HHS Public Access

Author manuscript

Behav Med. Author manuscript; available in PMC 2022 April 01.

Published in final edited form as:

Behav Med. 2021 ; 47(2): 120–130. doi:10.1080/08964289.2019.1676191.

Sexual orientation, tobacco use, and tobacco cessation treatment-seeking: Results from a national U.S. survey

Sean Esteban McCabe, PhD[1,2,3,4,5], **Brady T. West, PhD**[5], **Alicia K. Matthews, PhD**[6], **Rebecca Evans-Polce, PhD**[1], **Joseph G.L. Lee, PhD, MPH**[7], **Tonda L. Hughes, PhD**[8], **Phil Veliz, PhD**[1,2,5], **Vita McCabe, MD**[1,9], **Carol J. Boyd, PhD**[1,2,4,10]

[1]Center for the Study of Drugs, Alcohol, Smoking and Health, School of Nursing, University of Michigan, Ann Arbor, Michigan

[2]Institute for Research on Women and Gender, University of Michigan, Ann Arbor, Michigan

[3]Institute for Healthcare Policy and Innovation, University of Michigan, Ann Arbor, Michigan

[4]Center for Human Growth and Development, University of Michigan, Ann Arbor, Michigan

[5]Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, Michigan

[6]College of Nursing, Department of Health Systems Science, University of Illinois at Chicago, Chicago, Illinois

[7]Department of Health Education and Promotion, College of Health and Human Performance, and Center for Health Disparities, Brody School of Medicine, East Carolina University, Greenville, North Carolina

[8]School of Nursing and Department of Psychiatry, Columbia University, New York, New York

[9]St. Joseph Mercy Ann Arbor, St. Joseph Mercy Health System, Ypsilanti, Michigan

[10]Addiction Center, Department of Psychiatry, University of Michigan, Ann Arbor, Michigan

Abstract

Despite higher rates of tobacco use and smoking-related diseases among sexual minorities, tobacco cessation treatment-seeking behaviors (e.g., medication, nicotine replacement products) remain poorly understood across sexual orientation subgroups. This study examines tobacco cessation treatment-seeking behaviors associated with DSM-5 tobacco use disorder (TUD) across the three major sexual orientation dimensions (identity, attraction, behavior) in U.S. adults. Prevalence estimates reflect data collected from a 2012–2013 national sample of adults 18 years and older. More than three-fourths of U.S. adults with TUD had never engaged in tobacco cessation treatment-seeking behaviors, regardless of sexual orientation. Despite having the highest rates of TUD, bisexual men and women had some of the lowest rates of tobacco cessation treatment-seeking. Men who identified as gay, reported same-sex attraction, or same-sex behaviors

Address correspondence to: Sean Esteban McCabe, PhD, Center for the Study of Drugs, Alcohol, Smoking and Health, School of Nursing, University of Michigan, 400 N. Ingalls, Ann Arbor, Michigan 48109. plius@umich.edu; Phone: 734-615-8840. .

Declaration of interest statement

The authors have no potential conflicts of interest to report.

had the highest rates of tobacco cessation treatment-seeking. In contrast, women with same-sex attraction or same-sex behavior had higher rates of TUD but were less likely to engage in tobacco cessation treatment-seeking behaviors than women with only other-sex attraction or other-sex behavior, respectively. Heterosexual women were more likely to engage in tobacco cessation treatment-seeking than heterosexual men; this sex difference was not present for sexual minorities. Medications and nicotine replacement therapy products were the most prevalent forms of treatment-seeking. There were notable differences in tobacco cessation treatment-seeking behaviors based on sex and sexual orientation. Findings highlight the underutilization of tobacco cessation treatment-seeking among all U.S. adults and point to important factors to consider when working with sexual minorities who are trying to reduce or stop using tobacco.

Keywords

sexuality; tobacco use disorder; health disparities; tobacco cessation; treatment

Introduction

Cigarette smoking is responsible for more than 16 million people being diagnosed with smoking-related diseases and over 480,000 premature deaths per year in the U.S.[1] Large disparities in tobacco use have been documented, and sexual minorities (e.g., lesbian, gay, and bisexual [LGB] identified people) are at particularly high risk for cigarette smoking, tobacco use disorder (TUD), and smoking-related diseases.[1–6] The most recent U.S. Surgeon General's report on smoking stressed the importance of confronting and reversing the tragically higher tobacco use rates that threaten the health of sexual minorities.[1] As a result, tobacco prevention and control among sexual minority populations is an important research priority.[1,7]

Research on promoting tobacco cessation among sexual minorities remains largely limited to group- and internet-based interventions.[8–11] Existing research suggests that these and other evidence-based treatments (e.g., individual counseling, pharmacotherapy) recommended in the U.S. Public Health Service's *Clinical Practice Guideline: 2008 Update* are as effective for sexual minorities as for heterosexuals -- if they are used.[9,11–13] Unfortunately, there is scant empirical research regarding use of evidence-based tobacco cessation approaches among sexual minorities.

