0.40	0.20	4.19	0.04	1.49 (1.02, 2.19)
Ethnicity	0.39	0.24	2.53	0.11	1.47 (0.91, 2.37)
Cigarettes first versus SLT first	−0.36	0.28	1.63	0.20	0.70 (0.40, 1.21)
Cigarettes first versus hookah first	−0.13	0.22	0.35	0.56	0.88 (0.57, 1.35)
Cigarettes first versus ETP first	0.20	0.34	0.35	0.55	1.22 (0.63, 2.37)
Poly users versus non-users					
Sex	0.68	0.28	5.84	0.02	1.97 (1.14, 3.43)
Ethnicity	−0.10	0.31	0.10	0.75	0.91 (0.50, 1.66)
Cigarettes first versus SLT first	−0.21	0.35	0.36	0.55	0.81 (0.41, 1.61)
Cigarettes first versus hookah first	1.61	0.49	10.83	0.001	4.99 (1.92, 13.01)
Cigarettes first versus ETP first	1.19	0.62	3.66	0.06	3.29 (0.97, 11.12)
FIRST-TRIED SLT USERS AS COMPARISON GROUP					
Single users versus non-users					
Sex	0.40	0.20	4.19	0.04	1.49 (1.02, 2.19)
Ethnicity	0.39	0.24	2.53	0.11	1.47 (0.91, 2.37)
SLT first versus cigarettes first	0.36	0.28	1.63	0.20	1.43 (0.83, 2.49)
SLT first versus hookah first	0.23	0.30	0.59	0.44	1.26 (0.70, 2.27)
SLT first versus ETP first	0.56	0.40	1.99	0.16	1.75 (0.80, 3.82)
Poly users versus non-users					
Sex	0.68	0.28	5.84	0.02	1.97 (1.14, 3.43)
Ethnicity	−0.10	0.31	0.10	0.75	0.91 (0.50, 1.66)
SLT first versus cigarettes first	0.21	0.35	0.36	0.55	1.23 (0.62, 2.44)
SLT first versus hookah first	1.82	0.55	11.04	0.001	6.15 (2.11, 17.95)
SLT first versus ETP first	1.40	0.67	4.33	0.04	4.05 (1.08, 15.10)

Note: Bolded *p*-values indicate a significant predictor of any current tobacco use. ETP, emerging tobacco product; SLT, smokeless tobacco.

young, white males from the Midwest or South,²⁸ which is consistent with the demographic of the current study sample.

Uptake of Emerging Tobacco Products

ETPs were the first product tried by some students ($n=59$), 78% of whom first tried e-cigarettes. Interestingly, only one of these students was still using an ETP at the time of the study, and this was reported as occasional use of e-cigarettes. This may suggest that the uptake potential of current ETPs is limited among youth. This

finding is supported by the fact that all dissolvable tobacco products have been taken off of the market by tobacco companies owing to poor uptake of these products.²⁹ Moreover, given the timing of data collection, it is likely that students who first tried e-cigarettes tried a first-generation device, which anecdotally is considered to be much less effective in delivering nicotine than newer models.³⁰ In addition, only one student who initiated with an ETP (1.7%) was a daily user of any tobacco product (i.e., conventional cigarettes), compared to the 10% and 21% of current daily tobacco users who first tried conventional cigarettes and SLT, respectively.

Though this finding should be interpreted with caution, it potentially indicates that current ETPs are not necessarily strong gateways to regular tobacco use.

