



# Disparities in Tobacco use and cravings among sexual and gender minority adolescents in the United States

Sunday Azagba<sup>\*</sup>, Todd Ebling, Galappaththige S.R. de Silva

Penn State College of Nursing, 210 Nursing Sciences Building, University Park, PA, USA

## ARTICLE INFO

### Keywords:

Tobacco cravings  
Tobacco use  
Sexual and gender minority  
Adolescent  
Tobacco dependence

## ABSTRACT

**Background:** Despite well-documented disparities in tobacco use between sexual and gender minority (SGM) populations and their non-SGM counterparts, limited research has focused on tobacco cravings within these groups. This study examines tobacco use and tobacco cravings among SGM adolescents who are past 30-day tobacco product users in the United States.

**Methods:** Data were derived from the 2023 National Youth Tobacco Survey of high school students. Multivariable logistic regression analyses were conducted to examine the association between various SGM identities and tobacco use and cravings.

**Results:** Tobacco cravings were reported by 25.66 % of gay or lesbian, 34.63 % of bisexual, pansexual, queer, or asexual, and 19.09 % of other sexual minority adolescent tobacco users. Among gender minority users, 40.45 % of nonbinary, genderfluid, or genderqueer individuals and 20.34 % of other gender identities reported cravings. Compared to heterosexual users, the odds of cravings were higher among bisexual, pansexual, queer, or asexual (aOR = 4.35, 95 % CI = 2.12–8.94), gay or lesbian (aOR = 3.51, 95 % CI = 1.03–11.93), and other sexual identities (aOR = 2.79, 95 % CI = 1.16–6.71). Nonbinary, genderfluid, or genderqueer users had higher odds of cravings compared to cisgender boys or men (aOR = 3.64, 95 % CI = 1.63–8.13). Similarly, SGM adolescents had higher odds of current tobacco use than their non-SGM peers.

**Conclusions:** These findings highlight the significant disparities in tobacco cravings and use among SGM adolescents compared to their heterosexual counterparts. Programs targeting tobacco use and cravings among SGM youth will be beneficial.

## 1. Introduction

Despite a historical decline in tobacco use, it remains a significant public health concern both in the U.S. and globally. Tobacco use is linked to various cancers and diseases, is responsible for over 400,000 deaths annually, and incurs billions of dollars in direct medical expenses and lost productivity (U.S. Department of Health and Human Services, 2014). Adolescents are particularly vulnerable to social, environmental, and marketing influences that encourage tobacco use (U.S. Department of Health and Human Services, 2012). In 2023, approximately 1.8 million high school students reported using any tobacco product in the past 30 days (Birdsey et al., 2023). Adolescent smoking is associated with reduced lung function, impaired lung growth, asthma, and other respiratory issues (U.S. Department of Health and Human Services, 2012). Additionally, the prevalence of high school students reporting current e-cigarette use has risen from 1.5 % in 2011 to 10 % in 2023

(Birdsey et al., 2023; Arrazola et al., 2015). Adolescents' e-cigarette use is concerning, given that these products contain harmful constituents, including nicotine (U.S. Department of Health and Human Services, 2016).

Adolescents are particularly vulnerable to nicotine dependence (Colby et al., 2000). Nicotine, an addictive and naturally occurring psychoactive chemical found in tobacco plants, can be absorbed through the oral cavity or lungs, affecting a wide range of biological functions (Yildiz, 2004). Adolescence is a sensitive period of biological maturation, and nicotine exposure adversely impacts brain development and cognitive functioning during this time (Dwyer et al., 2009; Yuan et al., 2015). Research indicates that nicotine exposure may harm childhood health and lead to addiction and dependence among adolescents and young adults (McGrath-Morrow et al., 2020). Additionally, synthetic nicotine has been commercialized in liquid form for e-cigarettes and in salt form for oral nicotine pouches (Cheetham et al., 2022; Jordt, 2023;

<sup>\*</sup> Corresponding author.

