

Sexual and Gender Identity Disparities in Nicotine and Tobacco Use Susceptibility and Prevalence: Disaggregating Emerging Identities Among Adolescents from California, USA

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ABSTRACT

Background: Prior studies report nicotine/tobacco use disparities for sexual and gender minority (SGM) youth, but have insufficiently characterized SGM identity diversity.

Methods: Adolescents (mean age=15.2) from 11 high schools in Southern California completed surveys in Fall 2021. Ever use of combustible (cigarettes, cigars, hookah) and noncombustible (e-cigarettes, e-hookah, heated tobacco, smokeless/snus, oral nicotine) nicotine/tobacco (among overall sample, n=3,795) and susceptibility to future initiation of cigarettes, e-cigarettes, and flavored non-tobacco oral nicotine (among n=3,331 tobacco-naïve youth) were compared across four gender (male/masculine, female/feminine, transgender male/female, non-binary) and seven sexual (heterosexual, bisexual, pansexual, queer, questioning, gay/lesbian, asexual) identities.

Results: Non-binary (vs. cisgender male) youth had greater prevalence of ever combustible (Prevalence Ratio[PR]=2.86, 95%CI: 1.76-4.66) and non-combustible (PR=1.94, 95%CI: 1.31-2.86) nicotine/tobacco use, and susceptibility to future nicotine/tobacco initiation (PR range=2.32-2.68). Transgender (vs. cisgender male) youth had greater susceptibility to nicotine/tobacco use (PR range=1.73-1.95), but not greater tobacco use prevalence. There was greater prevalence of non-combustible nicotine/tobacco use (PR range=1.78-1.97) and susceptibility to nicotine/tobacco initiation (PR range=1.36-2.18) for all sexual minority (vs. heterosexual) identities, except for asexual. Bisexual (PR=2.03, 95%CI: 1.30-3.16) and queer (PR=2.87, 95%CI:1.31-6.27) youth had higher ever combustible tobacco use than heterosexual youth. Questioning (vs. heterosexual) youth were more susceptible to future tobacco initiation (PR range=1.36-2.05) but did not differ in ever use.

Conclusions: Disparities in nicotine/tobacco use and susceptibility were present with similar effect sizes across most, but not all, SGM identities. Inclusive measurement of SGM identities in research and surveillance may inform more precise tobacco control efforts to reduce disparities.

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IMPLICATIONS

Among high school students from Southern California with substantial diversity in sexual and gender identities, there was greater prevalence of tobacco use and susceptibility to future tobacco initiation for most, but not all, sexual and gender minority youth, including those with emerging sexual and gender identities such as non-binary, queer and pansexual. Additionally, findings indicate that tobacco control initiatives targeting youth who are questioning their sexual identities may be particularly important for preventing tobacco use initiation. This study reinforces the importance of measuring diversity within the LGBTQ+ community for tobacco use research, and highlights how inclusive measurement can inform more precise tobacco control interventions.

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INTRODUCTION

Significant tobacco-use disparities exist for sexual and gender minority (SGM) youth. According to United States (US) national data, youth identifying with any sexual minority identity have 3-4 times the risk of using cigarettes, e-cigarettes, and smokeless tobacco compared to heterosexual youth.¹⁻⁵ Evidence on gender minority disparities in adolescent tobacco use is more limited. However, data from the national Population Assessment of Tobacco and Health (PATH) study shows prevalence of tobacco use for transgender youth is about 2-3 times that of cisgender youth.¹ Adolescent onset of nicotine/tobacco use is associated with greater risk of chronic, persistent, and dependent patterns of nicotine/tobacco use into adulthood,⁶ and SGM youth are more likely to transition to regular and frequent nicotine/tobacco use in adulthood.^{7,8} The proportion of youth identifying as SGM is increasing⁹⁻¹¹, reinforcing the importance of LGBTQ+ youth as a priority population in tobacco control.

Substantial variation exists in sexual and gender identities that is often not captured in US nicotine/tobacco research. Prior studies either have not measured the wide range of SGM identities that exist, or studies collapse or dichotomize sexual/gender minority identities due to a limited sample size of SGM youth. For example, tobacco use among gender minority youth who do not identify as transgender remains understudied,^{12,13} despite a substantial proportion of SGM individuals identifying as non-binary or other nonconforming identities (i.e., an individual's gender differs from their sex assigned at birth, but does not conform to binary male/female gender identities).¹⁴⁻¹⁶ US National surveys such as the Youth Risk Behavior Survey and National Youth Tobacco Survey assess transgender identification, but do not include measures for non-binary identities.^{17,18} The US PATH study includes measures for transgender and gender nonconforming identities in their youth surveys, but the total number of youth identifying as either transgender *or* non-binary is small (<100).¹ Most US national surveys similarly do not measure emerging but increasingly common sexual identities such as pansexual, queer, and asexual.^{17,18} Prior work has demonstrated important variation in tobacco use between LGBTQ+ identities. For example, prevalence is often highest among bisexual individuals

compared to other sexual minority identities.^{3,19–22} Additionally, sexual minority and gender minority youth face different and unique stressors, and yet little research exists on the intersection of sexual and gender minority identities and nicotine/tobacco use. Recruiting diverse samples and improving measurement of LGBTQ+ identities can help to inform a more complete picture of tobacco use in this population to better inform interventions and policies to reduce SGM tobacco disparities.²³

