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Youth E-cigarette, Blunt, and Other Tobacco Use Profiles: Does SES Matter?

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Abstract

Objective—We examined the associations between socioeconomic status (SES) and adolescent polytobacco use profiles (including e-cigarettes and blunts).

Methods—Adolescents (N = 1932) completed surveys conducted in 2014 in 3 Connecticut high schools. Within a Latent Class Analysis (LCA) framework, logistic regressions examined associations between SES and polytobacco use profiles comprising never, ever, and current e-cigarette, blunt, cigarette, cigar, cigarillo, hookah, and smokeless tobacco use.

Results—We identified 5 classes: (1) current polytobacco users; (2) ever polytobacco users; (3) current e-cigarette, blunt, and cigarette users; (4) ever e-cigarette and blunt users; and (5) never users. Low SES, relative to high SES, was associated with greater likelihood of being: (1) an ever polytobacco user; (2) a current e-cigarette, blunt, and cigarette user; and (3) an ever e-cigarette and blunt user, relative to a never user.

Conclusions—Low SES is associated with membership in distinct polytobacco use latent classes. Regulatory initiatives that focus exclusively on cigarette use may miss the opportunity to

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influence adolescent use of other products, which may be especially relevant to low-income individuals. Future research should examine whether targeting a broader range of products reduces SES-related tobacco use disparities.

Keywords

polytobacco use; adolescents; socioeconomic status; latent class analysis

Tobacco use is a leading contributor to preventable morbidity and mortality in the United States (US). Although effective tobacco control policies have contributed to steady declines in cigarette use among youth,¹ emerging trends for use of alternative tobacco products are concerning. National data indicate increases in current use of alternative tobacco products from 2011 to 2015; e-cigarette use increased from 1.5% to 16%, and hookah use increased from 4.1% to 7.2%.² Moreover, a survey among adolescents in Connecticut showed high current use rates for blunts (ie, cigars filled with marijuana; 11.6%)³ and national trends show increased rates for blunt use in combined samples of adolescents and adults.⁴ Additionally, national surveys show high current use rates for cigar use (inclusive of cigarillo, 8.6%) and smokeless tobacco use (6.0%).²

Low socioeconomic status (SES) is associated with cigarette smoking initiation and progression to regular smoking in adolescents.^{5,6} Specifically, low SES, as documented by participation in free/reduced lunch, is associated with increased likelihood of adolescent cigarette smoking.⁷ Unlike the established associations between low SES and cigarette smoking in adults and adolescents, the association between low SES and alternative tobacco product use has not been well-studied. The emerging evidence has been contradictory; one study found that lower SES is associated with increased e-cigarette use in adults,⁸ but other studies have reported no association between SES and adolescent e-cigarette use.⁹⁻¹¹

Low SES also appears to be associated with increased use of cigars,¹² cigarillos,¹² hookah,¹³ and smokeless tobacco¹⁴ in adults. However, there is less consistent literature examining the associations between SES and use of alternative tobacco products among adolescents. One study found no association between parent education and adolescent cigar/cigarillo use.¹⁵ Another study found that adolescents' weekly spending income was positively associated with both cigarillo and cigar use.¹⁶ Concerning smokeless tobacco use, whereas parent education was not related to smokeless tobacco use in a nationally representative sample of US high school students,¹⁵ it was positively associated with smokeless tobacco use in Mexican-origin adolescents in Texas.¹⁷ With reference to blunt use, parental education and plans to attend college were not associated with blunt use in adolescents.¹⁸ Blunt use typically is examined as part of marijuana use, which is associated with higher SES among young adults potentially due to greater access on college campuses or stress/anxiety about achieving academic goals.¹⁹⁻²² Although there has been much debate about whether blunt use is best characterized as cigar use or marijuana use, we thought it was important to include use of blunts in our examination because youth create blunts from hollowed out cigars or tobacco leaf wrappers. Finally, pertaining to hookah, in nationally representative samples in the US, research has shown that greater parent education, greater adolescent

earned income, and greater adolescent weekly spending money are associated with ever, past-year, and current hookah use.^{23,24}

Although examining the association between SES and individual tobacco products is useful, important relationships may be obscured because such analyses may not reflect adolescents' polytobacco use. Indeed, studies have shown that the use of one tobacco product is associated with concurrent use of other tobacco products.²⁵⁻³⁰ Nationally, 12.7% of adolescents report using 2 or more tobacco products.³¹ The emergence of new alternative tobacco products (eg, e-cigarettes) and the resurgence of blunt use necessitate new investigations of poly-tobacco use in adolescents. Prior research that has relied on latent class analysis^{32,33} and latent transition analysis³⁴ to identify tobacco use classes that include e-cigarettes and traditional tobacco products indicates that there are at least 3 tobacco use classes: nonusers, users that have a high probability of polytobacco use, and users that primarily use e-cigarettes.³²⁻³⁴ Although they contributed to knowledge of how e-cigarette use relates to other tobacco product use, these studies did not assess how factors like SES may contribute to class membership.

