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Adolescent Use of Flavored Non-Tobacco Oral Nicotine Products

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Abstract

BACKGROUND AND OBJECTIVES: Flavored non-tobacco oral nicotine products (eg, nicotine pouches and nontherapeutic nicotine gum, lozenges, tablets, gummies), are increasingly marketed in the United States. Prevalence of non-tobacco oral nicotine product use among adolescents is unknown.

METHODS: We calculated prevalence of ever and past 6-month use of nicotine pouches, other non-tobacco oral nicotine products (ie, gum, lozenges, tablets, and/or gummies), e-cigarettes, cigarettes, hookah or waterpipe, cigars, cigarillos, and snus among high school students in Southern California between September and December 2021. Generalized linear mixed models tested associations of sociodemographic factors and tobacco-product use with use of any non-tobacco oral nicotine product.

RESULTS: Among the sample ($n = 3516$), prevalence was highest for e-cigarettes (ever: 9.6%, past 6-month: 5.5%), followed by non-tobacco oral nicotine products (ever: 3.4%, past 6-month: 1.7%), and <1% for other products. Ever users of combustible tobacco (adjusted odds ratio [aOR] = 77.6; 95% confidence interval [CI] = 39.7–152) and ever users of noncombustible tobacco (aOR

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= 40.4; 95% CI= 24.3–67.0) had higher odds of ever using non-tobacco oral nicotine products, compared to never users of combustible and noncombustible tobacco. Use of any non-tobacco oral nicotine product was greater for Hispanic (versus all other races/ethnicities except Asian, aOR = 2.58; 95% CI = 1.36–4.87), sexual minority (versus heterosexual, aOR=1.63; 95% CI = 1.03–2.57), gender minority (versus male, aOR = 2.83; 95% CI = 1.29–6.19), and female (versus male, aOR=1.92, 95% CI = 1.20–3.06) participants.

CONCLUSIONS: Non-tobacco oral nicotine products were the second most prevalent nicotine product used by adolescents. They were disproportionately used by certain racial or ethnic, sexual, or gender minority groups, and those with a history of nicotine use. Adolescent nontobacco oral nicotine product use surveillance should be a public health priority.

Non-tobacco oral nicotine products are a relatively new type of commercial nicotine product that include flavored nicotine pouches, nontherapeutic nicotine gums, lozenges, and tablets, and nicotine gummies (Fig 1).^{1,2} Although therapeutic nicotine gums and lozenges (ie, nicotine replacement therapy for cigarette smoking cessation) have been on the market for decades, a new sector of commercial oral nicotine products that are advertised as tobacco-free and not approved as cessation aids (ie, nontherapeutic) have recently entered the market. United States sales of non-tobacco nicotine pouches have increased substantially in recent years (commercial market share: 0.9% in 2018, to 4.0% in 2019 in the United States oral nicotine or tobacco commercial market).³ New nontobacco oral nicotine products may be of interest to adolescents because of the ability to conceal use from authority figures, similarity to preferred food products (eg, gum), and availability in appealing flavors. New non-tobacco oral nicotine products also employ marketing approaches that may attract youth, including availability in fruit and dessert flavors, digital marketing campaigns, and marketing themes connoting minimal harm.^{1,2}

National surveys such as the National Survey on Drug Use and Health,⁴ Youth Risk Behavior Surveillance System,⁵ and Population Assessment of Tobacco and Health⁶ do not currently include measures of nontobacco oral nicotine product use. Consequently, little is known about how common non-tobacco oral nicotine product use is among United States adolescents and whether there are certain groups that are at greater risk for use. In one study, ever use of non-tobacco nicotine pouches (which are similar to snus but do not contain tobacco plant) among Dutch adolescents (13 to 17 years old) surveyed in 2020 was <1%.⁷ However, no published studies have examined the prevalence of nicotine pouch use among United States adolescent populations or the prevalence of other novel non-tobacco oral nicotine products (eg, gums, lozenges, and gummies), which resemble candy and can be easily concealed. Because nicotine exposure in adolescence may adversely affect adolescent brain development and increase risk of nicotine addiction and attention, memory, learning, and impulse control problems,^{8–10} national surveillance of adolescent use of these products may be warranted if adolescent use of nontobacco oral nicotine products is of appreciable prevalence or elevated among vulnerable subgroups.