A national study found that sexual and gender minorities had similar awareness of traditional evidence-based tobacco cessation methods and used such methods at rates comparable to their heterosexual peers.[14] However, the authors combined sexual and gender minority subgroups (i.e., lesbian, bisexual, and transgender women, and gay, bisexual, and transgender men). A second national study found that heterosexual adult smokers were considerably more likely than sexual minority adult smokers to use evidence-based approaches such as medication and counseling (31.7% vs. 14.5%) to quit smoking. However, this study combined sexual minority subgroups (i.e., lesbian, gay, and bisexual), obscuring potential within group differences.[15] Past research has shown that disaggregation by sex and sexual orientation identifies the heterogeneity in tobacco use behaviors among sexual

minorities.[16,17] Sexual orientation is a complex construct that involves multiple dimensions (e.g., identity, attraction, and behavior). Among sexual minorities, cigarette smoking and other substance use differs considerably across sexual orientation dimensions.[16–18] Indeed, findings from prior research emphasize the importance of considering multiple dimensions of sexual orientation and indicate the need for more research to better understand variations in risk across sexual orientation dimensions. To date, there have been no studies using national data to examine tobacco cessation treatment-seeking behaviors across sexual orientation subgroups defined by identity, attraction and behavior. Understanding whether tobacco cessation treatment-seeking behaviors differ across sexual orientation subgroups is critical for targeting tobacco cessation efforts among sexual minorities. To fill this gap in knowledge, we examined tobacco cessation treatment-seeking behaviors associated with DSM-5 TUD across three dimensions of sexual orientation (identity, attraction, behavior) in a large national sample of adults in the United States.

Methods

Study design

We analyzed data from the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III). The NESARC-III target population is the noninstitutionalized civilian population, ages 18 years or older, living in the United States (the 50 states and the District of Columbia), including persons residing in noninstitutionalized group quarters such as college dormitories, group homes, group quarters, and dormitories for workers.[21] The NESARC-III included the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5), a fully structured diagnostic interview conducted with individuals in households. The NESARC-III is the only large national study that measures both DSM-5 TUD symptoms and the three major sexual orientation dimensions.[19,20] The household, person, and overall response rates were 72%, 84%, and 60.1%, respectively. The NESARC-III sample design, response rates, and weighting procedures are described in detail elsewhere.[4,21] All procedures, including informed consent, received full human subjects review and IRB approval.

Measures

Sociodemographic and background characteristics analyzed included age (18–34 years, 35–54 years, ≥55 years), sex (male, female), race (White, African American, Hispanic, other), educational attainment (high school degree or less, some college, or college degree or higher), metropolitan statistical area (urban, rural), U.S. Census geographical region (Northeast, South, Midwest, and West), any health insurance status (e.g., Medicare, Medicaid, military health care, private health insurance), and HIV status (ever tested positive for HIV or AIDS).

Major dimensions of sexual orientation—Sexual attraction was assessed by asking: *People are different in their sexual attraction to other people. Which category on the card best describes your feelings? (1) only attracted to females, (2) mostly attracted to females, (3) equally attracted to females and males, (4) mostly attracted to males, or (5) only attracted*

to males. Sexual identity was assessed by asking: *Which of the categories on the card best describes you? (1) heterosexual (straight), (2) gay or lesbian, (3) bisexual, or (4) not sure.* Sexual behavior was assessed with the following items: *Have you had sex in the last 12 months?* and *During the last 12 months, did you have sex with only males, only females, or both males and females?* Based on these two items, respondents were grouped into four sexual behavior categories (only same sex, only other sex, both sexes, and did not have sex).

DSM-5 tobacco use disorder (TUD)—TUD in the lifetime and past-year were assessed using DSM-5 criteria. Questions are from the AUDADIS-5, which asks about symptoms that can be used to operationalize DSM-5 criteria for TUD. Consistent with the DSM-5, an AUDADIS-5 TUD diagnosis is based on the presence of at least two of the 11 DSM-5 criteria (e.g., *"…find that you had to use much more tobacco or nicotine than you once did to get the effect you wanted"*) at the same time within a 12-month period. Reliability and validity of the DSM-based diagnoses of TUD have been shown to be strong in prior psychometric studies.[22,23] For example, concordance between AUDADIS-5 and PRISM-5 TUD criteria scales were excellent (ICC = 0.80 for past-year TUD and 0.85 for lifetime TUD).[22]

Tobacco cessation treatment-seeking behaviors—Tobacco cessation treatment-seeking was assessed by asking all respondents with a history of TUD the following: *Have you ever gone anywhere or seen anyone to get help for a reason that was related in any way to your use of tobacco or nicotine - a physician, counselor, or any other community agency or professional, or did you do anything else to help you quit or cut down on tobacco or nicotine use?* Tobacco cessation help- or treatment-seeking behaviors were defined as the following: (1) Counseling, family services, or other social services; (2) Support group or visit an internet chat room; (3) Doctor or other health professional prescribe a medication, for example, Chantix® (varenicline), Wellbutrin® or Zyban® (bupropion); (4) Nicotine patches, lozenges, or gum; (5) Electronic cigarettes or E-cigarettes, including E-liquid; (6) Acupuncture, acupressure, laser, electrostimulation therapy, meditation; and (7) Other methods to help quit or cut down. Respondents were asked whether or not they had used each of the seven tobacco cessation methods (i.e., responses were not open-ended). The response scale for each tobacco cessation item was dichotomous (yes / no).