To our knowledge, no studies have examined the association between SES and polytobacco use latent classes (inclusive of e-cigarettes and blunts) in adolescents. Understanding which new polytobacco use profiles have emerged and how SES is associated with these new polytobacco profiles use could help local and national policy makers develop more nuanced approaches to prevent adolescent tobacco use, especially with regard to reducing SES-based tobacco use disparities.

Thus, the objective of this study is to describe the association between SES and polytobacco use profiles that include e-cigarettes, blunts, cigarettes, cigarillos, cigars, hookah, and smokeless tobacco, through the use of latent class analysis (LCA). Importantly, we assessed SES using the Family Affluence Scale (FAS), a composite measure of adolescents' family resources (ie, family car and computer ownership; frequency of family vacationing; individual bedrooms for children). FAS items are easier for adolescents to answer than common SES measures like family financial status and parental education because adolescents may not be aware of these factors.³² As such, adolescent responses to the FAS are more accurate and have fewer missing responses than more common measures.³² Consistent with prior research, we developed latent classes based on never, ever, and current use of tobacco products.³³⁻³⁵ We anticipated identifying latent classes characterized by no use and polytobacco product use, respectively. Due to the novelty of this research, we did not make hypotheses about additional tobacco use profiles. We also hypothesized that low SES, relative to high SES, would be associated with membership in polytobacco user profiles relative to the non-user profile.

Methods

Participants

Participants were 1932 adolescents from 3 high schools in southeastern Connecticut. In spring 2014, participants completed a school-wide, paper-and-pencil survey examining attitudes toward and use patterns of e-cigarettes and other tobacco products.

Procedures

After obtaining IRB and school administrator approvals to conduct the study, we obtained passive parental permission for participants younger than 18 years old and participant consent for participants 18 years old or older. Prior to administering the survey in homeroom, we informed participants that their participation was voluntary and that their data would remain confidential.^{36,37}

Measures

Demographics—The current survey was part of a larger, longitudinal study. Participants reported their age and sex in the current survey and in a prior survey conducted in fall 2013. Participants reported their race/ethnicity only on the prior survey. As such, data on race were available only for students who completed both surveys and whose surveys could be linked.³⁸ Using this procedure we recovered race/ethnicity for 72.4% of participants. Race was coded as white (88.0%) versus non-white (12.0%) due to relatively small sample sizes for racial/ethnic minorities (black = 1.4%; Hispanic/Latino = 3.4%; Asian = 2.9%; biracial = 1.9%; Other = 0.7%). Sex was coded as female = 1 and male = 0.

Socioeconomic status (SES)—Participants completed the Family Affluence Scale (FAS),³⁹ a 4-item measure developed by the World Health Organization (WHO). The FAS has been shown to be a reliable and valid measure of SES among adolescents in Europe and North America.^{32,39,40} Participants indicated whether their family owns a car, van, or truck (no = 0, yes = 1) and whether they have their own bedroom (no = 0, yes = 1). In addition, participants reported the number of laptops/computers their family owns (none = 0, 1 = 1, 2 = 2, more than 2 = 3). Participants also indicated how often their family had vacationed in the past 12 months (not at all = 0, once = 1, twice = 2, more than twice = 3). Based on established thresholds,^{39,41} responses were used to create composite scores, which resulted in a trichotomous SES measure, whereby a 3-point ordinal scale was created, such that scores 0–4 were classified as low, 5–6 as medium, and 7–8 as high. Dummy-coded variables were created to contrast Low SES with Medium SES; Low SES with High SES; and Medium SES with High SES.