In the current study, we examine the prevalence of ever and past 6-month use of non-tobacco oral nicotine products, including nicotine pouches and flavored nontherapeutic nicotine gums, lozenges, tablets, and gummies, among Southern California ninth and tenth graders

during Fall 2021. We present prevalence estimates relative to other tobacco product use (e-cigarettes, combustible cigarettes, hookah, snus, large cigars, and cigarillos). We also examine whether sociodemographic factors and other tobacco product use are correlated with use of non-tobacco oral nicotine products.

METHODS

Data are from an ongoing survey study of behavioral health among Southern California adolescents. Students were recruited in ninth grade from a total of 11 schools in 7 school districts from Los Angeles, Riverside, San Bernardino, Orange, or Imperial counties. Recruitment of ninth grade adolescents was conducted in 2 waves. In the first recruitment wave during the 2020 to 2021 academic year, ninth graders enrolled at participating schools were eligible. The second recruitment wave involved a new population of ninth graders enrolled in a subset of 4 participating schools that took place during Fall 2021 of the 2021 to 2022 academic year. Data for the current study are from the Fall 2021 data collection (September 30 to December 14, 2021), when students from the first recruitment wave were in tenth grade and those from the second recruitment wave were in ninth grade. Between September and December 2021, 8512 students were eligible, 4203 enrolled in the study (parental consent and student assent obtained), and 3764 students (ninth grade, $n = 1236$; tenth grade, $n = 2528$) took the Fall 2021 survey (Supplemental Fig 3). The analytic sample was restricted to 3516 participants with nonmissing data on nicotine and tobacco product use. Most students completed in-classroom surveys collected on site at their respective schools. Students absent during data collection days were sent a link to the survey and invited to complete the survey remotely outside of their class time.

Ethics Statement

The study was approved by the University of Southern California Institutional Review Board. Written parental consent and student assent were obtained before data collection.

Measures

Non-Tobacco Oral Nicotine Product Use—Survey items assessed ever (versus never) and past 6-month (versus no past 6-month) use of (A) nicotine pouches and (B) other non-tobacco oral nicotine products (ie, gum, lozenges, tablets, and/or gummies). Nicotine pouches and other nontobacco oral nicotine products were examined separately and subsequently collapsed for primary analyses (ie, representing any nontobacco oral nicotine product based on use of either nicotine pouches or other oral products).

Other Tobacco Product Use—Additional survey items assessed ever and past 6-month use of combustible cigarettes, e-cigarettes, snus, cigars, little cigars or cigarillos, and hookah or waterpipe. Despite its similarity to nicotine pouches, snus was not considered a non-tobacco oral nicotine product in this study as it contains tobacco plant. The survey did not include questions on use of traditional smokeless tobacco products (eg, dip or chewing tobacco), which is rare among adolescents in similar Southern California cohorts.¹¹ We created variables for any combustible tobacco (ie, cigarettes, cigars, little cigars or cigarillos, hookah or waterpipe), any noncombustible tobacco product (ie, e-cigarettes, snus), and a

mutually exclusive 4-category variable distinguishing between dual and exclusive ever use of combustible and noncombustible tobacco products (dual ever use of combustible and noncombustible tobacco, exclusive ever use of combustible tobacco, exclusive ever use of noncombustible tobacco, and never use of either combustible or noncombustible tobacco).

Sociodemographic Characteristics—Adolescents self-reported race and ethnicity (Hispanic, Non-Hispanic Asian, Non-Hispanic all other races [American Indian or Alaska Native, Asian, Black, Native Hawaiian or Pacific Islander, White, multiracial, another race were assessed separately and collapsed in analysis]), sexual identity (heterosexual, sexual minority identity [asexual, bisexual, gay, lesbian, pansexual, queer, questioning], prefer not to disclose), gender identity (male or masculine, female or feminine, transgender or nonbinary [transgender male, transgender female, gender variant or nonbinary, another gender], prefer not to disclose), and highest parental or caregiver education (less than high school [eighth grade or less, less than high school], high school graduate, some college or college graduate [some college, college graduate], advanced degree, don't know), and perceived socioeconomic status (financially struggling or in poverty, all other socioeconomic categories [it varied, about average, pretty well off financially]).