Data analysis

All statistical analyses were design-based, in that they explicitly accounted for the complex design features of the NESARC-III sample when computing population estimates and testing hypotheses. These complex sample design features included stratification of the target population, multistage cluster sampling, and weighting to compensate for unequal probabilities of selection and differential nonresponse across population subgroups.[21] We used the Stata software (Version 15.1), and specifically the "svy" suite of commands, for all analyses. Variance estimates were computed using Taylor Series Linearization to reflect the complex sampling features (stratification, cluster sampling, and weighting) in the estimates of sampling variance.

The total size of the NESARC-III probability sample was 36,309 adults (15,862 men and 20,447 women). We included all study respondents in the analytic sample. There were no inclusion/exclusion criteria. For each individual analysis performed, a small number of individuals with relevant missing data on the variables under consideration were dropped. We report sample sizes after dropping cases with item-missing data in our tables.

Initial descriptive analyses focused on estimation of the distributions of sexual identity, sexual attraction, and sexual behavior for men and women. We then conducted separate analyses for men and women, using design-adjusted Rao-Scott tests[24] to examine the bivariate associations between sexual identity, attraction, and behavior, as well as indicators of lifetime and past-year TUD. We then stratified by sex and fit separate multivariable logistic regression models to the TUD indicators for each of the three sexual orientation dimensions, controlling for relevant socio-demographic covariates in each model. Design-adjusted goodness of fit tests[25] were used to assess the overall quality of model fit. All models presented in this paper were found to have adequate fit.

We also examined tobacco cessation treatment-seeking behaviors, focusing on participants with any lifetime diagnosis of a TUD. We initially compared the sexual identity subgroups (e.g., lesbian/gay, bisexual, not sure, heterosexual). We conducted sex-specific analyses of bivariate associations, and then fitt multivariable logistic regression models to the indicator of lifetime treatment-seeking, adjusting for the same covariates as in the analyses described above.

Finally, we conducted a series of exploratory descriptive analyses, focusing on the subpopulation of individuals with a lifetime TUD who ever sought help for tobacco cessation. Within this subsample of respondents, we compared the sexual orientation subgroups on the prevalence of specific tobacco cessation methods (e.g., using medication). Given the small sample sizes for some of the sexual orientation subgroups, these analyses were limited to descriptive comparisons.

Results

Population characteristics

Table 1 presents estimated distributions of sexual orientation for U.S. adults. Approximately 8.3% of the population was estimated to have same-sex sexual attraction, 3.1% had at least one same-sex sexual partner in the past year, and 2.8% self-identified as lesbian, gay, or bisexual (this estimate did not include respondents who endorsed “Not Sure”). Slightly more men than women endorsed same-sex sexual identity, attraction and behavior and slightly more women than men endorsed bisexual sexual identity, attraction and behavior. Approximately 66.2% of the target population identified as White, 11.8% as African American, 5.7% Asian, 14.7% Hispanic, and 1.6% as Native American or another race/ethnicity.

Prevalence of DSM-5 tobacco use disorder by sexual attraction, behavior, and identity

Table 2 presents comparisons on the prevalence of DSM-5 lifetime and past-year TUD across subgroups defined by the three dimensions of sexual orientation. All but one of the 12

bivariate tests showed statistically significant associations at $p < 0.001$. Among male and female respondents, bisexual-identified adults, those equally attracted to males and females, and those engaged in sexual behavior with both sexes generally had significantly higher probabilities of TUD. For example, 52.0% of bisexual men, 40.7% of gay men, and 35.2% of men not sure of their sexual identity reported lifetime TUD, relative to 31.8% of heterosexual men ($p < 0.001$). Similarly, 42.2% of bisexual women, 37.1% of lesbian women, and 37.6% of women not sure of their sexual identity reported lifetime TUD relative to 23.3% of heterosexual women ($p < 0.001$). Significant associations were found between lifetime and past-year TUD and both sexual attraction and sexual behavior among women, but only for sexual behavior among men ($p < 0.001$).

Tobacco use disorder across sexual orientation subgroups: Multivariable regression

Table 3 shows that in separate logistic regression models of DSM-5 TUD outcomes for each of the three sexual orientation dimensions and relevant covariates, minority sexual orientation was generally a much stronger correlate of the TUD outcomes among women than among men. In general, women who identified as bisexual, reported same-sex attraction, or engaged in same-sex sexual behavior had significantly higher odds of TUD than heterosexual women, regardless of the time frame. Among men, only those who identified as bisexual had significantly higher odds of TUD. No other significantly higher odds were found for men.

To further examine sex differences, we fitted our multivariable models to the combined data from both men and women and formally tested interactions between sex and each dimension of sexual orientation. First, for sexual identity, the odds ratio of lifetime TUD for lesbian women (2.0) was significantly larger than the odds ratio for gay men (1.3; $p = 0.023$). Second, for sexual attraction, the odds ratios of lifetime TUD for “only same sex” and “mostly same sex” were significantly larger for women than for men ($p < 0.001$). Third, for sexual behavior, the odds ratio of lifetime TUD for “only same sex” was once again significantly larger for women than for men ($p < 0.01$). In regard to past-year TUD, we found a similar interaction for sexual attraction, but no other interactions emerged as significant for identity or behavior.