Tobacco product use—We assessed ever use of e-cigarette, blunt (cigar filled with marijuana), cigarette, cigarillo (short, narrow cigar), cigar, hookah, and smokeless tobacco with the question stem: “Have you ever tried [product]?” Participant responses were coded as either yes or no. Current use of these products was assessed with the question: “How many days out of the past 30 days did you use [product]?” A report of one or more days of use of each product was coded as current use of that product. Separately for each product, we created a trichotomized variable, wherein never use = 0, ever use = 1 (a report of ever use but not current use), and current use = 2. All tobacco products, with the exception of cigarettes, were described with a photograph and short definition of the product. We also created 4 variables (ever tried one or more tobacco products; ever tried 2 or more tobacco products; current use of one or more products; current use of 2 or more products) to help describe the extent of “any product use” and “multiple product use” in preliminary screening.

Data Analysis

We completed preliminary data screening (eg, examination of descriptive data, missing data analysis) in SPSS 21.⁴² Data regarding race were missing for 27.6% of the sample. All other variables were missing data for fewer than 5% of cases. We conducted logistic regression to identify differences between participants who were missing data for race and participants who had data available for race. Participants who were missing data on race were more likely to be male (OR 0.54; 95% CI 0.43, 0.68), have tried cigarettes (OR 2.02; 95% CI 1.44, 2.83) and cigarillos (OR 2.02; 95% CI 1.28, 3.17) in their life time, but were less likely to have tried cigars (OR 0.64; 95% CI 0.411, 0.99). To address missing data, we conducted multiple imputation in Mplus 7.2.⁴³ We requested 100 multiple imputation datasets to reduce bias in estimates.⁴⁴ We compared results using multiple imputation to results not using multiple imputation (with and without a category for race = unknown). We found all 3 approaches yielded similar results. Therefore, we only present results from analyses that used multiple imputation to handle missing data. We used chi-square tests followed by Bonferroni-corrected z-tests (for dichotomous and ordinal variables) and analysis of variance (ANOVA; for continuous and categorical/ordinal variables) to determine bivariate associations between SES and demographic variables and tobacco use.

In Mplus 7.2,⁴³ we used LCA to identify polytobacco product use profiles.⁴⁵ We identified the optimal number of classes by starting with a one-class solution and comparing the effect of adding additional classes on multiple indicators of model fit; in the LCA, optimal fit was determined by identifying models with a lower Bayesian Information Criteria (BIC) statistic, a lower sample size-adjusted BIC statistic, a lower Akaike Information Criterion (AIC) statistic, and a higher entropy score. Within the same Mplus model, we used multinomial regression to examine whether SES was associated with the identified latent classes, after controlling for race, age, sex and school. Modeling the latent classes in tandem with the multinomial regression accounts for the effects of covariates on the probability of class membership.

Results

Sample Characteristics and Bivariate Associations

Sample characteristics and bivariate associations are presented in Table 1. In our sample, 18.1% of participants were from a low SES background, 48.8% of participants were from a medium SES background, and 33.1% were from a high SES background. The distribution of responses to the Family Affluence Scale (ie, SES) items is presented in Table 2. Most adolescents from low SES backgrounds reported having one to 2 computers at home, whereas adolescents from medium and high SES backgrounds tended to report having more than 2 computers at home. Rates of family car ownership were high in our sample (98%), though rate of car ownership was lowest among adolescents from low SES backgrounds. Rates for having one's own room were above 90% for adolescents from medium and high SES backgrounds, but at 69.5% for adolescents from low SES backgrounds.

As Table 1 shows, among adolescents from low SES backgrounds, ever use ranged from 8.6% (smokeless tobacco) to 21.2% (e-cigarette), and current use ranged from 6.9%

(smokeless tobacco) to 20.1% (e-cigarette). For adolescents from medium SES backgrounds, ever use rates ranged from 6.0% (smokeless tobacco) to 19.4% (e-cigarettes) and current use rates ranged from 3.4% (smokeless tobacco) to 14.5% (e-cigarettes). For adolescents from high SES backgrounds, ever use rates ranged from 3.9% (smokeless tobacco) to 16.3% (e-cigarettes) and current use rates ranged from 3.9% (smokeless tobacco) to 13.8% (e-cigarettes). Note, across all 3 SES groups, ever and current use rates were lowest for smokeless tobacco and highest for e-cigarette.