Statistical Analysis

We calculated the prevalence of ever (yes or no) and past 6-month (yes or no) use of nicotine pouches, other non-tobacco oral nicotine products (ie, gum, lozenges, tablets, and/or gummies), and each tobacco product (ie, combustible cigarettes, e-cigarettes, snus, cigars, little cigars or cigarillos, hookah/waterpipe) among the full sample. We examined the prevalence of ever and past 6-month use of any non-tobacco oral nicotine product (ie, nicotine pouches or other non-tobacco oral nicotine product) by sociodemographic characteristics and by combustible and noncombustible tobacco use history. To examine correlates of oral nicotine product use, we fit separate unadjusted generalized linear mixed models that accounted for clustering within schools to produce odds ratios (OR) and 95% confidence intervals (CI) for the association of each sociodemographic factor and combustible and noncombustible tobacco use history (independent variables) with ever and past 6-month use of any non-tobacco oral nicotine product (dependent variables). We additionally fit multivariable generalized linear mixed models adjusting for all sociodemographic factors. Missing data on sociodemographic factors ranged from 0.03% (grade) to 3.0% (parental education). Missing values were assigned a missing indicator and included in the analysis. Analyses used SAS v.9.4.

RESULTS

Among the sample of 3516 adolescents with nonmissing data on tobacco or nicotine use, 31.9% were in ninth grade and 68.1% were in tenth grade (Table 1). Most identified as Hispanic (47.3%) or Asian (32.0%), and 17.9% identified as another race and ethnicity (7.9% multiple races, 6.9% White, 1.3% Black, 0.31% Native Hawaiian or Pacific Islander, 0.06% American Indian, and 1.4% all other races). A majority reported that the highest level of parental education was some college or greater, and only 5.9% of participants reported that their family struggled financially or were in poverty. Approximately one-quarter

(23.0%) of participants identified as sexual minority identity, and 4.1% preferred not to report their sexual identity. For gender identity, 46.6% of participants identified as female or feminine, 43.3% as male or masculine, 5.2% as transgender, gender nonbinary, or another gender, and 3.6% preferred not to say.

The most prevalent nicotine or tobacco product used was e-cigarettes (9.6% ever, 5.5% past 6 month use), followed by nicotine gums, lozenges, tablets, and/or gummies (3.1% ever, 1.4% past 6 month use; Fig 2). For all other products, ever and past 6 month use prevalence was <1%, including nontobacco nicotine pouches (0.6% ever, 0.3% past 6 month use). Overall, 3.4% of participants reported ever use and 1.7% reported past 6-month use of any non-tobacco oral nicotine product, whereas 9.6% reported ever use and 5.5% reported past 6-month use of any noncombustible tobacco product (ie, e-cigarettes, snus) and 2.0% of participants reported ever use and 1.3% reported past 6-month use of any combustible tobacco product (ie, cigarettes, cigars, little cigars or cigarillos, hookah).

In adjusted analyses, the odds of ever use of any non-tobacco oral nicotine product were elevated for tenth graders (versus ninth graders, adjusted OR [aOR]: 2.08, 95% CI: 1.23–3.50), Hispanic participants (versus all other race and ethnicities except Asian, aOR: 2.58, 95% CI: 1.36–4.87), participants reporting a sexual minority identity (versus heterosexual, aOR: 1.63, 95% CI: 1.03–2.57), participants identifying as female or feminine (versus male or masculine, aOR: 1.92, 95% CI: 1.20–3.06), and transgender or nonbinary youth (versus male or masculine, aOR: 2.83, 95% CI: 1.29–6.19) (Table 2). Sociodemographic correlates were similar for past 6-month use of any non-tobacco oral nicotine product (Supplemental Table 4).