The current study analyzes data from a youth cohort in Southern California with detailed measures of sexual and gender identity and substantial diversity in SGM identities. The aims of the study were to examine disparities in prevalence of nicotine/tobacco use by gender identity (Aim 1a) and sexual identity (Aim 1b), as well as disparities in susceptibility to tobacco products among tobacco naïve youth by gender identity (Aim 2a) and sexual identity (Aim 2b), with a focus on describing tobacco use outcomes among youth with understudied sexual and gender identities. We additionally examine disparities in nicotine/tobacco use prevalence and susceptibility by the intersection of gender and sexual identity (Aim 3).

METHODS

Data Source and Sample

This study is a cross-sectional analysis of ADVANCE, an ongoing prospective cohort study of behavioral health among students enrolled in 11 Southern California high schools. All 9th grade students (typically ages 14-15 years) enrolled at the partnering schools were eligible to participate. Recruitment and enrollment of two 9th grade cohorts occurred in the Fall of 2020 (class of 2024 [i.e., graduating in 2024 after four total years of high school]), and the Fall of 2021 (class of 2025). Data for the current study were collected between September 30-December 14, 2021, when students were in 9th grade (class of 2025) or 10th grade (class of 2024). Recruitment and data collection procedures were described in detail previously.²⁴ A total of 4,203 participants were enrolled and 3,795 students (9th grade n=1,173; 10th grade n=2,612) took the Fall 2021 survey and were eligible for the analysis (90% participant rate). We obtained parental consent and student assent from all participants. This study was approved by the University of Southern California Institutional Review Board.

We focused on two primary analytic samples. We assessed tobacco use prevalence among the full sample of 3,795 students. To assess tobacco-use susceptibility, we restricted the sample to 3,331 tobacco naïve participants who reported never using any tobacco products (i.e., cigarettes, e-cigarettes, hookah, e-hookah, cigars, oral nicotine products, heated tobacco, smokeless/snus) at the time of the survey.

Measures

Gender Identity and Sexual identity

Participants reported their sex assigned at birth (male, female, prefer not to disclose), and gender identity (male/masculine, female/feminine, transgender male, transgender female, gender variant/non-binary, additional/other gender identity [fill in response], or prefer not to disclose). Sex and gender were measured separately, permitting a “two-step” approach to characterizing gender identity following US federal guidelines;²⁵ any participant with a discordant sex assigned at birth and current gender identity (e.g., male sex and female/feminine gender identity) were classified as transgender. Participants also completed a survey item assessing sexual identity (heterosexual, asexual, bisexual, gay, lesbian, pansexual, queer, questioning or unsure, another identity [fill in response], prefer not to disclose).

For descriptive analyses, we reported detailed non-collapsed frequencies of sexual and gender identities. We collapsed some categories that represent similar identity constructs due to small cell sizes of tobacco use outcomes. We combined transgender male and transgender female categories into a single transgender category. We combined gender variant/non-binary and additional/other gender identity into a single non-binary gender category, as most write-in responses for ‘another gender identity’ included non-conforming identities such as ‘genderfluid’ and ‘genderqueer’.

We combined queer and additional/other sexual identity into a single category. Queer is often used as an umbrella term for non-heterosexual identities that do not conform to monosexual identities like lesbian or gay,

or to bisexual identity; many of the write-in responses for ‘another sexual identity’ included identities such as “demisexual” and “omnisexual” that also do not conform to monosexual or bisexual identity categories. While we did not have a sufficiently large sample size to disaggregate queer and other identities, we were able to disaggregate pansexual identities, which is an increasingly common term used among young people.²⁶ Finally, we collapsed gay and lesbian into a single category.

Our primary analyses examine main effects of gender identity and sexual identity separately. For a secondary analysis, we additionally created a combined variable to capture the intersection of gender and sexual identity. We first trichotomized gender identity (gender minority, cisgender, prefer not to disclose) and sexual identity (sexual minority, heterosexual, prefer not to disclose). We then created a single five-category variable based on combinations of sexual and gender identity (gender minority and sexual minority, gender minority and heterosexual, cisgender and sexual minority, cisgender and heterosexual, and sexual identity or gender identity not disclosed).