Lower SES was associated with high rates of use for e-cigarettes, [$\chi^2(4) = 14.36, p < .01$], blunts [$\chi^2(4) = 9.88, p < .05$], cigarettes [$\chi^2(4) = 43.83, p < .001$], cigars, [$\chi^2(4) = 12.11, p < .05$], and smokeless tobacco [$\chi^2(4) = 17.86, p < .01$] (Table 2). SES was not significantly associated with use of cigarillos [$\chi^2(4) = 6.63, p = .16$] or hookah [$\chi^2(4) = 7.85, p = .10$]. Lower SES also was associated with greater likelihood of having ever tried one or more tobacco products [$\chi^2(2) = 23.53, p < .01$] and current use of one or more tobacco products [$\chi^2(2) = 14.41, p < .01$]. In addition, lower SES was associated with greater likelihood of having ever tried 2 or more tobacco products [$\chi^2(2) = 15.87, p < .001$] and current use of 2 or more tobacco products [$\chi^2(2) = 9.57, p < .01$].

SES groups also differed by age, sex and race: (1) adolescents of low and medium SES backgrounds tended to be younger than adolescents of high SES background [$F(2, 1929) = 5.29, p < .01$]; (2) adolescents of low SES background were less likely to be female than male, compared to adolescents of medium and high SES background [$\chi^2(2) = 22.21, p < .001$]; and (3) adolescents of low SES background were less likely to be white than adolescents of medium and high SES background [$\chi^2(2) = 20.73, p < .001$]. Therefore, to address potential confounding effects, we controlled for these variables in our analyses.

E-cigarette and Tobacco Use Latent Classes

Table 3 shows that all fit statistics improved as we progressed from testing a one-class model to a 3-class model. In the 4-class model, all fit statistics improved except for entropy. As BIC tends to perform well for categorical data,⁴⁶ we continued to fit additional models (5-class model, 6-class model) until BIC showed a distinct minimum value (which occurred in the 5-class model). We opted for the 5-class solution because it showed improved fit relative to prior models and had theoretically valid latent classes. Response probabilities for class membership are shown in Table 4. We named classes based on highest response probability for each tobacco product use category. Class 1 (4.2%; current polytobacco use group) included youth with high probability of current use for all of the tobacco products (e-cigarette, blunt, cigarettes, cigar, cigarillo, hookah, and smokeless tobacco) studied. Class 2 (6.8%; ever polytobacco use group) included youth with high probability of ever use for all of the tobacco products studied. Class 3 (6.9%; current e-cigarette, blunt and cigarette use group) included youth with high probability of current use for e-cigarettes, blunts and cigarettes. Class 4 (14.3%; ever e-cigarette, blunt use group) included youth with high probability of ever use for e-cigarettes and blunts. Class 5 (67.8%; never use group) included youth with low probability of ever or current use for all of the tobacco products (e-cigarette, blunt, cigarettes, cigar, cigarillo, hookah, and smokeless tobacco) studied.

SES and Polytobacco Use Latent Classes

Table 5 shows results from the multinomial regression examining the association between SES and tobacco use profiles, with the never use group (class 5) as the reference group. Results using other classes as reference groups are not presented because no statistically significant associations were observed in those comparisons

Class 1: current polytobacco use group—There was no association between low SES, relative to high SES, and likelihood of being in the current polytobacco use group (OR 0.88; 95% CI 0.35, 2.20) relative to the never use group (class 5). Low SES relative to medium SES, was not associated with membership in the current polytobacco use group (OR 1.04; 95% CI 0.42, 2.54). There was no association between medium SES, relative to high SES, and membership in the current polytobacco use group (OR 0.85; 95% CI 0.49, 1.49). Females were less likely to belong to the current polytobacco use group (OR 0.25; 95% CI 0.11, 0.53) than males. Older youth were more likely to be in the current polytobacco use group (OR 2.06; 95% CI 1.65, 2.57) than younger youth. White race was not associated with membership in the current polytobacco use group (OR 0.68; 95% CI 0.30, 1.53).

Class 2: ever polytobacco use group—Low SES, relative to high SES, was associated with greater likelihood of being in the ever polytobacco use group (OR 2.23; 95% CI 1.22, 4.07). However, low SES, relative to medium SES, was not associated with membership in the ever polytobacco use group (OR 1.59; 95% CI 0.91, 2.77). There was no association between medium SES, relative to high SES, and membership in the ever polytobacco use group (class 2; OR 1.40; 95% CI 0.84, 2.33). Females were less likely to belong to the ever poly-tobacco use group (OR: 0.37; 95% CI 0.22, 0.61) than males. Older youth were more likely to be in the ever polytobacco use group (OR 1.79; 95% CI 1.50, 2.12) than younger youth. White race was not associated with membership in the ever poly-tobacco use group (OR 1.48; 95% CI 0.66, 3.32)