The prevalence of ever use of any non-tobacco oral nicotine product was greatest among dual ever users of combustible and noncombustible tobacco products (43.6%; prevalence difference [PD] versus never use: 42.8%, 95% CI: 29.7%–55.9%), followed by exclusive ever users of combustible tobacco (26.7%; PD versus never use: 25.8%, 95% CI: 3.4%–48.2%), and exclusive ever users of noncombustible tobacco products (22.2%; PD versus never use: 21.3%, 95% CI: 16.5%–26.2%) (Table 3). Among never users of either combustible or noncombustible tobacco, 0.85% had ever used any non-tobacco oral nicotine product. Compared to never users of combustible and noncombustible tobacco, aORs were 77.6 (95% CI: 39.7–152) for ever users of combustible tobacco, and 40.4 (95% CI: 24.3–67.0) for ever users of noncombustible tobacco products. Similar patterns were seen for past 6-month use of any non-tobacco oral nicotine product (Supplemental Table 4).

DISCUSSION

This study represents one of the first attempts to estimate the prevalence of flavored non-tobacco oral nicotine product use among adolescents in the United States. Among adolescents in ninth and tenth grades from Southern California, flavored non-tobacco oral nicotine products were the second most commonly used nicotine product, behind e-cigarettes. Hispanic ethnicity, female and gender minority identity, and sexual minority identity were associated with greater odds of use of nontobacco oral nicotine products among adolescents. Non-tobacco oral nicotine product use was greatest among adolescents

who had ever used both combustible and other noncombustible tobacco products, and prevalence was rare among never users of tobacco products. This is the first study to estimate the prevalence of a new subclass of nontherapeutic nontobacco oral nicotine products (ie, gum, lozenges, tablets, and gummies), and only the second to estimate the prevalence of non-tobacco nicotine pouch use among adolescents.⁷ Prevalence estimates in this regional cohort were low across all nicotine or tobacco products, resembling recent national trends^{12–14}; however, rates of nontherapeutic non-tobacco oral nicotine products in this sample, particularly for nicotine gum, lozenges, tablets, and/or gummies, were not negligible and were more common than almost all other nicotine products (with the exception of e-cigarettes).

Nontherapeutic non-tobacco nicotine gums, lozenges, tablets, and gummies have several attributes that might attract youth. For example, Krave, Lucy, Solace, and Rogue brand products are available in flavors such as “Cherry Bomb,” “Blue Raz,” “Fruit Medley,” and “Pomegranate” and resemble candies, which may create a sense of familiarity for youth. The act of putting a piece of gum or gummy in the mouth might feel intuitive and less risky for an adolescent, in contrast to nicotine or tobacco products that are inhaled or are packaged in pouches, both of which may seem foreign to youth with little experience using tobacco products. Importantly, oral nicotine products are discreet and easily concealed; without packaging, and in some cases, even with packaging, many products are indistinguishable from regular gum or candy, making them easy to hide from parents, teachers, or other authority figures. Many nontherapeutic oral nicotine products also have modern packaging designs that distinguish these products from traditional nicotine replacement therapy products (eg, Nicorette), and brands have engaged in digital media campaigns in which their oral nicotine products are marketed as a lower risk alternative to inhalable nicotine products.² Flavors, concealability, design, and digital marketing were all identified as important drivers behind the rise in youth use of JUUL e-cigarettes between 2015 and 2018¹⁵ and the subsequent rise in youth use of PuffBar and other disposable e-cigarettes.¹³ It is plausible that nontherapeutic flavored nicotine gums, lozenges, and gummies may take the place of other nicotine products in the coming years, given their unique features, similarity in marketing to other nicotine products that have gained rapid popularity in this age group, and apparent appeal to young people.