Tobacco use

Participants reported whether they ever used eight tobacco products, including cigarettes (even one puff), cigars/cigarillos, hookah, e-cigarettes, e-hookahs, flavored oral nicotine products (e.g., nicotine pouches, flavored nicotine gum, lozenges, tablets, and/or gummies), smokeless/snus, and heated tobacco (e.g., IQOS). We assessed prevalence of having ever used combustible tobacco (cigarettes, cigars, or hookah), and having ever used non-combustible tobacco (e-cigarettes, e-hookah, oral nicotine, smokeless/snus, or heated tobacco). Due to low tobacco use prevalence, we did not examine current (i.e., past 30-day) nicotine/tobacco use, or examine individual products separately.

Tobacco use susceptibility

Tobacco use susceptibility is a validated measure of risk for future initiation of tobacco products.²⁷ There was higher prevalence of susceptibility than ever tobacco use outcomes, and thus we assessed susceptibility separately for cigarettes, e-cigarettes, and flavored non-tobacco oral nicotine products. For each product, participants who never used that product were asked three questions to assess susceptibility, including whether (1) they would use the product in the next year, (2) they are curious about using the product, and (3) they might try the product if offered by their friend. Response options were definitely not, probably not, probably yes, and definitely yes. As in prior research, participants who responded with anything other than “definitely not” for any of the three questions were considered susceptible to future initiation of that tobacco product.^{27–29}

Covariates

Additional sociodemographic characteristics included race/ethnicity (Hispanic, Non-Hispanic Asian, Non-Hispanic White, Non-Hispanic Multiracial, Non-Hispanic all other races [American Indian/Alaska Native, Black/African American, Native Hawaiian/Pacific Islander, another race were assessed separately and collapsed in analysis]), highest level of parental education (less than high school [8th grade or less], high school graduate, some college or greater [some college, college graduate, advanced degree], don’t know), and perceived family financial status (well-off, about average, financially struggling or in poverty, it varied). Details on all survey items are presented in Supplemental Table 1.

Analysis

We examined the distribution (frequency/percentage) of sexual and gender identities and tobacco use outcomes. We then fit log-binomial models to produce prevalence ratios (PR) and 95% confidence intervals (CI) for the association of sexual identities (vs. heterosexual) and gender identities (vs. cisgender male/masculine) with each tobacco ever-use outcome (among the full sample of 3,795 youth) (Aims 1a-b), and each tobacco use

susceptibility outcome (among 3,331 youth who had never used any tobacco product) (Aims 2a-b). When log-binomial models did not converge, Poisson models were used.³⁰ For all models, we present unadjusted and adjusted (for sociodemographic covariates) estimates. In analyses of the intersection of gender and sexual identity (Aim 3), we ran separate models with two reference groups (cisgender and heterosexual, and cisgender and sexual minority youth).

Participants with missing sexual identity (3.3%) or gender identity data (2.9%) were included in the analyses but maintained as a separate “missing” category to avoid overestimating prevalence within groups. We used multiple imputation (full conditional specification [FCS] method)³¹ with 10 imputed datasets to account for missing data on covariates (3.1-13.7%), ever use of combustible (1.5%) and non-combustible tobacco (1.9%), and susceptibility to cigarettes (4.2%), e-cigarettes (11.4%), and oral nicotine products (3.5%).

RESULTS

In our sample of 3,795 9th and 10th graders (mean age=15.2 years), most participants were Hispanic (50.0%) or Asian (32.4%); 55% perceived their family’s financial status as about average, and a majority (76%) had parents or caregivers with at least some college education or higher (Table 1). For gender identity, 45.9% identified as female/feminine, 42.4% as male/masculine, 3.3% as non-binary or another non-conforming identity, 1.4% as transgender, and 2.4% preferred not to disclose their gender identity. For sexual identity, 70.1% identified as heterosexual, 9.0% as bisexual, 4.5% as questioning, 3.0% as pansexual, 2.7% as gay or lesbian, 2.1% as queer or another non-heterosexual identity, 1.2% as asexual, and 4.0% preferred not to disclose their sexual Identity.

Aim 1: Tobacco Use Prevalence

Aim 1a: Gender identity

In the total sample, prevalence of ever use was 4.3% (n=164) for combustible tobacco and 11.4% (n=433) for non-combustible tobacco. In adjusted models, non-binary youth had greater prevalence of ever using combustible (PR=2.86, 95%CI: 1.76-4.66) and non-combustible tobacco (PR=1.94, 95%CI: 1.31-2.86) relative to male/masculine youth (Table 2). Prevalence was slightly higher for transgender (vs. male/masculine) youth for non-combustible tobacco use (13.2% vs. 7.3%), however confidence intervals were imprecise and included a wide range of values, including one (PR=1.45, 95%CI: 0.67-3.13). One transgender participant (1.9%) had ever used combustible tobacco. Cisgender female/feminine (vs. male/masculine) youth had greater prevalence of having ever used non-combustible tobacco (PR=1.66, 95%CI: 1.33-2.08), but not combustible tobacco (PR=0.82, 95%CI: 0.56-1.19). Youth who preferred not to disclose their gender identity (vs. male/masculine youth) reported greater prevalence of combustible tobacco, though confidence intervals included one (PR=2.00, 95%CI: 0.90-4.42). Youth with missing gender identity had the highest prevalence of both combustible (17.3%) and non-combustible tobacco (37.3%).