Prevalence of tobacco cessation treatment-seeking by sexual attraction, behavior, and identity

Table 4 demonstrates that for men with a history of TUD, lifetime tobacco cessation treatment-seeking was much more common for those identifying as gay, those attracted to only or mostly males, and those who reported only male sexual partners. For women, treatment-seeking behaviors tended to be more common among those who reported never having had sex or only having had sex with men. Indeed, when comparing women and men with a lifetime TUD who reported only same-sex behavior, 22% of men reported seeking help for tobacco cessation in their lifetime, compared to only 7% of women ($p < 0.001$). Notably, approximately 75% of the NESARC-III sample with a lifetime DSM-5 TUD reported never having engaged in tobacco cessation treatment-seeking.

Tobacco cessation treatment-seeking by sexual orientation subgroups: Multivariable regression

As shown in Table 5, the bivariate associations in Table 4 remained robust when adjusting for the other relevant covariates of tobacco cessation treatment-seeking behavior. Compared with heterosexual men, substantially higher odds of lifetime treatment-seeking were found for men who identified as gay, reported same-sex attraction, or only engaged in same-sex sexual behavior; in contrast, women who reported same-sex attraction and only engaged in same-sex behavior had significantly lower odds of treatment-seeking behavior. In a combined model using the same approach to testing interactions between sex and sexual orientation as described earlier, we found significantly lower odds ratios for women indicating “only same-sex” attraction and behavior compared to men ($p < 0.001$)..

Prevalence of specific tobacco cessation methods by sexual orientation subgroups

Next, we examined specific tobacco cessation methods across the sexual orientation subgroups among those who have sought help for TUD at some point in their lifetime. Medication (e.g., varenicline, bupropion) and nicotine replacement therapy (i.e., patches, gum, or lozenges) were the most used tobacco cessation methods, regardless of sexual orientation subgroup (see Supplemental Tables A, B and C). Those who identified as bisexual or not sure, and those attracted equally to both sexes or mostly the other sex, were more likely to use support groups (see Supplemental Tables A, B and C).

Discussion

We found that several sexual orientation subgroups with the highest rates of DSM-5 TUD had very low rates of engaging in any evidence-based tobacco cessation treatment-seeking behaviors. These findings suggest that there is a considerable opportunity to reduce cigarette smoking and smoking-related diseases among sexual minorities. Bisexual men and women had the highest rates of TUD and some of the lowest rates of tobacco cessation treatment-seeking. In contrast, gay men had the highest rates of tobacco cessation treatment-seeking. Heterosexual women were more likely to engage in tobacco cessation treatment-seeking than heterosexual men; this sex difference was not present for sexual minorities. We estimate that more than three-fourths of U.S. adults with a lifetime DSM-5 TUD have never engaged in tobacco cessation treatment-seeking. This low level of tobacco cessation treatment-seeking behaviors is an important finding and is consistent with prior research showing that unassisted quit attempts are the most commonly used cessation strategy by adults who report smoking.[26]

We found that bisexual men and women had (1) the highest rates of TUD (e.g., over 50% of bisexual men report lifetime TUD), and (2) among the lowest rates of lifetime tobacco cessation treatment-seeking (e.g., only 11% of bisexual men with a lifetime TUD had ever engaged in tobacco cessation treatment-seeking behaviors). These findings are consistent with other studies showing that bisexual youth and adults have higher rates of cigarette smoking relative to their heterosexual counterparts.[3,4,6] Higher rates of TUD among bisexual men and women and low treatment utilization is highly significant given the association between TUD and smoking-related diseases.[1] A recent study found that cigarette smoking

and eligibility for low-dose computed tomography lung cancer screening were significantly higher among bisexual-identified older adults relative to gay, lesbian, or heterosexual-identified older adults.[27] Taken together, these findings provide a strong indication that bisexual men and women are at heightened risk for smoking-related diseases.

Given evidence that healthcare-based interventions can increase inequities,[28] targeted approaches are needed to ensure that cessation interventions help those who are at greatest risk of having a TUD. Evidence-based clinical and public health approaches exist for treating TUD.[29] There appears to be a tremendous need for promoting and implementing evidence-based interventions in healthcare organizations that serve sexual minorities. For example, LGBT-serving health centers should ensure implementation of systems-level interventions to identify and connect individuals who smoke with resources for quitting.[30] Tobacco cessation media campaigns should include targeted efforts to reach sexual minorities. Comprehensive state and federal approaches should follow best practices for including and reaching sexual and gender minorities.[31] At a population level, strategic efforts to raise tobacco taxes in areas of the country with higher concentrations of sexual minorities could help address inequities in TUD by sexual orientation.[32] There remains a need to promote and conduct more rigorous research focused on tobacco cessation among sexual minority populations in the U.S. and worldwide.[10,11] Interventions and research need to consider the role of unassisted quitting,[26] the costs and benefits of different approaches to promoting cessation,[33] and how to improve implementation of existing systems-level approaches to maximize their reach among sexual minority communities.[30] Additionally, more research is needed to fully understand the reasons for low levels of utilization among sexual minority subgroups. Future work should also consider the effectiveness of different cessation interventions by age.