On the other hand, we found that the prevalence of nicotine pouch use, another type of non-tobacco oral nicotine product, was low (<1%) among adolescents in our sample, similar to a previous Dutch study.⁷ Non-tobacco nicotine pouches are placed in between the lip and gums and resemble Swedish style snus, but instead of shredded tobacco filling, the pouches contain microcrystalline cellulose with nicotine salt, flavors, sweeteners, and other additives.^{2,16,17} Although there is no previous estimate of nicotine pouch use prevalence in American youth, ever use estimates of snus has been low among previous national samples of United States adolescents^{13,18} and was low in the current cohort. It is possible that oral nicotine or tobacco products in pouch forms (whether as snus or nicotine pouches) are either less appealing or more difficult to access than other nicotine or tobacco products among adolescents in the United States. However, in contrast to mass-manufactured snus products, which are available only in mint variants, mass-marketed non-tobacco nicotine pouch brands such as Velo (British American Tobacco), On! (Altria), and Zyn (Swedish Match) come in

fruity flavors, such as “Citrus Burst.”² Given these characteristics and evidence of increasing marketing of nicotine pouches in the United States,^{1,2} national monitoring of non-tobacco nicotine pouch use in American youth is warranted.

Similar to research on other tobacco products,^{19–21} adolescents from disadvantaged populations appeared to be at greatest risk of having used non-tobacco oral nicotine products, including sexual and gender minority youth. Hispanic adolescents were at greater risk of having used oral nicotine products compared with those with other racial and ethnic identities. E-cigarette use is increasing among Hispanic populations,¹⁹ which may at least partially explain the differences by Hispanic ethnicity observed in this study given that oral nicotine use was highly correlated with a history of other noncombustible tobacco use. Additionally, previous studies demonstrate sexual identity disparities in adolescent use of cigarettes^{20,22–25} and e-cigarettes.^{26–29} However, very little data exists on gender identity disparities in tobacco product use among adolescents.^{30–32} Young people are increasingly identifying as gender nonbinary or nonconforming,³³ and it is critical to continue to monitor gender identity disparities in oral nicotine product use as well as other tobacco product use that may harm adolescent health.

Female adolescents were more likely than males to have used nontobacco oral nicotine products. Oral nicotine products are easily shareable and discrete, attributes which may appeal to adolescent females who tend to use nicotine for social reasons and are more likely than males to experience societal disapproval and stigma of substance use.^{34,35} Previous research also indicates that male youth are more likely than females to use tobacco products for the “nicotine rush.”³⁶ Nicotine absorption through mucous membranes that occurs from oral nicotine product use is slower than lung absorption,³⁷ potentially resulting in a less noticeable nicotine “buzz” than smoking or vaping.

As in previous studies in adult populations,^{1,7,38} we found that most adolescents who had ever used non-tobacco oral nicotine products had also used e-cigarettes or cigarettes, with the greatest prevalence among dual ever users of combustible and noncombustible tobacco products. However, it is not clear from our data whether non-tobacco oral nicotine products were initiated before or after initiation of e-cigarettes and combustible tobacco. Given that use of other noncombustible nicotine products such as e-cigarettes increases risk of subsequent initiation of combustible cigarette smoking³⁹ and cannabis use,⁴⁰ there is reason to be concerned about whether non-tobacco oral nicotine product use increases risk of using other harmful substances. Notably, <1% of adolescents who had never used other nicotine or tobacco products reported using any nontobacco oral nicotine products. It will be important to continue to monitor non-tobacco oral nicotine use to see whether prevalence among never tobacco users changes in the future.

This research is subject to some limitations. Although non-tobacco oral nicotine products were common in our sample relative to other nicotine products, the overall prevalence of nicotine and tobacco product use in this study was low. It was, therefore, necessary to collapse sociodemographic variables in analyses, which inhibited more granular examination of correlates by specific races or sexual and gender identities. Recruitment for this study took place from Fall 2020 to Fall 2021 amid the coronavirus disease 2019 pandemic.

As such, 22% of eligible students did not return parental or caregiver consent forms, 22% of parents or caregivers did not consent to participation, and 7% of students did not assent to participation; this could lead to selection bias if students who participated differ from those who did not participate with respect to demographics and nicotine product use behaviors. Additionally, these data were collected in Southern California which may limit generalizability of results to the national United States population; however, previous findings of adolescent tobacco use behaviors in similar California cohorts are highly concordant with findings from nationwide samples.^{41–44} Because of the cross-sectional nature of the data, we were unable to determine the temporal relationship between oral nicotine product use and e-cigarette and combustible tobacco use. All data were self-reported, and there may be misclassification of nicotine product use or sociodemographic factors. Use of traditional smokeless tobacco products and Food and Drug Administration-approved nicotine replacement therapy was not assessed here. Finally, nicotine gum, lozenges, tablets, and gummies were assessed in one single question, and we were unable to determine which of these oral nicotine products was most prevalent.