Aim 1b: Sexual identity

Compared to heterosexual youth, participants identifying as bisexual (PR=1.97, 95%CI: 1.51-2.58), gay or lesbian (PR=1.79, 95%CI: 1.13-2.83), pansexual (PR=1.91, 95%CI: 1.25-2.91), and queer/other identities (1.78, 95%CI: 1.01-3.13) had greater prevalence of ever using non-combustible tobacco (Table 2). There was a higher prevalence of combustible tobacco use for youth identifying as bisexual (PR=2.03, 95%CI: 1.30-3.16) and queer/other identities (OR=2.87, 95%CI: 1.31-6.27). Though combustible tobacco use prevalence was greater among pansexual (6.3%) and gay/lesbian youth (8.7%) (versus heterosexual, 3.3%), adjusted PR confidence intervals were consistent with a range of associations, including none. Asexual youth did not have elevated prevalence of combustible (no events) or non-combustible (8.5% vs. 9.1% among heterosexual) tobacco use.

Additionally, youth who were questioning their sexual identities did not have greater prevalence of having ever used combustible (PR=1.36, 95%CI: 0.62-2.95) or non-combustible (PR=0.98, 95%CI: 0.57-1.68) tobacco.

Youth who preferred not to disclose their sexual identity did not have higher tobacco use prevalence than heterosexual youth, but youth with missing sexual identity had higher prevalence of both combustible and non-combustible tobacco.

Aim 2: Tobacco Use Susceptibility

Aim 2a: Gender identity

Among 3,331 youth who had never used any tobacco products, 14.6% (n=489) were susceptible to future cigarette smoking, 19.5% (n=650) to future e-cigarette use, and 15.3% (n=511) to future oral nicotine product use. Non-binary youth had the greatest susceptibility to future initiation of cigarettes, e-cigarettes, and oral nicotine (32.3%, 39.4%, 32.3%, respectively), followed by transgender youth (23.9%, 30.4%, 23.9%), female/feminine youth (15.6%, 22.0%, 16.0%), with the lowest susceptibility among male/masculine youth (11.3%, 14.8%, 12.9%) (Table 3). In adjusted models, non-binary youth had more than twice the risk compared to male/masculine youth of susceptibility to future cigarette initiation (PR=2.68, 95%CI: 2.04-3.51), e-cigarette initiation (OR=2.41, 95%CI: 1.92-3.04) and oral nicotine product initiation (2.32, 95%CI: 1.78-3.04). Transgender youth had approximately twice the risk (versus male/masculine youth) of susceptibility to all three products (PR range=1.73-1.95). Cisgender female (vs. male/masculine) youth also had elevated susceptibility to all three products (PR range=1.23-1.46). Youth who preferred not to disclose their gender identity had greater susceptibility to cigarettes (PR=1.89, 95%CI: 1.21-2.94), but not oral nicotine or e-cigarettes.

Aim 2b: Sexual identity

Among tobacco-naïve youth, participants with most sexual minority identities (vs. heterosexual) had greater susceptibility to future initiation of cigarettes (adjusted PR range=1.98-2.18), e-cigarettes (PR range=1.36-1.62), and oral nicotine products (PR range=1.62-1.82) (Table 4). There were few differences in susceptibility PRs between sexual minority identity groups. One exception was for youth identifying as asexual, who did not have higher susceptibility to future initiation of any product compared to heterosexual youth. Youth who preferred not to disclose their sexual identity (vs. heterosexual youth) did not have elevated susceptibility to any product.