Class 3: current e-cigarette, blunt and cigarette use group—Low SES, relative to high SES, was associated with greater likelihood of being in the current e-cigarette, blunt and cigarette use group (OR 2.21; 95% CI 1.19, 4.10). Relative to medium SES, low SES was not associated with membership in the current e-cigarette, blunt and cigarette user group (OR 1.77; 95% CI 0.98, 3.17). There was no association between medium SES, relative to high SES, and membership in the current e-cigarette, blunt, and cigarette use group (OR 1.25; 95% CI 0.72, 2.17). Females were more likely to belong to the current e-cigarette, blunt, and cigarette use group (OR: 1.65; 95% CI 1.01, 2.69) than males. In contrast to the other classes, age was not associated with membership in the current e-cigarette, blunt, and cigarette use group (OR 1.08; 95% CI 0.91, 1.27). White race was not associated with membership in the current e-cigarette, blunt, and cigarette use group (OR 0.84; 95% CI 0.46, 1.53).

Class 4: ever e-cigarette and blunt use group—Low SES, relative to high SES was associated with greater likelihood of being in the ever e-cigarette, blunt use group (OR 1.58; 95% CI 1.01, 2.46). Low SES, relative to medium SES, was associated with membership in

the ever e-cigarette and blunt use group (OR 1.55; 95% CI 1.02, 2.34). There was no association between medium SES, relative to high SES, and membership in the ever e-cigarette, blunt use group (OR 1.02; 95% CI 0.71, 1.46). Sex was not associated with likelihood of membership in this class (OR 1.16; 95% CI 0.84, 1.61). Older youth were more likely to be in the ever e-cigarette, blunt use group (OR 1.38; 95% CI 1.20, 1.58) than younger youth. White race was not associated with membership in the ever e-cigarette, blunt use group (OR 0.93; 95% CI 0.58, 1.48).

Discussion

We examined the association between SES and polytobacco use profiles that included e-cigarettes, blunts, cigarettes, cigarillos, cigars, hookah, and smokeless tobacco. We identified 5 latent classes: (1) current polytobacco users; (2) ever polytobacco users; (3) current e-cigarette, blunt, and cigarette users; (4) ever e-cigarette and blunt users; and (5) never users (ie, abstainers). These classes generally were consistent with previous adolescent research.^{33,47} However, we identified more latent classes (5 classes), identified classes with e-cigarette and blunt use as predominate features, and found that our polytobacco use profiles included a substantial proportion of e-cigarette users, suggesting that those who have tried e-cigarettes are likely to have tried other tobacco products (or vice versa). We also found that relative to the never user group, low SES, compared to high SES, was associated with greater likelihood of membership in 3 classes: (1) ever polytobacco use group; (2) current e-cigarette, blunt and cigarette use group; and (3) ever e-cigarette and blunt use group.

Our study is unique because, in contrast to prior LCAs that are inclusive of e-cigarettes, we described the association between latent classes and SES.^{33,47,48} Low SES was associated with greater likelihood of membership in 3 of 5 latent classes, and was not associated with the current polytobacco use class or never-user group. Previous research has suggested a number of factors that may contribute to greater probability of tobacco product use among youth from low SES backgrounds.⁴⁹ For example, adolescents from low SES backgrounds may be more likely to have parents or friends who smoke,^{50,51} be targeted for tobacco related advertisements,⁵² and use tobacco as a way to cope with stress associated with their low SES status.⁵³ Thus, the lack of association between low SES and current polytobacco use is somewhat unexpected. Perhaps, these adolescents lack financial resources to use all of the studied tobacco products at once. It is also possible factors such as parental substance use, biologic predispositions or cultural norms supersede the effects of SES in this population. Given that we did not examine the aforementioned factors, it is essential that future studies examine them as potential mediators of the relationship between SES and alternative tobacco product use. It is also surprising that we did not consistently observe significant associations for comparisons involving medium SES, as other studies have shown that each level of increase in SES (ie, income) is associated with corresponding protective health effects for youth.⁵⁴

Another unique finding in the current study is that the polytobacco use profiles included blunts, a tobacco product that largely has not been included in previous studies of polytobacco use. It is surprising that latent classes defined by blunt use would emerge for an

overwhelmingly white sample, as blunt use tends to occur more often among African Americans.¹⁸ However, more recent trends have suggested blunt use has spread to other racial groups.⁴

A secondary finding of this study is that girls were more likely than boys to be current e-cigarette, blunt and cigarette users, but less likely than boys to be current polytobacco users and ever polytobacco users. Whereas boys have traditionally been at risk for greater tobacco use, a recent nationally representative study has shown an increasing trend in concurrent cigarette and cigar use for girls, but a decreasing trend for boys from 1999 to 2013.⁵⁵ Extending this prior work, our findings suggest that girls may be uniquely at risk for combinations of polytobacco use that include blunts as a unique cigar product, e-cigarettes, and cigarettes.