CONCLUSION

In this study of Southern California adolescents, flavored non-tobacco oral nicotine products were the second most widely-used nicotine product type and were disproportionately used by certain populations historically impacted by tobacco-related health disparities. Use of these products are not currently tracked in youth national surveillance surveys. Surveillance of non-tobacco oral nicotine product use among adolescents merits priority for national policies designed to protect pediatric populations and promote health equity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ABBREVIATIONS

aOR	adjusted odds ratio
CI	confidence interval
OR	odds ratio
PD	prevalence difference

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WHAT'S KNOWN ON THIS SUBJECT:

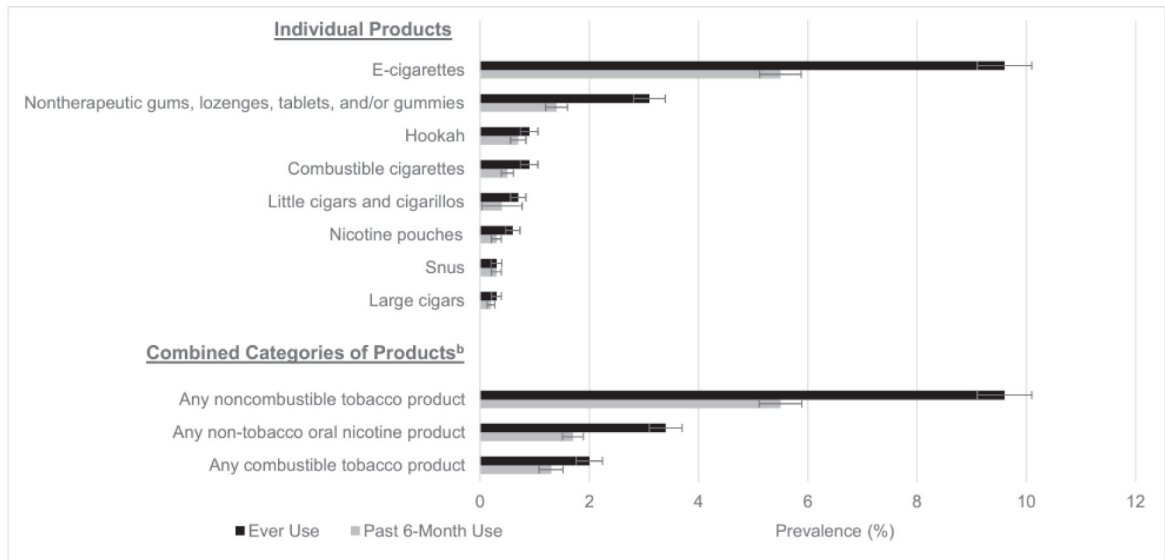
Non-tobacco oral nicotine products (eg, nicotine pouches, gum, lozenges, gummies) are increasingly marketed in the United States. It is unknown how common non-tobacco oral nicotine product use is among adolescents, and whether certain groups are at elevated risk of use.

WHAT THIS STUDY ADDS:

Flavored non-tobacco oral nicotine products were the second most prevalent nicotine product used by adolescents in Southern California. They were disproportionately used by certain racial and ethnic, sexual, or gender minority groups, and those with a history of nicotine use.



FIGURE 1. Examples of flavored non-tobacco oral nicotine products on the market. A, Nicotine pouches. B, Nontherapeutic nicotine gum. C, Nontherapeutic nicotine lozenges. D, Nicotine gummies.



^a Nicotine and tobacco products presented in descending order of frequency. Error bars represent standard error of prevalence estimates.