E-mail address: [spa5695@psu.edu](mailto:spa5695@psu.edu) (S. Azagba).

<https://doi.org/10.1016/j.pmedr.2025.102993>

Received 18 September 2024; Received in revised form 25 January 2025; Accepted 26 January 2025

Available online 27 January 2025

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Berman et al., 2023; Duan et al., 2024). Notably, between 2017 and 2022, the nicotine strength in e-cigarettes increased significantly in the United States (Wang et al., 2023). Craving is a key characteristic of nicotine dependence (Colby et al., 2000; Tiffany et al., 2009). The manifestation of craving, or a strong desire or urge to use tobacco, is a criterion for diagnosing tobacco dependence, also known as “tobacco use disorder,” according to the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). Time to first tobacco use after waking up is a validated indicator of dependence, including among adolescents (Fagerstrom and Schneider, 1989; Prokhorov et al., 2000; Muscat et al., 2009). High school students currently using tobacco and reporting cravings or urges to use tobacco products within 30 min of waking increased from 15.6 % in 2019 to 19.5 % in 2021 (Apelberg et al., 2014; Gentzke, 2022).

Adolescent sexual and gender minority (SGM) tobacco use disparities have been well-documented in the literature (Institute of Medicine, 2011; Azagba et al., 2014; Marshal et al., 2008; Rosario et al., 2014). Studies have found that sexual minority adolescents are more likely to try their first cigarette at an earlier age, be current smokers, and have a higher smoking frequency than their heterosexual peers (Corliss et al., 2013). Specific sexual minority subgroups exhibit higher nicotine dependence compared to their non-sexual minority counterparts (Watson et al., 2018; Goldberg et al., 2013). Transgender youth also appear to have a greater susceptibility to nicotine and tobacco use, with other gender identities, such as non-binary, queer, and pansexual individuals, showing a higher prevalence of tobacco use than other gender groups (Harlow et al., 2024; Day et al., 2017). Furthermore, prior research focusing exclusively on lesbian, gay, and bisexual adolescents found that these groups had higher odds of tobacco cravings than their heterosexual peers (Azagba and Shan, 2021). These studies have identified significant tobacco-related disparities between SGM and non-SGM populations. However, there remains limited research on tobacco cravings within SGM adolescents, particularly across diverse sexual and gender identities. Incorporating a broader range of sexual and gender identities into analyses of tobacco use and tobacco cravings can fill this research gap.

This study utilizes nationally representative data to examine tobacco product cravings among diverse SGM adolescent current tobacco users in comparison to their non-SGM peers. We hypothesize that SGM adolescents will report higher tobacco use and that SGM tobacco users will experience more frequent tobacco cravings than their non-SGM counterparts. By examining these potential differences, this study seeks to shed light on the evolving landscape of tobacco and nicotine consumption, especially with the rise of newer forms such as vaping. Understanding these use patterns is crucial for developing informed public health strategies and interventions tailored to the unique needs of SGM adolescents.

## 2. Methods

### 2.1. Data

This study utilizes data from the 2023 National Youth Tobacco Survey (NYTS), an annual cross-sectional survey targeting students in grades six to 12 in United States public and private schools. The NYTS is designed to support surveillance and evaluation efforts and covers a wide array of topics such as tobacco product use prevalence, attitudes, exposure to tobacco information on social media, access to tobacco products, nicotine dependence, cessation attempts, secondhand smoke exposure, harm perceptions, and tobacco product warnings. Employing a stratified, three-stage cluster probability-based sampling frame, the NYTS aims to capture a nationally representative sample of middle school (grades six to eight) and high school (grades nine to 12) students. Our study data focuses exclusively on high school students.