There are gaps in the implementation of clinical best practices by providers in LGBT-serving health centers.[30,34] In supplemental analyses (results not shown), we found that bisexual adults and sexual minority women were less likely to have health insurance. In addition, prior evidence suggests that sexual minority adults have fewer economic resources due to job selection and employment discrimination.[35–37] These factors likely impact access to healthcare and insurance coverage for tobacco cessation, especially among bisexuals and sexual minority women. Interventions to promote cessation, including policy interventions, need to be relevant to and take into consideration the marginalized position of sexual minorities. Examples include health provider education and training and specialized media campaigns such as The Break Up.[38] Additionally, strategies for reaching sexual minorities outside the formal health care setting (e.g., quit lines, online interventions, and support groups) should also be considered given potential distrust of the health care system and potential barriers to health care access. Finally, based on the high rates of co-occurring alcohol and other substance use among sexual minority tobacco users, tobacco cessation efforts are encouraged to include a wide range of screening tools to detect other forms of substance misuse,[39,40] and ensure system referral patterns for treatment evaluation for those individuals who screen positive.

Previous research has found conflicting evidence regarding sexual and gender minorities' use of traditional evidence-based tobacco cessation methods and combining sexual minority

subgroups may make it more difficult to identify subgroup differences.[14] Our findings reinforce the importance of analyzing data separately by sexual minority subgroup and sex to better understand tobacco use treatment-seeking behaviors.[41,42] For example, women with lifetime TUD who self-identified as heterosexual, or reported only other-sex attraction or only other-sex behavior, had significantly higher rates of engaging in tobacco cessation treatment-seeking behaviors than their male counterparts. In contrast, sexual minority women with lifetime TUD who reported only same-sex attraction or only same-sex behavior had significantly lower odds of engaging in tobacco cessation treatment-seeking behaviors. Among those with a lifetime TUD who had only engaged in same-sex behavior, 22% of men reported help-seeking, compared to only 7% of women ($p < 0.001$). Finally, tobacco cessation treatment-seeking behaviors among those with a lifetime TUD were least prevalent among women who only engaged in same-sex sexual behavior (7%) and men who reported a history of both male and female sex partners (5%).

Prevalence rates for TUD and tobacco cessation in the present study did not vary much across the three sexual orientation dimensions for exclusively heterosexually oriented (whether sexual orientation was defined by identity, attraction, or behavior). There was, however, substantial variation in TUD and tobacco cessation among sexual minority women and men across the three sexual orientation dimensions. In supplemental analyses (see Supplemental Table D) examining all of the cross-classes defined by the three dimensions of sexual orientation, we found that these three dimensions did not overlap perfectly—evidence that these dimensions represent conceptually different aspects of sexual orientation and highlight the importance of examining multiple sexual orientation dimensions in future research.

The present study had some notable strengths and limitations that should be carefully considered when evaluating the implications of the findings. A major strength is the nationally representative sample of U.S. adults. Furthermore, the TUD measure was based on DSM-5 criteria to determine severity rather than relying on a single dichotomous question about tobacco use. It should be noted that the present study included some tobacco cessation treatment-seeking behaviors (e.g., e-cigarettes, acupuncture) that are not currently recommended by the U.S. Public Health Service-sponsored *Clinical Practice Guideline* as evidence-based methods and require more research, especially among sexual minorities.[29] In terms of limitations, causal inferences were not possible given the cross-sectional design of the study. Also, small sample sizes for some of the sexual orientation subgroups limited analyses, especially when disaggregating by sociodemographic characteristics such as sex. In these cases, analyses were limited to descriptive comparisons with future research in mind. We have included these findings because differences between the subgroups might emerge as clinically meaningful given larger samples of sexual minorities who have sought help for TUD. Future research is needed that examines potential age-related differences in tobacco cessation treatment-seeking behaviors among sexual minorities. In addition, gender identity was not assessed in the NESARC-III and future research is needed that includes more detailed sexual and gender identity measures. Existing measurement of sexual identity in the NESARC-III and other federal surveys may not capture all sexual minority identities such as pansexual, asexual, among other categories. Finally, the prevalence of DSM-5 TUD

was likely underestimated in the NESARC-III because small but vulnerable groups of currently institutionalized individuals, such as incarcerated adults, were not included.[43,44]

Conclusions

This is the first national study to provide estimates of tobacco cessation treatment-seeking among U.S. adults across three major dimensions of sexual orientation. These findings indicate the underutilization of tobacco cessation treatment-seeking behaviors among all U.S. adults and highlight important variability in treatment-seeking behaviors among subgroups defined by sexual orientation. The vast majority of adults who smoke wish that they had never started.[45] Stronger efforts are needed to connect smokers who wish to quit with evidence-based resources – especially among groups that are at higher risk of TUD, who may also face marginalization in the healthcare system.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The development of this article was supported by research grants L40DA042452, R01CA203809, R01CA212517, R01DA031160, and R01DA036541 from the National Cancer Institute and National Institute on Drug Abuse, NIH. This manuscript was prepared using a limited access dataset obtained from the National Institute on Alcohol Abuse and Alcoholism. The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute, National Institute on Alcohol Abuse and Alcoholism, National Institute on Drug Abuse, NIH, or the U.S. Government. The authors would also like to thank the anonymous reviewers and editorial team for their detailed review and helpful suggestions to earlier versions of the manuscript. The authors would like to thank Kara Dickinson and Kate Leary for their assistance editing and formatting the manuscript for publication.