^b Any noncombustible tobacco product includes use of e-cigarettes or snus; any non-tobacco oral nicotine product includes use of nicotine pouches or nontherapeutic nicotine gums, lozenges, tablets, and/or gummies; any combustible tobacco product includes use of hookah, combustible cigarettes, little cigars or cigarillos, large cigars

FIGURE 2. Prevalence of ever and past 6-month use of 8 different nicotine and tobacco products among 3516 adolescents in Southern California between September and December 2021.^a

Sociodemographic Characteristics of 3516 Adolescents in Southern California Between September and December 2021

TABLE 1

Sociodemographic Characteristic	No. (%)
High school grade	
Ninth grade	1121 (31.9)
Tenth grade	2395 (68.1)
Race and ethnicity	
Hispanic	1663 (47.3)
Asian	1125 (32.0)
Multiple races	277 (7.9)
White	242 (6.9)
Black	47 (1.3)
Native Hawaiian or Pacific Islander	11 (0.31)
American Indian or Alaska Native	2 (0.06)
Another race	48 (1.4)
Missing	101 (2.9)
Highest parental education	
8th grade or less	81 (2.3)
Some high school	176 (5.0)
High school	449 (12.8)
Some college	459 (13.1)
College degree	1087 (30.9)
Advanced degree	766 (21.8)
Don't know	394 (11.2)
Missing	104 (3.0)
Perceived socioeconomic status	
Well-off	984 (28.0)
About average	1845 (52.5)
Struggling financially or in poverty	206 (5.9)
It varied	415 (11.8)
Missing	66 (1.9)

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Sociodemographic Characteristic	No. (%)
Sexual identity	
Heterosexual	2507 (71.3)
Bisexual	328 (9.3)
Questioning	163 (4.6)
Pansexual	107 (3.0)
Lesbian	56 (1.6)
Gay	41 (1.2)
Asexual	40 (1.1)
Queer	33 (0.94)
Another identity	42 (1.2)
Prefer not to disclose	145 (4.1)
Missing	54 (1.5)
Gender identity	
Female or feminine	1638 (46.6)
Male or masculine	1524 (43.3)
Gender variant or nonbinary	101 (2.9)
Transgender male	18 (0.51)
Transgender female	6 (0.17)
Another gender identity	57 (1.6)
Prefer not to disclose	128 (3.6)
Missing	44 (1.3)

TABLE 2

Sociodemographic Correlates of Ever Use of Any Non-Tobacco Oral Nicotine Product Among 3516 Adolescents in Southern California Between September and December 2021

Sociodemographic Factor	No. (%) Oral Nicotine Product Use ^a	Unadjusted Prevalence Difference (95% CI)	Unadjusted OR (95% CI) ^b	Adjusted OR (95% CI) ^{b,c}
High school grade				
Ninth grade	22 (2.0)	Ref.	Ref.	Ref.
Tenth grade	96 (4.0)	2.0 (0.9 to 3.2)	2.02 (1.24 to 3.32)	2.08 (1.23 to 3.50)
Race and ethnicity				
Hispanic	79 (4.7)	2.4 (0.9 to 3.9)	2.15 (1.25 to 3.70)	2.58 (1.36 to 4.87)
Asian	22 (2.0)	-0.3 (-1.0 to 1.7)	0.99 (0.50 to 1.98)	1.52 (0.71 to 3.25)
All other races ^d	17 (2.3)	Ref.	Ref.	Ref.
Parental education				
Less than high school	15 (5.8)	2.9 (-0.06 to 5.9)	2.06 (1.12 to 3.80)	1.64 (0.87 to 3.09)
High school	19 (4.2)	1.3 (-0.07 to 3.4)	1.41 (0.81 to 2.45)	1.23 (0.70 to 2.17)
Some college or college degree	45 (2.9)	Ref.	Ref.	Ref.
Advanced degree	20 (2.6)	-0.3 (-1.7 to 1.1)	0.93 (0.54 to 1.59)	1.09 (0.63 to 1.89)
Don't know	11 (2.8)	-0.1 (-2.0 to 1.7)	1.00 (0.51 to 1.95)	1.02 (0.51 to 2.04)
Subjective financial status				
Struggling or in poverty	14 (6.8)	3.7 (1.2 to 6.3)	2.27 (1.27 to 4.08)	1.76 (0.96 to 3.23)
Well-off, average, or varied	99 (3.1)	Ref.	Ref.	Ref.
Sexual identity				
Heterosexual	66 (2.6)	Ref.	Ref.	Ref.
Sexual minority ^e	44 (5.4)	2.8 (1.1 to 4.5)	2.13 (1.44 to 3.16)	1.63 (1.03 to 2.57)
Prefer not to disclose	5 (3.4)	0.8 (-2.2 to 3.9)	1.48 (0.58 to 3.76)	1.29 (0.49 to 3.44)
Gender identity				
Male or masculine	28 (1.8)	Ref.	Ref.	Ref.
Female or feminine	67 (4.1)	2.3 (1.1 to 3.4)	2.29 (1.46 to 3.58)	1.92 (1.20 to 3.06)
Transgender or nonbinary ^f	13 (7.1)	5.3 (1.5 to 9.1)	4.10 (2.08 to 8.10)	2.83 (1.29 to 6.19)
Prefer not to disclose	5 (3.9)	2.1 (-1.4 to 5.5)	2.31 (0.87 to 6.11)	1.69 (0.60 to 4.76)