The sampling design for NYTS involved three distinct stages: first,

selecting Primary Sampling Units (PSUs) within each stratum; second, selecting schools within the chosen PSUs; and third, selecting classes within each selected school, with all students in the chosen classes participating. A total of 420 schools were randomly selected across 42 states, with four schools subsequently deemed ineligible. The 2023 survey was conducted online using the Qualtrics XM platform, with data stored on a FedRAMP-approved platform. Students accessed the survey through a dedicated URL and logged in using a class identification. The survey employed skip-pattern logic to tailor questions based on students’ tobacco use, presenting one question per screen to ensure privacy. Students were given one class period (35–45 min) to complete the survey, with a median completion time of about 19 min. The 2023 NYTS had a response rate of 43 % at the school level and 70.9 % at the individual level. The NYTS dataset is de-identified and publicly available, and thus, no further Institutional Review Board oversight is needed.

### 2.2. Measures

#### 2.2.1. Dependent variable

Two dependent variables were considered in this study: tobacco use and tobacco cravings. Current tobacco use, a dichotomous variable, represents any use of different forms of tobacco over the past 30 days. These included cigarette use, cigar use, chewing tobacco, snuff or dip use, electronic cigarettes or e-cigarette use, hookah tobacco use, roll-your-own cigarette use, pipe tobacco use, snus use, oral nicotine products use, bidis use, heated tobacco use, and nicotine pouches use. Among current tobacco users, the tobacco craving variable was derived from the survey question, “How soon after you wake up do you want to use a tobacco product of any kind?” The response options were: “Within five minutes”, “From six to 30 minutes”, “From more than 30 minutes to one hour”, “After more than one hour but less than 24 hours”, “I rarely want to use tobacco products”, and “I do not want to use tobacco products”. We classified this variable in two ways: (i) as an ordinal variable in the adjusted logistic regression analyses and (ii) as a binary variable to estimate the prevalence of tobacco cravings within 30 min of waking.

#### 2.2.2. Independent variables

Our study focused on two primary independent variables: sexual identity and gender identity. Sexual identity was determined by responses to the question, “Which of these options best describes your sexual orientation?” The response options included “Straight or heterosexual”, “Gay or lesbian”, “Bisexual, pansexual, or queer”, “Asexual”, “I am not sure, or I am questioning”, and “Something else not included here”. To analyze sexual identity, we approached it in two ways: as a sexual minority group and through a detailed classification of sexual identity. The sexual minority group (LGB+) was formed by combining the responses “Gay or lesbian”, “Bisexual, pansexual, or queer”, “Asexual”, “I am not sure, or I am questioning”, and “Something else not included here”. For the more granular classification, the responses “Bisexual, pansexual, or queer” and “Asexual” were combined into one category only for tobacco craving, while “I am not sure, or I am questioning” and “Something else not included here” were combined into an “Other” category for both tobacco use and cravings to ensure sufficient group sizes.

For gender identity, the survey asked, “Which of the following best describes your gender?” The options provided were: “Girl or woman”, “Boy or man”, “Nonbinary, genderfluid, or genderqueer”, “Something else not included here”, and “I am not sure, or I am questioning”. To ensure adequate group sizes, the responses “Something else not included here” and “I am not sure, or I am questioning” were combined into an “Other” group.

In addition to these primary variables, we included other independent variables such as grade levels (grades nine, 10, 11, and 12) and race/ethnicity. Race/ethnicity categories were non-Hispanic white, non-Hispanic black, Hispanic, and non-Hispanic other. The non-Hispanic other category included respondents who identified as non-Hispanic

Asian, American Indian or Alaska Native, non-Hispanic Native Hawaiian or other Pacific Islander, and those who identified as multiple non-Hispanic races.