This investigation begins to answer the question of whether certain tobacco products serve as gateways to long-term tobacco use. However, the study has some notable weaknesses. First, the study design is cross-sectional; as such, it is not clear how the students' use of tobacco evolved over time. Similarly, age at first use was not assessed. Second, all data were self-reported with no biochemical verification of smoking status, which increases the potential of recall bias. Third, although a large sample of youth participated in the study, the demographic characteristics of the sample are not nationally representative of all youth, rather just college students. Therefore, these results may not generalize to all youth tobacco users. Fourth, the current study did not assess cigar use. Finally, and most importantly, the current study, along with previous studies investigating the gateway potential of various tobacco products,^{30–32} only investigated the construct of first product tried as the mechanism for potential gateways. Future research should be more thorough in assessing the extent to which use of a certain tobacco product makes it easier to try and use another tobacco product. This may be measured as physiological or psychological "capability." For example, it could just as easily be argued that milk is a gateway product to long-term tobacco use, as this is usually the first product that a long-term user of tobacco will try in their lifetime. Rather than determining which product was used first chronologically, future research may better understand paths to regular tobacco use by determining if use of this nicotine/tobacco product makes it easier for an individual to try or use the next nicotine/tobacco product. Borrowing from the psychological literature,³³ we define this as *acquired capability for tobacco use*.

Despite these limitations, the present investigation helps to identify the gateway potential of various tobacco products in a rapidly expanding tobacco market. Curbing youth progression from trying a tobacco product to long-term tobacco use is necessary to significantly reduce the relatively stable prevalence of smoking.^{3,4} Development and dissemination of effective interventions for poly tobacco users is also necessary given the high prevalence of poly tobacco use among this age group. Lastly, continued surveillance of ETP and hookah use is vital, as these products continue to proliferate and, in the case of e-cigarettes, improve on effective nicotine delivery. As such, their potential as gateway products will likely increase. Since completion of data collection, awareness and use of ETPs has only increased and these products' technology has only advanced, which highlights the importance of continued surveillance of the use and uptake patterns of these and other tobacco products.

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References

1. USDHHS. Preventing tobacco use among youth and young adults: a report of the Surgeon General. Atlanta GA: DHHS, CDC, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2012.
2. Campaign for Tobacco-free kids. The toll of tobacco in Oklahoma. 2013. www.tobaccofreekids.org/facts_issues/toll_us/oklahoma.
3. CDC. Cigarette use among high school students—United States, 1991–2009. *MMWR Morb Mortal Wkly Rep* 2010;59(26):797–801.
4. Eaton DK, Kann L, Kinchen S, et al. Youth Risk Behavior Surveillance—United States, 2011. *MMWR Surveill Summ* 2012;61(4):1–162.
5. Cobb NK, Abrams DB. E-cigarette or drug-delivery device? Regulating novel nicotine products. *N Engl J Med* 2011;365(3):193–5.
6. U.S. Food and Drug Administration. Regulation of E-Cigarettes and Other Tobacco Products. 2011. www.fda.gov/NewsEvents/PublicHealthFocus/ucm252360.htm.
7. CDC. Cigarette smoking in the United States: current cigarette smoking among U.S. adults aged 18 years and older. 2013. www.cdc.gov/tobacco/campaign/tips/resources/data/cigarette-smoking-in-united-states.html.
8. Grekin ER, Ayna D. Waterpipe smoking among college students in the United States: a review of the literature. *J Am Coll Health* 2012;60(3):244–9.
9. Barnett TE, Shensa A, Kim KH, et al. The predictive utility of attitudes toward hookah tobacco smoking. *Am J Health Behav* 2013;37(4):433–9.
10. Haddock CK, Weg MV, DeBon M, et al. Evidence that smokeless tobacco use is a gateway for smoking initiation in young adult males. *Prev Med* 2001;32(3):262–7.
11. Tomar SL. Is use of smokeless tobacco a risk factor for cigarette smoking? The U.S. experience. *Nicotine Tobacco Res* 2003;5(4):561–9.
12. Rodu B, Cole P. Evidence against a gateway from smokeless tobacco use to smoking. *Nicotine Tob Res* 2010 May;12(5):530–4.
13. Timberlake DS, Huh J, Lakon CM. Use of propensity score matching in evaluating smokeless tobacco as a gateway to smoking. *Nicotine Tob Res* 2009;11(4):455–62.
14. Hecht SS, Stepanov I, Hatsukami DK. Major tobacco companies have technology to reduce carcinogen levels but do not apply it to popular smokeless tobacco products. *Tob Control* 2011;20(6):443.
15. Meier E, Lechner WV, Miller MB, et al. Changes in smokeless tobacco use over four years following a campus wide anti-tobacco intervention. *Nicotine Tob Res* 2013;15(8):1382–7.
16. Golub A, Johnson BD. The shifting importance of alcohol and marijuana as gateway substances among serious drug abusers. *J Stud Alcohol* 1994;55(5):607–14.
17. Merrill JC, Kleber HD, Shwartz M, et al. Cigarettes, alcohol, marijuana, other risk behaviors, and American youth. *Drug Alcohol Depend* 1999;56(3):205–12.
18. O'Connor RJ, Flaherty BP, Edwards BQ, et al. Regular smokeless tobacco use is not a reliable predictor of smoking onset when psychosocial predictors are included in the model. *Nicotine Tob Res* 2003;5:535–43.
19. Vaughn M, Wallace J, Perron B, et al. Does marijuana use serve as a gateway to cigarette use for high-risk African-American youth? *Am J Drug Alcohol Abuse* 2008;34(6):782–91.
20. McElroy S, ed. Multiple regression: testing and interpreting interactions. Thousand Oaks CA: Sage, 1991.