Aim 3: Intersection of Sexual and Gender Identity

Examining combined categories of sexual and gender identity, 5.7% (n=218) of youth identified with a gender minority and sexual minority identity, 0.6% (n=22) with a gender minority and heterosexual identity, 15.9% (n=603) with a cisgender and sexual minority identity, 68.9% (n=2,613) as cisgender and heterosexual, and 5.4% preferred not to disclose their gender or sexual identity (n=206). Prevalence of most susceptibility and ever-use outcomes was greater for youth who identified as both gender minority and sexual minority than cisgender sexual minority youth (Supplemental Tables 2-3). For example, youth identifying with a gender minority and sexual minority identity had greater susceptibility to future initiation of cigarettes (PR=1.39, 95%CI: 1.06-1.82), e-cigarettes (PR=1.51, 95%CI: 1.19-1.92), and oral nicotine (PR=1.51, 95%CI: 1.19-1.92), and ever use of combustible tobacco (PR=1.79, 95%CI: 1.03-3.14) than cisgender sexual minority youth. Prevalence of non-combustible tobacco use was similar for gender minority youth with a sexual minority identity (17.0%) and cisgender youth with a sexual minority identity (17.2%). Estimates were imprecise for gender minority youth with heterosexual identities due to small cell sizes. However, prevalence estimates indicated that compared to cisgender youth with heterosexual identities, gender minority youth with heterosexual identities had higher prevalence of ever use of combustible tobacco, and greater susceptibility to e-cigarettes and oral nicotine.

DISCUSSION

In this diverse sample of 9th and 10th grade students from Southern California, participants reported substantial variation in sexual and gender identities. The most common sexual minority identity reported was bisexual, followed by questioning, and pansexual. Nearly 7% of youth identified as transgender or with a non-binary/non-conforming gender identity. Compared to heterosexual and cisgender youth, there was generally a greater prevalence of tobacco use and susceptibility to future tobacco initiation for all sexual and gender minority youth except for asexual youth. There was also a greater risk of susceptibility to tobacco use and prevalence of non-combustible tobacco use for cisgender female versus male youth. Youth who were questioning their sexual identities were susceptible to future tobacco initiation but did not have a greater prevalence of tobacco use. Youth who identified with both a gender minority and sexual minority identity had a greater risk for susceptibility to future tobacco use and ever use of combustible tobacco than cisgender sexual minority youth.

Findings align with prior national studies showing elevated tobacco use prevalence among SGM youth.^{1,2,21,32–34} Our work extends the prior literature by examining disparities in a sample of youth identifying with a wide range of sexual and gender identities and including measures of novel tobacco products such as flavored oral nicotine (which is gaining popularity among youth).^{24,29} Among sexual minority youth in our sample, 48% reported an identity that is generally not measured in US national surveys (e.g., pansexual, queer, questioning, asexual, other non-heterosexual identities). Additionally, among gender minority youth in our sample, 78.5% reported identifying as non-binary, which is also often not measured in national surveys. Our findings highlight that youth identify with a wide range of sexual and gender identities. Including diverse measures of identities in tobacco use surveys may help to avoid misclassification of identities and biased estimates of tobacco use disparities. For example, the 2016 asexual community survey report demonstrated that if participants are shown a limited set of identity options in a survey (e.g., straight, gay, bisexual), 45% of asexual individuals would select bisexual as their identity and 45% of questioning individuals would select heterosexual.³⁰

In this study, tobacco use prevalence was similar across many sexual minority identities. For example, prevalence of combustible tobacco use differed by <2% between youth identifying as bisexual, gay/lesbian, pansexual, and queer/other identities. This is inconsistent with prior research often showing a higher prevalence of tobacco use among bisexual compared to other sexual minority youth populations.^{17,31} It is possible that we were underpowered to detect differences between identity groups, or that greater differences may emerge in later adolescence.³⁵ Prevalence for all tobacco-use outcomes tended to be slightly higher for non-binary than transgender youth (though confidence intervals overlapped in all estimates). For example, youth identifying as non-binary, but not transgender, had an elevated risk of having ever smoked combustible cigarettes compared to cisgender male youth. Studies comparing tobacco use disparities between gender minority groups are rare and evidence is mixed, and none (to our knowledge) examine alternative nicotine products (e.g., e-cigarettes, oral nicotine).¹³ Some studies report greater cigarette smoking risk for non-binary versus transgender participants,^{14,36} while others find greater smoking risk for transgender versus non-binary individuals.³⁷ More research is needed to understand differences in tobacco use behaviors and underlying mechanisms between gender minority youth with binary versus non-binary identities.

Asexual youth did not have greater prevalence of tobacco use or susceptibility to future tobacco initiation relative to heterosexual participants. Prior studies have shown that adults with asexual attractions (i.e., no sexual attraction to others) have similar or lower prevalence of substance use relative to heterosexual adults.³⁸⁻⁴⁰ A study by Wheldon et al. using data from the LGBTQ National Teen Survey found lower cigarette smoking prevalence for asexual youth compared to all other sexual identities, including heterosexual youth.³³ Potential explanations for lower substance use among asexual individuals include (but are not necessarily limited to) distinct experiences of anti-asexual discrimination leading to different coping mechanisms relative to other LGBTQ+ groups, and different social gathering spaces for asexual versus other LGBTQ+ groups (e.g., online versus in-person gatherings centered on drug and alcohol use).³⁹ It is also possible that asexual youth in our sample may develop sexual attractions later in life; their lack of sexual attraction may be indicative of slower maturation (i.e., “late bloomers”) in which they are not yet thinking about sex or tobacco use.