2.3. Statistical analyses

Descriptive statistics were conducted to characterize the weighted 2023 NYTS sample among high school students who responded about their tobacco use and cravings. This included calculating tobacco cravings across various categories of sexual identity and gender identity. Due to the small cell sizes in these categories, confidence intervals for the prevalence rates were estimated using the bootstrap method to ensure more accurate and reliable results. Additionally, multivariable logistic regression analysis was performed to investigate the relationships between the independent variables—sexual identity and gender identity—and the dependent variable of tobacco use. Ordinal logistic regression analysis was also conducted to examine the association between these independent variables and tobacco cravings. Each regression analysis was adjusted for grade level and race/ethnicity to control for potential confounding factors. To account for the complex survey design of the NYTS, the analysis incorporated sampling weights, survey strata, and clusters. All statistical analyses were conducted using R software (R Core Team, 2024).

3. Results

Table 1 presents the characteristics of the weighted study samples from the 2023 NYTS data for tobacco use and cravings. Among the 10,266 high school students who responded about their tobacco use, 26.53 % were in grade nine, 25.72 % in grade 10, 24.07 % in grade 11, and 23.68 % in grade 12. The majority of respondents identified as non-Hispanic white (49.32 %), followed by Hispanic (28.39 %), non-Hispanic black (13.99 %), and non-Hispanic other (8.30 %). Similarly, among the 1180 high school students who answered the question about tobacco cravings, 23.10 % were in grade nine, 25.80 % in grade 10, 23.28 % in grade 11, and 27.82 % in grade 12. In terms of the racial and ethnic composition for the tobacco craving outcome sample, most students were non-Hispanic white (55.94 %), followed by Hispanic (26.49 %), non-Hispanic black (10.22 %), and non-Hispanic other (7.36 %).

Tobacco cravings across various sexual identity and gender identity groups are shown in Table 2. Sexual minority current tobacco users had a higher tobacco craving at 29.61 %, compared to 12.51 % among straight or heterosexual students. Within the sexual minority group, those identifying as bisexual, pansexual, queer, or asexual had the highest tobacco craving at 34.63 %, followed by gay or lesbian students at 25.66 %. The “Other” group within the sexual minority category reported the lowest craving at 19.09 %. Regarding gender identity, students who identified as non-binary, genderfluid, or genderqueer had the

**Table 1**  
Descriptive sample characteristics, U.S. high school students, 2023.

	Tobacco use sample % (95 % CI)	Tobacco craving sample % (95 % CI)
N	10,266	1180
Grade Level		
9th	26.53 (21.54, 31.51)	23.10 (14.91, 31.30)
10th	25.72 (22.37, 29.07)	25.80 (18.33, 33.27)
11th	24.07 (19.51, 28.62)	23.28 (16.25, 30.31)
12th	23.68 (19.38, 27.99)	27.82 (16.85, 38.79)
Race/Ethnicity		
Non-Hispanic white	49.32 (42.53, 56.11)	55.94 (46.34, 65.53)
Non-Hispanic black	13.99 (10.51, 17.47)	10.22 (5.67, 14.77)
Hispanic	28.39 (23.10, 33.68)	26.49 (20.23, 32.75)
Non-Hispanic other	8.30 (5.87, 10.74)	7.36 (0.10, 14.61)

% refers to the weighted percentage, and 95 % CI denotes the 95 % Confidence Interval. Note: The tobacco craving sample is a subset of the tobacco use sample. Tobacco craving represents the use of tobacco within 30 min of waking.

**Table 2**  
Tobacco cravings within 30 min of waking among current tobacco users, U.S. high school students, 2023.

	Tobacco craving sample % (95 % CI)
Sexual Identity	
Straight or heterosexual	12.51 (9.26, 16.29)
LGB	29.61 (21.26, 38.55)
Sexual Identity with a broader classification	
Straight or heterosexual	12.51 (9.32, 16.35)
Gay or lesbian	25.66 (10.47, 49.51)*
Bisexual, pansexual, queer, or Asexual	34.63 (24.01, 45.92)
Other	19.09 (7.67, 35.99)*
Gender Identity	
Boy or man	15.39 (10.96, 20.94)
Girl or woman	18.45 (12.84, 24.61)
Nonbinary, genderfluid, or genderqueer	40.45 (22.53, 59.70)
Other	20.34 (7.39, 48.92)*