References

1. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention (US); 2014.
2. Johnson SE, Holder-Hayes E, Tessman GK, King BA, Alexander T, Zhao X. Tobacco product use among sexual minority adults: Findings from the 2012–2013 national adult tobacco survey. Am J Prev Med. 2016;50:e91–e100. doi: 10.1016/j.amepre.2015.07.041. [PubMed: 26526162]
3. Kasza KA, Ambrose BK, Conway KP, et al. Tobacco-product use by adults and youths in the United States in 2013 and 2014. N Engl J Med. 2017;376:342–353. doi: 10.1056/NEJMsa1607538. [PubMed: 28121512]
4. Kerridge BT, Pickering RP, Saha TD, et al. Prevalence, sociodemographic correlates and DSM-5 substance use disorders and other psychiatric disorders among sexual minorities in the United States. Drug Alcohol Depend. 2017;170:82–92. doi: 10.1016/j.drugalcdep.2016.10.038. [PubMed: 27883948]
5. Lee JG, Griffin GK, Melvin CL. Tobacco use among sexual minorities in the USA, 1987 to May 2007: a systematic review. Tob Control. 2009;18:275–282. doi: 10.1136/tc.2008.028241. [PubMed: 19208668]
6. Medley G, Lipari RN, Bose J, Cribb DS, Kroutil LA, McHenry G. Sexual orientation and estimates of adult substance use and mental health: Results from the 2015 National Survey on Drug Use and Health. Rockville, MD: NSDUH Data Review, SAMHSA; 2016.

7. Institute NC. Health disparities. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 2016.
8. Baskerville NB, Dash D, Shuh A, Wong K, Abramowicz A, Yessis J, et al. Tobacco use cessation interventions for lesbian, gay, bisexual, transgender and queer youth and young adults: A scoping review. Prev Med Rep. 2017;6:53–62. doi: 10.1016/j.pmedr.2017.02.004. [PubMed: 28271021]
9. Matthews AK, Steffen A, Kuhns L, Ruiz R, Ross N, Burke L, et al. Evaluation of a randomized clinical trial comparing the effectiveness of a culturally targeted and non-targeted smoking cessation intervention for lesbian, gay, bisexual and transgender (LGBT) smokers. [published online ahead of print August 31, 2018]. Nicotine Tob Res. doi: 10.1093/ntr/nty184.
10. Berger I, Mooney-Somers J. Smoking cessation programs for lesbian, gay, bisexual, transgender, and intersex people: A content-based systematic review. Nicotine Tob Res. 2017;19:1408–1417. doi: 10.1093/ntr/ntw216. [PubMed: 27613909]
11. Lee JG, Matthews AK, McCullen CA, Melvin CL. Promotion of tobacco use cessation for lesbian, gay, bisexual, and transgender people: a systematic review. Am J Prev Med. 2014;47:823–831. doi: 10.1016/j.amepre.2014.07.051. [PubMed: 25455123]
12. Covey LS, Weissman J, LoDuca C, Duan N. A comparison of abstinence outcomes among gay/bisexual and heterosexual male smokers in an intensive, non-tailored smoking cessation study. Nicotine Tob Res. 2009;11:1374–1377. doi: 10.1093/ntr/ntp137. [PubMed: 19778993]
13. Grady ES, Humfleet GL, Delucchi KL, Reus VI, Munoz RF, Hall SM. Smoking cessation outcomes among sexual and gender minority and nonminority smokers in extended smoking treatments. Nicotine Tob Res. 2014;16:1207–1215. doi: 10.1093/ntr/ntu050. [PubMed: 24727483]
14. Fallin A, Lee YO, Bennett K, Goodin A. Smoking cessation awareness and utilization among lesbian, gay, bisexual, and transgender adults: An analysis of the 2009–2010 national adult tobacco survey. Nicotine Tob Res. 2015;18:496–500. doi: 10.1093/ntr/ntv103. [PubMed: 26014455]
15. Babb S, Malarcher A, Schauer G, Asman K, Jamal A. Quitting smoking among adults - United States, 2000–2015. MMWR Morb Mortal Wkly Rep. 2017;65:1457–1464. doi: 10.15585/mmwr.mm6552a1. [PubMed: 28056007]
16. McCabe SE, Hughes TL, Bostwick W, Boyd CJ. Assessment of difference in dimensions of sexual orientation: Implications for substance use research in a college-age population. J Stud Alcohol. 2005;66:620–629. [PubMed: 16331847]
17. McCabe SE, Hughes TL, Bostwick WB, West BT, Boyd CJ. Sexual orientation, substance use behaviors and substance dependence in the United States. Addiction. 2009;104:1333–1345. doi: 10.1111/j.1360-0443.2009.02596.x. [PubMed: 19438839]
18. Talley AE, Aranda F, Hughes TL, Everett B, Johnson TP. Longitudinal associations among discordant sexual orientation dimensions and hazardous drinking in a cohort of sexual minority women. J Health Soc Behav. 2015;56:225–245. doi: 10.1177/0022146515582099. [PubMed: 25911224]
19. Chou SP, Goldstein RB, Smith SM, Huang B, Ruan WJ, Zhang H, et al. The epidemiology of DSM-5 nicotine use disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions-III. J Clin Psychiatry. 2016;77:1404–1412. doi: 10.4088/JCP.15m10114. [PubMed: 27135834]
20. Federal Interagency Working Group on Improving Measurement of Sexual Orientation and Gender Identity in Federal Surveys. Current measures of sexual orientation and gender identity in federal surveys. Washington, DC: Federal Committee on Statistical Methodology; 2016.
21. Grant BF, Chu A, Sigman R, Amsbary M, Kali J, Sugawara Y, et al. National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III): Source and Accuracy Statement. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism; 2015.
22. Hasin DS, Greenstein E, Aivadyan C, Stohl M, Aharonovich E, Saha T, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5): procedural validity of substance use disorders modules through clinical re-appraisal in a general population sample. Drug Alcohol Depend. 2015;148:40–46. doi: 10.1016/j.drugalcdep.2014.12.011. [PubMed: 25604321]
23. Grant BF, Goldstein RB, Smith SM, Jung J, Zhang Z, Chou SP, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5): Reliability of substance use and