Ref., reference; No., number.

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^a Use of nicotine pouches or nontherapeutic nicotine gums, lozenges, tablets, and/or gummies.

^b Estimate of association with ever versus never oral nicotine use from generalized linear mixed models accounting for clustering with schools.

^c Adjusted model includes all sociodemographic factors as simultaneous regressors.

^d All other races includes American Indian or Alaska Native, Asian, Black, Native Hawaiian or Pacific Islander, White, multiracial, another race.

^e Sexual minority identity includes asexual, bisexual, gay, lesbian, pansexual, queer, and questioning.

^f Transgender or nonbinary includes transgender male, transgender female, gender variant or nonbinary, another gender.

TABLE 3

Tobacco Product Correlates of Ever Use of Any Non-Tobacco Oral Nicotine Product Among 3516 Adolescents in Southern California Between September and December 2021

Tobacco Product Use History ^a	No. Participants	No. (%) Oral Nicotine Product Use ^b	Unadjusted Prevalence Difference (95% CI)	Unadjusted OR (95% CI) ^c	Adjusted OR (95% CI) ^{c,d}
Dual use combustible and noncombustible tobacco	55	24 (43.6)	42.8 (29.7 to 55.9)	89.9 (46.7 to 173)	90.1 (43.5 to 187)
Exclusive combustible tobacco ^e	15	4 (26.7)	25.8 (3.4 to 48.2)	42.2 (12.6 to 141)	45.3 (12.8 to 160)
Exclusive noncombustible tobacco	284	63 (22.2)	21.3 (16.5 to 26.2)	33.1 (20.7 to 53.0)	33.4 (19.8 to 56.5)
Never use	3162	27 (0.85)	Ref.	Ref.	Ref.
Any combustible tobacco	70	28 (40.0)	39.2 (27.7 to 50.6)	77.4 (42.1 to 143)	77.6 (39.7 to 152)
Never use	3162	27 (0.85)	Ref.	Ref.	Ref.
Any noncombustible tobacco	339	87 (25.7)	24.8 (20.2 to 29.5)	40.1 (25.5 to 62.9)	40.4 (24.3 to 67.0)
Never use	3162	27 (0.85)	Ref.	Ref.	Ref.

^a Combustible tobacco includes combustible cigarettes, hookah or waterpipe, little cigars or cigarillos, big cigars. Noncombustible tobacco includes e-cigarettes and snus. Never use includes participants who never used combustible and noncombustible tobacco.

^b Use of nicotine pouches or nontherapeutic nicotine gums, lozenges, tablets, and/or gummies

^c Estimate of association with ever versus never oral nicotine use from generalized linear mixed models accounting for clustering with schools.

^d Adjusted model includes tobacco product use history and all sociodemographic factors from Table 2.

^e Regression estimates should be interpreted with caution due to events <5 among exclusive combustible tobacco users.