% refers to the weighted percentage, and 95 % CI denotes the 95 % Confidence Interval. The LGB group includes students who identified as “Gay or lesbian,” “Bisexual, pansexual, or queer,” “Asexual,” “I am not sure, or I am questioning,” and “Something else not included here.” The “Other” sexual identity group includes students who identified as “I am not sure, or I am questioning” or selected “Something else not included here” in response to the sexual identity question. The “Other” gender identity group includes students who identified as “I am not sure, or I am questioning” or selected “Something else not included here” in response to the gender identity question. \* Indicates higher variability due to the small cell size.

highest tobacco cravings at 40.45 %. This was followed by the “Other” group at 20.34 %, and students identifying as girl or woman at 18.45 %. The lowest tobacco craving was found among students who identified as boy or man, with a rate of 15.39 %.

Table 3 details the associations between sexual identity with tobacco use and tobacco cravings. For tobacco use, students in the sexual minority group (LGB+) had significantly higher odds of using tobacco, with an adjusted odds ratio (aOR) of 2.06 (95 % CI = 1.38–3.07), compared to straight or heterosexual students. Similarly, among current tobacco users, LGB+ students had significantly higher odds of experiencing tobacco cravings (aOR = 3.26, 95 % CI = 1.90–5.57) compared to their counterparts, straight or heterosexual students. Non-Hispanic black students and non-Hispanic other students had significantly lower odds for both tobacco use and cravings compared to non-Hispanic white students.

Tables 4 and 5 further explore these associations using a more

**Table 3**  
Association between sexual identity with tobacco use and tobacco craving, U.S. high school students, 2023.

	Tobacco use aOR (95 % CI)	Tobacco craving aOR (95 % CI)
Sexual Identity		
Straight or heterosexual	1.00	1.00
LGB+	2.06 (1.38, 3.07)	3.26 (1.90, 5.57)
Grade Level		
9th	1.00	1.00
10th	1.36 (0.80, 2.32)	1.35 (0.94, 1.93)
11th	1.08 (0.71, 1.65)	1.33 (0.77, 2.27)
12th	1.64 (0.95, 2.85)	1.21 (0.78, 1.89)
Race/Ethnicity		
Non-Hispanic White	1.00	1.00
Non-Hispanic Black	0.57 (0.36, 0.89)	0.29 (0.12, 0.71)
Hispanic	0.82 (0.63, 1.07)	0.47 (0.33, 0.68)
Non-Hispanic Other	0.42 (0.19, 0.91)	0.28 (0.11, 0.71)

aOR refers to the adjusted Odds Ratio, and 95 % CI denotes the 95 % Confidence Interval. The LGB group includes students who identified as “Gay or lesbian,” “Bisexual, pansexual, or queer,” “Asexual,” “I am not sure, or I am questioning,” and “Something else not included here.” Note: The tobacco craving sample is a subset of the tobacco use sample. Tobacco craving represents the use of tobacco within 30 min of waking.

**Table 4**  
Association between tobacco use and sexual identity with a broader classification, U.S. high school students, 2023.

	Tobacco use aOR (95 % CI)
Sexual identity with a broader classification	
Straight or heterosexual	1.00
Gay or lesbian	2.20 (0.93, 5.16)
Bisexual, pansexual, or queer	2.04 (1.38, 3.00)
Asexual	1.83 (0.89, 3.76)
Other	2.07 (1.24, 3.46)
Grade Level	
9th	1.00
10th	1.36 (0.79, 2.32)
11th	1.08 (0.71, 1.65)
12th	1.64 (0.95, 2.84)
Race/Ethnicity	
Non-Hispanic white	1.00
Non-Hispanic black	0.56 (0.36, 0.89)
Hispanic	0.82 (0.63, 1.07)
Non-Hispanic other	0.42 (0.19, 0.89)

aOR refers to the adjusted Odds Ratio, and 95 % CI denotes the 95 % Confidence Interval. The “Other” sexual identity group includes students who identified as “I am not sure, or I am questioning” or selected “Something else not included here” in response to the sexual identity question.