Our study had several limitations. Due to the cross-sectional nature of our study, we cannot make causal inferences or determine whether e-cigarette use preceded use of the other products. The generalizability of the findings may be limited by the inclusion of a convenience sample of students from predominantly white, middle-to-high income backgrounds in Connecticut. In particular, we may not have been able to detect unique findings in black students due to sample size limitations, as we did not identify a class of blunt/cigar use (which has been shown previously to be a typical use pattern in this population).⁵⁶⁻⁵⁹ Also, a substantial portion of the race/ethnicity data were missing (27.6%). We minimized the effects of missing data by using multiple imputation. This approach helped mitigate the effects of missing data bias by allowing us to retain cases that would have otherwise been excluded from the analysis via list wise deletion. The imputation resulted in demographics that are consistent with the demographics of the schools' towns. It is important to point out that our results were consistent across 3 missing data approaches (ie, complete case analysis, multiple imputation, and including an indicator for missing race). Lastly, we observed differences in age, sex and race across levels of SES. However, we controlled for potential confounding effects by including these demographic factors in our analysis.

Despite these limitations, our study extends the existing literature on polytobacco use among adolescents by including e-cigarettes and blunts (along with 5 other tobacco products) in an LCA, and showing that low SES, relative to high SES, was associated with greater likelihood of being: (1) an ever polytobacco user; (2) a current e-cigarette, blunt, and cigarette user; and (3) an ever e-cigarette and blunt user, relative to a never user. Future research should examine how polytobacco use that is inclusive of e-cigarettes emerges among low-income adolescents and how such use is associated with age of initiation and progression of tobacco use over time. There also is a need for research that aims to develop a better understanding of why low SES youth are more susceptible to polytobacco use.

Implications for Tobacco Regulation

Our findings have significant implications for tobacco regulatory policies that aim to prevent poly-tobacco use and tobacco-related health disparities in low SES adolescents. In particular, the higher probability of certain polytobacco use patterns in low SES youth may widen

tobacco-related health disparities by conferring heightened risk of chronic health problems in a group that may not have the resources to access and engage in appropriate healthcare. The current study suggests that regulatory initiatives should focus on polytobacco use, as those that focus exclusively on cigarettes miss the opportunity to have a direct influence on low-income individuals. Future research should examine whether targeting a broader range of products helps reduce SES-related tobacco use disparities. Tobacco regulatory efforts have contributed to steady declines in tobacco use over several decades; however, high SES adolescents have experienced greater declines than low SES adolescents.⁶⁰ Overall, our findings suggest that socioeconomic differences in tobacco use persist.

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Table 1
Demographics and Prevalence of Tobacco Product Use by Socioeconomic Status (SES) (N = 1932)

	Total	Low SES (18.1%, N = 349)	Medium SES (48.8%, N = 943)	High SES (33.1%, N = 640)	χ^2	F
Demographics						
Age (Mean, SD)	16.0 (1.3)	16.2 (1.3) ^a	16.1 (1.3) ^a	15.9 (1.3) ^b		5.29 ^{**}
Sex (%)						
Female	50.5	40.1 ^a	50.7 ^b	55.8 ^b	22.21 ^{***}	
Race (%)						
White	88.4	81.4 ^a	90.2 ^b	89.5 ^b	20.73 ^{***}	
Tobacco Use						
E-cigarettes (%)						
Never	66.0	58.7 ^a	66.1 ^b	70.0 ^b	14.36 ^{**}	
Ever	18.7	21.2 ^a	19.4 ^a	16.3 ^a		
Past month	15.3	20.1 ^a	14.5 ^b	13.8 ^b		
Blunts (%)						
Never	76.8	70.8 ^a	78.4 ^b	77.7 ^b	9.88 [*]	
Ever	12.1	15.2 ^a	11.8 ^a	10.8 ^a		
Past month	11.2	14.0 ^a	9.9 ^a	11.6 ^a		
Cigarettes (%)						
Never	77.2	64.2 ^a	78.8 ^b	81.9 ^b	43.83 ^{***}	
Ever	11.9	18.1 ^a	11.6 ^b	8.9 ^b		
Past month	11.0	17.8 ^a	9.7 ^b	9.2 ^b		
Cigarillos (%)						
Never	86.6	83.1 ^a	86.4 ^{a,b}	88.8 ^b	6.63	
Ever	8.2	10.6 ^a	8.5 ^a	6.6 ^a		
Past month	5.2	6.3 ^a	5.1 ^a	4.7 ^a		
Cigars (%)						
Never	83.5	81.7 ^a	82.7 ^a	85.6 ^a	12.11 [*]	
Ever	10.3	13.2 ^a	11.3 ^a	7.2 ^b		
Past month	6.2	5.2 ^a	5.9 ^a	7.2 ^a		