psychiatric disorder modules in a general population sample. Drug Alcohol Depend. 2015;148:27–33. doi: 10.1016/j.drugalcdep.2014.11.026. [PubMed: 25595052]

24. Rao JNK, Scott AJ. On chi-squared tests for multi-way tables with cell proportions estimated from survey data. Ann Stat. 1984;12:46–60.
25. Archer KJ, Lemeshow S, Hosmer DW. Goodness-of-fit tests for logistic regression models when data are collected using a complex sampling design. Comput Stat Data Anal. 2007;51:4450–4464.
26. Chapman S, MacKenzie R. The global research neglect of unassisted smoking cessation: causes and consequences. PLoS Med. 2010;7:e1000216. doi: 10.1371/journal.pmed.1000216.
27. Matthews AK, McCabe SE, Lee JGL, Veliz P. Differences in smoking prevalence and eligibility for low-dose computed tomography (LDCT) lung cancer screening among older U.S. adults: role of sexual orientation. Cancer Causes Control. 2018;29:769–774. doi: 10.1007/s10552-018-1044-x. [PubMed: 29948516]
28. Lorenc T, Petticrew M, Welch V, Tugwell P. What types of interventions generate inequalities? Evidence from systematic reviews. J Epidemiol Community Health. 2013;67:190–3. doi: 10.1136/jech-2012-201257. [PubMed: 22875078]
29. Tobacco Use and Dependence Guideline Panel. Treating tobacco use and dependence: 2008 Update. Rockville, MD: U.S. Department of Health and Human Services; 2008.
30. Lee JGL, DeMarco ME, Beymer MR, Shover CL, Bolan RK. Tobacco-free policies and tobacco cessation systems at health centers serving lesbian, gay, bisexual, and transgender clients. LGBT Health. 2018;5:264–9. doi: 10.1089/lgbt.2017.0208. [PubMed: 29658846]
31. The Network for LGBT Health Equity. MPOWERED: Best and promising practices for LGBT tobacco prevention and control. Fort Lauderdale, FL: LGBT HealthLink, The Network for Health Equity; 2012.
32. Golden SD, Kong AY, Lee JGL, Ribisl KM. Disparities in cigarette tax exposure by race, ethnicity, poverty status and sexual orientation, 2006–2014, USA. Prev Med. 2018;108:137–144. doi: 10.1016/j.ypmed.2017.12.017. [PubMed: 29289642]
33. Alpert HR, Connolly GN, Biener L. A prospective cohort study challenging the effectiveness of population-based medical intervention for smoking cessation. Tob Control. 2013;22:32–37. doi: 10.1136/tobaccocontrol-2011-050129. [PubMed: 22234781]
34. Aleshire ME, Fallin-Bennett A, Bucher A, Hatcher J. LGBT friendly healthcare providers' tobacco treatment practices and recommendations. [published online ahead of print May 15, 2019] Perspect Psychiatr Care. doi: 10.1111/ppc.12395.
35. Jeong YM, Veldhuis CB, Aranda F, Hughes TL. Racial/ethnic differences in unmet needs for mental health and substance use treatment in a community-based sample of sexual minority women. J Clin Nurs. 2016;25:3557–3569. doi: 10.1111/jocn.13477. [PubMed: 27461857]
36. Mishel E Discrimination against queer women in the US workforce: a résumé audit study. Socius. 2016;2:1–13. doi: 10.1177/2378023115621316.
37. Schmitt ED. Discrimination versus specialization: a survey of economic studies on sexual orientation, gender and earnings in the United States. J Lesbian Stud. 2008;12:17–30. doi: 10.1300/10894160802174250. [PubMed: 19042290]
38. Plant A, Montoya JA, Tyree R, Aragon L, Weber M, Le Veque M, et al. The break up: Evaluation of an anti-smoking educational campaign for lesbians, gays, and bisexuals in Los Angeles county. J Health Commun. 2017;22:29–36. doi: 10.1080/10810730.2016.1247485. [PubMed: 27967602]
39. Matthews AK, Cesario J, Ruiz R, Ross N, King A. A qualitative study of the barriers to and facilitators of smoking cessation among lesbian, gay, bisexual, and transgender smokers who are interested in quitting. LGBT Health. 2017;4:24–33. doi: 10.1089/lgbt.2016.0059. [PubMed: 28068208]
40. O'Cleirigh C, Elsesser SA, King D, Ehlinger PP, Bradford JB, Grasso C, et al. Characteristics and correlates of tobacco use in a community sample of sexual minority men and women: Implications for smoking cessation program development. LGBT Health. 2018;5:197–202. doi: 10.1089/lgbt.2016.0157. [PubMed: 29641316]
41. Emory K, Kim Y, Buchting F, Vera L, Huang J, Emery SL. Intragroup variance in lesbian, gay, and bisexual tobacco use behaviors: Evidence that subgroups matter, notably bisexual women. Nicotine Tob Res. 2016;18:1494–1501. doi: 10.1093/ntr/ntv208. [PubMed: 26377512]