**Table 5**  
Association between tobacco craving and sexual identity with a broader classification, U.S. high school students, 2023.

	Tobacco craving aOR (95 % CI)
Sexual identity with a broader classification	
Straight or heterosexual	1.00
Gay or lesbian	2.47 (0.98, 6.24)
Bisexual, pansexual, queer, or asexual	3.16 (1.72, 5.81)
Other	4.25 (2.41, 7.47)
Grade Level	
9th	1.00
10th	1.39 (0.97, 2.00)
11th	1.36 (0.79, 2.33)
12th	1.25 (0.79, 2.00)
Race/Ethnicity	
Non-Hispanic white	1.00
Non-Hispanic black	0.29 (0.12, 0.70)
Hispanic	0.45 (0.31, 0.66)
Non-Hispanic other	0.32 (0.10, 1.04)

aOR refers to the adjusted Odds Ratio, and 95 % CI denotes the 95 % Confidence Interval. The “Other” sexual identity group includes students who identified as “I am not sure, or I am questioning” or selected “Something else not included here” in response to the sexual identity question. Note: The tobacco craving sample is a subset of the tobacco use sample. Tobacco craving represents the use of tobacco within 30 min of waking.

granular classification of sexual identity. Students who self-identified as bisexual, pansexual, or queer had significantly higher odds of tobacco use (aOR = 2.04, 95 % CI = 1.38–3.00) compared to those who identified as straight or heterosexual. Additionally, students in the “Other” group had higher odds of tobacco use (aOR = 2.07, 95 % CI = 1.24–3.46) compared to straight or heterosexual students. Similarly, students currently using tobacco who identified as bisexual, pansexual, queer, or asexual had 3.16 times higher odds of tobacco cravings (aOR = 3.16, 95 % CI = 1.72–5.81) compared to their straight or heterosexual counterparts. Moreover, students in the “Other” group had 4.25 times higher odds of experiencing tobacco cravings (aOR = 4.25, 95 % CI = 2.41–7.47).

The associations between gender identity with tobacco use and tobacco cravings are reported in Table 6. Nonbinary, genderfluid, or genderqueer students had higher odds of using tobacco, with an aOR of 1.87 (95 % CI = 1.12–3.10) compared to those identifying as boy or man. Similarly, current tobacco users identifying as non-binary,

**Table 6**  
Association between gender identity with tobacco use and tobacco craving, U.S. high school students, 2023.

	Tobacco use aOR (95 % CI)	Tobacco Craving aOR (95 % CI)
Gender Identity		
Boy or man	1.00	1.00
Girl or woman	1.18 (0.79, 1.75)	0.85 (0.57, 1.28)
Nonbinary, genderfluid, or genderqueer	1.87 (1.12, 3.10)	2.75 (1.44, 5.25)
Other	3.06 (0.98, 9.51)	3.26 (2.10, 5.06)
Grade Level		
9th	1.00	1.00
10th	1.26 (0.76, 2.07)	1.17 (0.84, 1.63)
11th	1.07 (0.71, 1.61)	1.33 (0.86, 2.06)
12th	1.60 (0.92, 2.80)	1.11 (0.61, 2.01)
Race/Ethnicity		
Non-Hispanic white	1.00	1.00
Non-Hispanic black	0.55 (0.36, 0.85)	0.30 (0.13, 0.72)
Hispanic	0.80 (0.61, 1.05)	0.50 (0.33, 0.78)
Non-Hispanic other	0.39 (0.21, 0.74)	0.23 (0.08, 0.64)

aOR refers to the adjusted Odds Ratio, and 95 % CI denotes the 95 % Confidence Interval. The “Other” gender identity group includes students who identified as “I am not sure, or I am questioning” or selected “Something else not included here” in response to the gender identity question. Note: The tobacco craving sample is a subset of the tobacco use sample. Tobacco craving represents the use of tobacco within 30 min of waking.