	Total	Low SES (18.1%, N = 349)	Medium SES (48.8%, N = 943)	High SES (33.1%, N = 640)	χ^2	F
Hookahs (%)						
Never	80.8	75.6 ^a	81.9 ^b	82.0 ^{ab}	7.85	
Ever	13.0	16.0 ^a	12.6 ^a	11.9 ^a		
Past month	6.2	8.3 ^a	5.5 ^a	6.1 ^a		
Smokeless Tobacco (%)						
Never	90.0	84.5 ^a	90.6 ^b	92.2 ^b	17.86 ^{**}	
Ever	5.8	8.6 ^a	6.0 ^{ab}	3.9 ^b		
Past month	4.2	6.9 ^a	3.4 ^b	3.9 ^{ab}		
Ever Tried One or More Product	41.5	52.4 ^a	40.6 ^b	36.7 ^b	23.53 ^{***}	
Current Use of One or More Product	23.8	31.5 ^a	22.5 ^b	21.4 ^b	14.41 ^{**}	
Ever Tried 2 or More Product	31.4	39.8 ^a	30.8 ^b	27.7 ^b	15.87 ^{***}	
Current Use of 2 or More Product	13.5	18.6 ^a	12.5 ^b	12.2 ^b	9.57 ^{**}	

Note. Within rows, superscripts reflect result of Bonferroni-corrected z-tests; Cells with different letters significantly differ from one another at $p < .05$;

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 2
Distribution of Responses to Family Affluence Scale Items across SES Category (N = 1932)

	Total	Low SES (18.1%, N = 349)	Medium SES (48.8%, N = 943)	High SES (33.1%, N = 640)
Number of Computers at Home				
None	1.6	8.1	0.2	0.0
One	9.4	39.2	4.9	0.0
2	22.9	41.3	26.7	7.4
More than 2	66.1	11.3	68.2	92.6
Family Has Vehicle				
No	2.0	7.6	1.2	0.3
Yes	98.0	92.4	98.8	99.7
Has Own Bedroom				
No	11.5	30.5	9.8	3.9
Yes	88.5	69.5	90.2	96.1
Vacations in Past Year				
Not at all	21.9	68.3	19.7	0.0
Once	34.5	28.5	60.3	0.0
Twice	23.8	2.0	17.4	45.2
More than Twice	19.7	1.2	2.6	54.8

Table 3
Fit Indices of Latent Class Analyses of the Tobacco and Modified Tobacco Products (N = 1932)

Number of Classes	Log-Likelihood	AIC	BIC	Adjusted BIC	Entropy
1	-8339.128	16706.256	16784.184	16739.706	N/A
2	-6333.486	12724.972	12886.395	12794.261	0.918
3	-5949.734	11987.469	12232.386	12092.597	0.923
4	-5765.489	11648.977	11977.390	11789.946	0.896
5	-5685.566	11519.131	11931.040	11695.939	0.907
6	-5656.149	11490.298	11985.700	11702.945	0.916

Note. Text in bold indicates the optimal class solution chosen based on empirical and theoretical considerations; AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; N/A, not applicable.