Youth who were questioning their identities had greater susceptibility to future initiation of tobacco but did not have greater prevalence of having ever used tobacco products. Youth questioning their sexual identity may be in an intermediate (and transitory) stage of identity development, and this study's finding aligns with prior work demonstrating that risk for tobacco use initiation increases for youth who have recently changed their sexual identities.^{34,41} For example, in a sample of youth and young adults, we previously showed that participants who identified as heterosexual at baseline and as sexual minority over follow-up had similar baseline levels of substance use relative to consistently heterosexual youth; however this group had greater risk of having initiated smoking at follow-up (after coming out).³⁴ Tobacco-use interventions that target youth who are questioning their sexual identities may offer a rare and time-sensitive opportunity for primary prevention of initiation.

Youth who identified with both a gender minority and a sexual minority identity had greater prevalence of tobacco use susceptibility and initiation of combustible tobacco than cisgender youth with a sexual minority identity. Youth with both sexual and gender minority identities may experience compounded stressors, including homophobic and transphobic discrimination, potentially leading to tobacco use as a coping mechanism. This is supported by prior studies showing levels of mental health problems and distress are greater for youth identifying with both sexual and gender minority identities compared to cisgender sexual minority youth.^{1,26,42-44} Other explanations may be related to normalization of tobacco use within SGM social groups,^{45,46} in which SGM youth may use tobacco as a form of establishing their identity. Sexual minority youth with transgender or non-binary gender identities may warrant further attention as a priority population in tobacco control efforts.

This study has limitations. The analysis was cross-sectional; future work will incorporate multiple data waves to examine tobacco use behaviors over time. Despite a diverse sample, there were small sample sizes for several SGM identities, reducing precision and the ability to directly compare prevalence between SGM groups, or other intersectional identities (i.e., by race/ethnicity). Similarly, low prevalence of tobacco use limited our ability to examine current tobacco use or tobacco frequency/intensity measures. We also collapsed all

combustible (cigarettes, cigars, hookah) and non-combustible tobacco products (e-cigarettes, e-hookah, smokeless/snus, heated tobacco, oral nicotine) and several SGM identity groups due to small cells. Additionally, prevalence of SGM identities in our sample (7% gender minority and 27% sexual minority) is higher than US national estimates (1.4% and 9.5%, respectively)^{47,48} and results from this Southern California sample may not generalize to the broader US population or globally outside of the US.

This work reinforces the importance of measuring diversity within the LGBTQ+ community for tobacco use research. In our sample of 9th and 10th graders from Southern California, youth identified with a wide range of sexual and gender identities, and tobacco use susceptibility and prevalence differed across several SGM groups. All SGM youth (except for asexual youth) had elevated risk for future or ever use of several different tobacco products, with the greatest risk observed for youth with both gender minority and sexual minority identities. Tobacco control initiatives that target youth who are questioning their identities may be particularly important for preventing tobacco use initiation. Inclusive measurement of a wide range of sexual and gender identities in research and surveillance may inform more precise tobacco control interventions, including education campaigns or programmatic efforts to reduce SGM tobacco disparities.

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DECLARATION OF INTEREST

Authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data are available upon reasonable request by contacting the corresponding author.

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Table 1. Sociodemographic characteristics of 3,795 9th and 10th graders from Southern California, September-December 2021

Characteristic	N	%
Gender Identity		
Male/masculine	1608	42.4
Female/feminine	1741	45.9
Non-binary, another gender ^a	193	5.1
Transgender ^b	53	1.4
Prefer not to disclose gender identity	90	2.4
Missing	110	2.9
Sexual Identity		
Heterosexual	2662	70.1
Bisexual	343	9.0
Pansexual	112	3.0
Gay or lesbian	103	2.7
Queer or another identity ^c	80	2.1
Asexual	47	1.2
Questioning	172	4.5
Prefer not to disclose sexual identity	151	4.0
Missing	125	3.3
Race/Ethnicity		
Hispanic	1898	50.0
Non-Hispanic Asian	1228	32.4
Non-Hispanic White	312	8.2
Non-Hispanic Multiracial	187	4.9
Non-Hispanic all other races	170	4.5
Family Financial status		
Well off	1012	26.7
About average	2067	54.5
Financially struggling or poverty	242	6.4
It varied	474	12.5
Parental Education		
8th grade or less	115	3.0
Some high school	222	5.8
High school graduate	584	15.4
Some college	605	15.9
College graduate	1335	35.2
Advanced degree	934	24.6
^a Includes 127 non-binary youth and 66 youth with another non-conforming identity.		
^b includes 39 transgender male and 14 transgender female youth		
^c Includes 36 queer youth and 44 youth with other sexual minority identities.		