21. Riegert D, ed. Applied multiple regression/correlation analysis for the behavioral sciences. Mahwah NJ: Lawrence Erlbaum Associates, 2003.
22. Foster DS, ed. Regression with dummy variables. Newbury Park CA: Sage, 1993.
23. King BA, Dube SR, Tynan MA. Current tobacco use among adults in the United States: findings from the National Adult Tobacco Survey. *Am J Public Health* 2012;102(11):e93–e100.
24. McClave-Regan A, Berkowitz J. Smokers who are also using smokeless tobacco products in the US: a national assessment of characteristics, behaviors, and beliefs of dual users. *Tob Control* 2011;20(3):239–42.
25. Post A, Gilljam H, Rosendahl I, et al. Symptoms of nicotine dependence in a cohort of Swedish youths: a comparison between smokers, smokeless tobacco users and dual tobacco users. *Addiction* 2010;105(4):740–6.
26. Wetter DW, McClure JB, de Moor C, et al. Concomitant use of cigarettes and smokeless tobacco: prevalence, correlates, and predictors of tobacco cessation. *Prev Med* 2002;34(6):638–48.
27. Rath JM, Villanti AC, Abrams DB, et al. Patterns of tobacco use and dual use in US young adults: the missing link between youth prevention and adult cessation. *J Environ Public Health* 2012;2012:679134.
28. McClave-Regan AK, Berkowitz J. Smokers who are also using smokeless tobacco products in the US: a national assessment of characteristics, behaviours and beliefs of “dual users.” *Tob Control* 2011;20(3):239–42.
29. Tobacco News & Data. Star Scientific exiting tobacco business. 2012. www.cspnet.com/category-management-news-data/tobacco-news-data/articles/star-scientific-exiting-tobacco-business.
30. O'Connor RJ, Kozłowski LT, Flaherty BP, et al. Most smokeless tobacco use does not cause cigarette smoking: results from the 2000 National Household Survey on Drug Abuse. *Addict Behav* 2005;30(2):325–36.
31. Jensen PD, Cortes R, Engholm G, et al. Waterpipe use predicts progression to regular cigarette smoking among Danish youth. *Subst Use Misuse* 2010;45(7–8):1245–61.
32. Patton GC, Coffey C, Carlin JB, et al. Reverse gateways? Frequent cannabis use as a predictor of tobacco initiation and nicotine dependence. *Addiction* 2005;100(10):1518–25.
33. Stellrecht NE, Gordon KH, Van Orden K, et al. Clinical applications of the interpersonal-psychological theory of attempted and completed suicide. *J Clin Psychol* 2006;62(2):211–22.