Table 4
Demographics and Probability of Class Membership for Tobacco Product Use by Latent Classes (N = 1932)

	Total	Class 1-Current Polytabacco Users (4.2%, N = 82)	Class 2-Ever Polytabacco Users (6.8%, N = 134)	Class 3-Current E-cigarette, Blunt and Cigarette users (6.9%, N = 133)	Class 4-Ever E-cigarette and Blunt Users (14.3%, N = 274)	Class 5-Never Users (67.8%, N = 1309)
Demographics						
Age (Mean, SD)	16.0 (1.3)	16.9 (1.0)	16.7 (1.2)	16.0 (1.2)	16.4 (1.1)	15.8 (1.3)
Sex (%)						
Female	50.5	20.7	27.6	61.7	55.8	52.4
Race (%)						
White	88.4	84.1	91.0	85.7	88.3	88.7
SES (%)						
Low SES	18.1	35.4	23.9	25.6	31.8	35.0
Medium	48.8	47.6	50.0	48.9	46.4	49.3
High SES	33.1	17.1	26.1	25.6	21.9	15.7
E-cigarettes (%)						
Never	66.0	4.0	1.5	4.9	26.2	92.4
Ever	18.7	9.3	71.3	2.7	67.4	4.2
Past Month	15.3	86.7	27.1	92.4	6.4	3.4
Blunts (%)						
Never	76.8	17.1	8.6	36.8	44.8	99.2
Ever	12.1	6.3	61.8	4.8	45.2	0.4
Past Month	11.2	76.6	29.6	58.3	10.0	0.4
Cigarettes (%)						
Never	77.2	20.9	13.3	29.8	57.6	96.9
Ever	11.9	5.3	44.6	29.0	32.3	2.4
Past Month	11.0	73.7	42.1	41.2	10.1	0.8
Cigarillos (%)						
Never	86.6	0.0	6.6	88.9	87.3	99.9
Ever	8.2	5.7	87.3	2.4	12.5	0.0
Past Month	5.2	94.3	6.2	8.7	0.2	0.1
Cigars (%)						

	Total	Class 1-Current Polytoabacco Users (4.2%, N = 82)	Class 2-Ever Polytoabacco Users (6.8%, N = 134)	Class 3-Current E-cigarette, Blunt and Cigarette users (6.9%, N = 133)	Class 4-Ever E-cigarette and Blunt Users (14.3%, N = 274)	Class 5-Never Users (67.8%, N = 1309)
Never	83.5	2.9	5.8	75.7	73.7	99.7
Ever	10.3	7.4	86.2	6.0	24.2	0.0
Past Month	6.2	89.7	8.0	18.3	2.1	0.3
Hookahs (%)						
Never	80.8	26.6	19.7	45.9	60.4	99.0
Ever	13.0	19.3	76.6	10.4	37.8	0.6
Past Month	6.2	54.1	3.7	43.6	1.9	0.4
Smokeless Tobacco (%)						
Never	90.0	30.7	34.8	87.4	89.2	99.9
Ever	5.8	8.9	58.6	2.1	8.5	0.0
Past Month	4.2	60.4	6.6	10.5	2.2	0.1

Table 5
Odds Ratios and Confidence Intervals from Multinomial Regression Examining the Association Between SES and Tobacco Use Latent Classes (N = 1932)

	Class 1-Current Poly tobacco Use Group (ref: Class 5 – Never User Group)		Class 2-Ever Poly tobacco Use Group (ref: Class 5 – Never User Group)	
	OR	95% CI	OR	95% CI
Age	2.06	1.65	2.57	1.50
Female (ref: Male)	0.25	0.11	0.53	0.22
Low SES (ref: High SES)	0.88	0.35	2.20	1.22
Low SES (ref: Med SES)	1.04	0.42	2.54	0.91
Med SES (ref: High SES)	0.85	0.49	1.49	0.84
White (ref: other)	0.68	0.30	1.53	0.66
School 1	0.62	0.35	1.12	0.52
School 2	0.50	0.23	1.09	0.55

	Class 3-Current E-cigarette, Blunt and Cigarette Use Group (ref: Class 5 – Never User Group)		Class 4-Ever E-cigarette and Blunt Use Group (ref: Class 5 – Never User Group)	
	OR	95% CI	OR	95% CI
Age	1.08	0.91	1.27	1.20
Female (ref: Male)	1.65	1.01	2.69	0.84
Low SES (ref: High SES)	2.21	1.19	4.10	1.01
Low SES (ref: Med SES)	1.77	0.98	3.17	1.02
Med SES (ref: High SES)	1.25	0.72	2.17	0.71
White (ref: other)	0.84	0.46	1.53	0.58
School 1	1.75	0.98	3.15	0.71
School 2	0.95	0.49	1.83	0.59

Note. Bold indicates statistical significance; $p < .05$.