Table 2. Gender and Sexual Identity and Prevalence of Ever Use of Tobacco Products among Full Sample (n=3,795)

Tobacco Product Category	Sexual/gender identity	N (%) ^a	Unadjusted	Adjusted ^b
			PR (95%CI)	PR (95%CI)
	Gender Identity			
Combustible Tobacco^c	Male/masculine	58 (3.6)	REF	REF
	Female/feminine	54 (3.1)	0.90 (0.61, 1.31)	0.82 (0.56, 1.21)
	Non-binary	25 (13.0)	3.59 (2.23, 5.80)	2.86 (1.76, 4.66)
	Transgender	1 (1.9)	-	-
	Prefer not to disclose	7 (7.8)	2.24 (1.02, 4.92)	2.00 (0.90, 4.42)
	Missing	19 (17.3)	5.00 (2.96, 8.42)	3.70 (2.16, 6.34)
Non-Combustible Tobacco^d	Male/masculine	118 (7.3)	REF	REF
	Female/feminine	226 (13.0)	1.77 (1.42, 2.22)	1.66 (1.33, 2.08)
	Non-binary	33 (17.1)	2.34 (1.59, 3.44)	1.94 (1.31, 2.86)
	Transgender	7 (13.2)	1.83 (0.85, 3.92)	1.45 (0.67, 3.13)
	Prefer not to disclose	8 (8.9)	1.22 (0.59, 2.49)	1.17 (0.57, 2.40)
	Missing	41 (37.3)	5.11 (3.58, 7.29)	3.96 (2.75, 5.69)
	Sexual Identity			
Combustible Tobacco^c	Heterosexual	88 (3.3)	REF	REF
	Asexual	0 (0.0)	-	-
	Bisexual	26 (7.6)	2.39 (1.54, 3.71)	2.03 (1.30, 3.16)
	Gay or lesbian	9 (8.7)	2.44 (1.18, 5.03)	1.98 (0.95, 4.12)
	Pansexual	7 (6.3)	1.94 (0.90, 4.20)	1.52 (0.70, 3.30)
	Queer/another identity	7 (8.8)	2.79 (1.29, 6.04)	2.87 (1.31, 6.27)
	Questioning	7 (4.1)	1.26 (0.58, 2.73)	1.36 (0.62, 2.95)
	Prefer not to disclose	4 (2.6)	-	-
	Missing	16 (12.8)	4.00 (2.34, 6.83)	3.41 (1.98, 5.90)
Non-Combustible Tobacco^d	Heterosexual	241 (9.1)	REF	REF
	Asexual	4 (8.5)	-	-
	Bisexual	71 (20.7)	2.30 (1.76, 3.00)	1.97 (1.51, 2.58)
	Gay or lesbian	20 (19.4)	2.15 (1.36, 3.40)	1.79 (1.13, 2.83)
	Pansexual	24 (21.4)	2.37 (1.56, 3.61)	1.91 (1.25, 2.91)
	Queer/another identity	13 (16.3)	1.80 (1.03, 3.15)	1.78 (1.01, 3.13)
	Questioning	14 (8.1)	0.90 (0.53, 1.55)	0.98 (0.57, 1.68)
	Prefer not to disclose	9 (6.0)	0.66 (0.34, 1.29)	0.72 (0.37, 1.39)
	Missing	37 (29.6)	3.29 (2.33, 4.65)	2.82 (1.98, 4.02)

PR=prevalence ratio.

PRs suppressed for outcome N<5.

^aN(%)ever nicotine/tobacco use from first imputation^bAdjusted for race/ethnicity, parental education, and family financial status^cIncludes cigarettes, cigars/cigarillos, hookah^dIncludes e-cigarettes, e-hookah, smokless/snus, heated tobacco, and flavored oral nicotine

Table 3. Gender Identity and Susceptibility to Future Initiation of Tobacco Products among Tobacco Naïve Youth (n=3,331)