genderfluid, or genderqueer (aOR = 2.75, 95 % CI = 1.44–5.25) and students in the “Other” group (aOR = 3.26, 95 % CI = 2.10–5.06) had significantly higher odds of experiencing tobacco cravings compared to those identifying as boy or man. Additionally, non-Hispanic black and non-Hispanic other students had significantly lower odds of both tobacco use and cravings compared to non-Hispanic White students. Among Hispanic students who reported current tobacco use, the odds of experiencing tobacco cravings were also significantly lower (aOR = 0.50, 95 % CI: 0.33–0.78) compared to non-Hispanic White students.

4. Discussion

This study utilized nationally representative data to examine tobacco cravings among SGM versus non-SGM high school students. The findings indicate that a higher proportion of SGM adolescent current tobacco users reported tobacco cravings compared to their heterosexual counterparts. Specifically, we found higher tobacco cravings among those who identified as bisexual, pansexual, queer, asexual, gay, lesbian, or other sexual identities compared to heterosexual students. Furthermore, in terms of gender identity, we identified significantly higher tobacco cravings among those who identified as nonbinary, genderfluid, or genderqueer compared to their cisgender peers. We also found a statistically significant association between sexual identity and both tobacco use and tobacco cravings, with those identifying as SGM having higher odds of tobacco use and cravings than non-SGM peers. In terms of disaggregated sexual identity, bisexual, pansexual, or queer students and those in the “Other” category were more likely to report current tobacco use and cravings. Similarly, for gender identity, nonbinary, genderfluid, or genderqueer individuals, as well as those in the “Other” category, had higher odds of tobacco cravings. These results contribute to the existing literature on SGM health disparities by highlighting that SGM adolescent current tobacco users in the U.S. face a higher risk of tobacco cravings than their peers. This underscores the need for targeted interventions and public health strategies to address these disparities.

Tobacco marketing strategies may help explain our findings. Historically, the tobacco industry has targeted SGM groups, including adolescents, in their marketing efforts (Smith and Malone, 2003; Washington, 2002; Cruz et al., 2019; Stevens et al., 2004). Partly due to these targeted strategies, sexual minorities have reported greater exposure and receptivity to tobacco industry marketing (Dilley et al., 2008). Receptivity to tobacco marketing among adolescents appears to be a



predictor of smoking in young adulthood (Gilpin et al., 2007). Similarly, SGM individuals have more frequently reported exposure to and interaction with tobacco-related messages on social media compared to non-SGM individuals, and greater exposure was significantly associated with a higher likelihood of tobacco use (Emory et al., 2019). Among adolescents, increased social media use and heavier exposure to e-cigarette content and advertisements were associated with a greater risk for e-cigarette use (Vogel et al., 2021). Emerging evidence suggests that tobacco companies may be targeting SGM individuals through nontraditional marketing sources (Lewis et al., 2024). Young people are particularly susceptible to marketing influences to use tobacco products, including e-cigarettes (U.S. Department of Health and Human Services, 2012; U.S. Department of Health and Human Services, 2016). This targeted tobacco and e-cigarette marketing through traditional and social media venues may partially account for the differences observed between SGM and non-SGM tobacco cravings.