			Unadjusted	Adjusted
Tobacco Product	Gender Identity	N (%)^a	PR (95%CI)	PR (95%CI)
Cigarettes	Male/masculine	166 (11.3)	REF	REF
	Female/feminine	235 (15.6)	1.39 (1.15, 1.67)	1.38 (1.15, 1.66)
	Non-binary	50 (32.3)	2.86 (2.18, 3.74)	2.68 (2.04, 3.51)
	Transgender	11 (23.9)	2.12 (1.24, 3.64)	1.95 (1.14, 3.35)
	Prefer not to disclose	18 (22.8)	1.94 (1.24, 3.03)	1.89 (1.21, 2.94)
	Missing	9 (13.0)	1.02 (0.50, 2.07)	0.97 (0.48, 1.96)
E-cigarettes	Male/masculine	219 (14.8)	REF	REF
	Female/feminine	331 (22.0)	1.48 (1.27, 1.73)	1.46 (1.25, 1.70)
	Non-binary	61 (39.4)	2.71 (2.16, 3.40)	2.41 (1.92, 3.04)
	Transgender	14 (30.4)	2.04 (1.29, 3.22)	1.88 (1.20, 2.96)
	Prefer not to disclose	11 (13.9)	0.88 (0.48, 1.58)	0.86 (0.48, 1.55)
	Missing	14 (20.3)	1.27 (0.75, 2.14)	1.18 (0.71, 1.98)
Oral Nicotine	Male/masculine	191 (12.9)	REF	REF
	Female/feminine	241 (16.0)	1.24 (1.04, 1.48)	1.23 (1.03, 1.47)
	Non-binary	50 (32.3)	2.53 (1.95, 3.29)	2.32 (1.78, 3.04)
	Transgender	11 (23.9)	1.86 (1.09, 3.17)	1.73 (1.02, 2.95)
	Prefer not to disclose	11 (13.9)	1.01 (0.56, 1.83)	0.96 (0.53, 1.75)
	Missing	7 (10.1)	0.67 (0.29, 1.54)	0.63 (0.28, 1.45)

PR=prevalence ratio.

^aN(%) susceptible from first imputation^bAdjusted for race/ethnicity, parental education, and family financial status

Table 4. Sexual Identity and Susceptibility to Future Initiation of Tobacco Products among Tobacco Naïve Youth (n=3,331)

Tobacco Product	Sexual Identity	N (%)^a	Unadjusted PR (95%CI)	Adjusted PR (95%CI)
Cigarettes	Heterosexual	281 (11.7)	REF	REF
	Asexual	5 (11.6)	1.00 (0.43, 2.29)	0.97 (0.42, 2.23)
	Bisexual	73 (27.4)	2.33 (1.86, 2.93)	2.18 (1.74, 2.74)
	Gay or lesbian	21 (26.3)	2.23 (1.52, 3.27)	2.14 (1.46, 3.14)
	Pansexual	22 (25.0)	2.14 (1.47, 3.13)	1.98 (1.36, 2.90)
	Queer or other identity	17 (25.8)	2.22 (1.45, 3.39)	2.10 (1.38, 3.22)
	Questioning	39 (25.2)	2.16 (1.61, 2.89)	2.05 (1.53, 2.75)
	Prefer not to disclose	18 (12.7)	1.09 (0.70, 1.70)	1.08 (0.69, 1.69)
	Missing	13 (14.8)	1.16 (0.66, 2.03)	1.10 (0.63, 1.92)
E-cigarettes	Heterosexual	423 (17.6)	REF	REF
	Asexual	3 (7.0)	-	-
	Bisexual	84 (31.6)	1.78 (1.46, 2.17)	1.59 (1.30, 1.94)
	Gay or lesbian	22 (27.5)	1.61 (1.12, 2.30)	1.51 (1.06, 2.15)
	Pansexual	28 (31.8)	1.81 (1.32, 2.48)	1.62 (1.18, 2.22)
	Queer or other identity	17 (25.8)	1.47 (0.97, 2.23)	1.39 (0.92, 2.12)
	Questioning	38 (24.5)	1.43 (1.07, 1.90)	1.36 (1.03, 1.81)
	Prefer not to disclose	17 (12.0)	0.68 (0.43, 1.08)	0.69 (0.44, 1.08)
	Missing	18 (20.5)	1.10 (0.70, 1.72)	1.01 (0.65, 1.57)
Oral Nicotine	Heterosexual	323 (13.4)	REF	REF
	Asexual	4 (9.3)	-	-
	Bisexual	67 (25.2)	1.85 (1.46, 2.34)	1.72 (1.36, 2.18)
	Gay or lesbian	18 (22.5)	1.74 (1.16, 2.62)	1.64 (1.09, 2.47)
	Pansexual	23 (26.1)	1.95 (1.35, 2.81)	1.77 (1.23, 2.56)
	Queer or other identity	17 (25.8)	1.93 (1.26, 2.94)	1.82 (1.19, 2.77)
	Questioning	35 (22.6)	1.68 (1.24, 2.29)	1.62 (1.18, 2.20)
	Prefer not to disclose	14 (9.9)	0.75 (0.45, 1.24)	0.73 (0.44, 1.21)
	Missing	10 (11.4)	0.76 (0.39, 1.47)	0.71 (0.37, 1.37)

PR=prevalence ratio.

PRs suppressed for outcome N<5.

^aN(%) susceptible from first imputation^bAdjusted for race/ethnicity, parental education, and family financial status