The minority stress model provides further context to our results. This model proposes that minority groups, such as sexual or gender minorities, face additional and unique social stressors that increase their risk for adverse health outcomes (Meyer, 2003). In this model, social stressors range from environmental factors like prejudice, discrimination, or violence to individual factors like expectations of rejection, identity concealment, and internalized social stigma (Meyer, 2003). Research has shown that SGM adolescents face numerous minority stress risk factors for substance use, including victimization, lack of a supportive environment, psychological stress, internalizing and externalizing problem behaviors, and negative disclosure reactions (Goldbach et al., 2014). A study by Mann et al. found that greater minority stress experiences of discrimination were associated with more nicotine use days and higher nicotine dependence symptoms among sexual minority youth (Mann et al., 2021). Another study found that vicarious exposure to heterosexism elicited negative mood and nicotine cravings among young sexual minority adults who used nicotine (Mereish and Miranda, 2024). Elsewhere, a study found that nicotine craving mediated the association between minority stress exposure and subsequent nicotine use among sexual minority youth (Mereish et al., 2022). Overall, these studies suggest that minority stress may contribute to the disparate tobacco cravings observed among SGM adolescents.

Adolescent tobacco use remains a significant public health concern. Nicotine is highly addictive, and adolescents are particularly vulnerable to tobacco use during this critical period of habit formation and belief internalization. Sexual and gender minority (SGM) adolescents face even greater risks due to increased exposure to tobacco marketing through traditional and social media channels, as well as structural vulnerabilities. Our findings indicate that SGM adolescents have a higher prevalence of tobacco cravings—a potential key indicator of nicotine dependence—compared to their heterosexual and cisgender peers. Given that over 80 % of long-term adult smokers begin smoking by the age of 18 (U.S. Department of Health and Human Services, 2012), adolescence represents a crucial window for intervention and behavior modification. Reducing exposure to tobacco product marketing and addressing the environmental and individual stressors faced by SGM adolescents may help alleviate their disproportionate tobacco burden and enhance their overall well-being.

## 5. Limitations

Our study has several strengths, including nationally representative data, attention to diverse SGM identities, and insights into tobacco use and craving disparities among minority groups. However, our findings should be considered alongside the following limitations. First, our sample was limited to those who responded to survey questions regarding both past-30-day tobacco product use and tobacco cravings. Due to the potential for social desirability bias (i.e., the inclination to respond to questions in a way that the respondent is viewed positively by others), responses to this behavioral question may have been

underreported. Second, we cannot assume identity uniformity among those who responded to sexual or gender questions as “other.” There may be variations among these groups that were not captured in the present survey construction. Third, certain responses could not be disaggregated in the analysis beyond the survey questionnaire. For example, the response options for sexual identity did not specify “gay” and “lesbian” separately but grouped them as “gay or lesbian.” Likewise, it did not distinguish between cisgender versus transgender boys or men, nor between cisgender versus transgender girls or women. Fourth, due to the analytic design of this study, causal inferences cannot be made.

## 6. Conclusion

This study underscores the significantly higher tobacco use among SGM adolescents and the elevated tobacco cravings among SGM adolescent current tobacco users compared to their heterosexual counterparts. This finding highlights the need for targeted public health strategies to address the unique risks faced by SGM youth. The influence of targeted tobacco marketing and experiences of structural vulnerabilities likely contribute to these disparities. To mitigate these risks, it may be beneficial to develop and implement comprehensive, inclusive, and culturally sensitive approaches that address both the environmental and individual factors influencing tobacco use among SGM adolescents. Such approaches should aim to reduce exposure to tobacco marketing, provide supportive environments, and address the psychological and social stressors that disproportionately affect SGM youth. Furthermore, future research should investigate the underlying mechanisms driving these disparities and evaluate the effectiveness of tailored interventions in reducing tobacco cravings and use among SGM adolescents.

## Disclosure of funding

This study was not supported by a funding source.

## CRediT authorship contribution statement

**Sunday Azagba:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Conceptualization. **Todd Ebling:** Writing – review & editing, Writing – original draft, Project administration, Investigation. **Galappaththige S.R. de Silva:** Writing – review & editing, Methodology, Formal analysis, Data curation.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

The authors do not have permission to share data.

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