42. Matthews DD, Blosnich JR, Farmer GW, Adams BJ. Operational definitions of sexual orientation and estimates of adolescent health risk behaviors. LGBT Health. 2014;1:42–49. [PubMed: 25110718]

43. Compton WM, Dawson D, Duffy SQ, Grant BF. The effect of inmate populations on estimates of DSM-IV alcohol and drug use disorders in the United States. Am J Psychiatry. 2010;167:473–474. doi: 10.1176/appi.ajp.2009.09081087.

44. Meyer IH, Flores AR, Stemple L, Romero AP, Wilson BD, Herman JL. Incarceration rates and traits of sexual minorities in the United States: National inmate survey, 2011–2012. Am J Public Health. 2017;107:267–273. doi: 10.2105/AJPH.2016.303576. [PubMed: 27997242]

45. Fong GT, Hammond D, Laux FL, Zanna MP, Cummings KM, Borland R, et al. The near-universal experience of regret among smokers in four countries: findings from the International Tobacco Control Policy Evaluation Survey. Nicotine Tob Res. 2004;6 Suppl 3:S341–351. [PubMed: 15799597]

Table 1.

Estimated sexual orientation distributions among U.S. adults

	Women		Men	
Sexual orientation measures	**% (SE)[a]**	**Sample Size[b]**	**% (SE)[a]**	**Sample Size[b]**
Sexual Identity	1.2% (<0.1)	265	1.8% (0.1)	321
Lesbian/Gay	1.9% (0.1)	422	0.8% (<0.1)	144
Bisexual	0.6% (<0.1)	130	0.4% (<0.1)	69
Not sure	96.4% (0.2)	19,454	97.0% (0.2)	15,190
Heterosexual				
Sexual Attraction	2.6% (0.2)	530	2.8% (0.2)	492
Only same sex	0.5% (<0.1)	115	0.8% (<0.1)	141
Mostly same sex	2.0% (0.2)	444	0.7% (<0.1)	138
Equally both sexes	4.5% (0.2)	933	2.7% (0.2)	429
Mostly other sex	90.4% (0.3)	18,228	93.0% (0.3)	14,524
Only other sex				
Sexual Behavior (past-year)	2.0% (0.1)	426	3.2% (0.2)	545
Only same-sex	0.6% (<0.1)	171	0.3% (<0.1)	56
Both sexes	30.3% (0.5)	6,427	20.6% (0.4)	3,385
Did not have sex	67.0% (0.5)	12,954	76.0% (0.5)	11,571
Only other sex				

Source: 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III). The total NESARC-III sample sizes, prior to excluding any cases based on missing data, were as follows: total = 36,309; women = 20,447, and men = 15,862.

[a]Weighted estimates; standard errors estimated using Taylor Series Linearization..

[b]Unweighted sample sizes.

Table 2.

Weighted prevalence estimates of DSM-5 tobacco use disorder by sexual attraction, sexual behaviors, and sexual identity

	Women		Men	
	Lifetime tobacco use disorder % (SE)	**Past-year tobacco use disorder % (SE)**	**Lifetime tobacco use disorder % (SE)**	**Past-year tobacco use disorder % (SE)**
Sexual Identity	***	***	***	***
Lesbian or gay	37.09 (3.58)	27.27 (3.48)	40.65 (3.30)	29.99 (3.56)
Bisexual	42.18 (3.34)	36.26 (3.16)	51.95 (5.23)	40.80 (5.54)
Not sure	37.62 (5.04)	33.57 (5.11)	35.32 (8.58)	27.51 (7.21)
Heterosexual	23.33 (0.54)	16.41 (0.43)	31.82 (0.71)	22.99 (0.55)
Sample size	*20,271*	*20,271*	*15,724*	*15,724*
Sexual Attraction	***	***	***	20.86 (2.28)
Only same sex	31.25 (2.19)	20.18 (1.72)	28.42 (2.41)	26.01 (4.87)
Mostly same sex	33.47 (5.95)	22.25 (5.45)	36.53 (5.32)	32.97 (5.12)
Equally females and males	36.61 (2.68)	31.20 (2.47)	37.10 (5.09)	23.68 (2.07)
Mostly other sex	34.17 (1.75)	26.68 (1.78)	33.27 (2.46)	23.22 (0.56)
Only other sex	22.89 (0.55)	16.10 (0.45)	32.14 (0.72)	*15,724*
Sample size	*20,250*	*20,250*	*15,724*	
Sexual Behavior (past-year)	***	***	***	***
Only same sex	31.76 (2.88)	23.52 (2.47)	32.28 (2.55)	24.88 (2.55)
Both sexes	52.59 (5.18)	49.22 (5.08)	52.88 (7.58)	48.12 (7.67)
Never had sex	20.74 (0.70)	12.79 (0.49)	29.47 (1.11)	18.26 (0.85)
Only other sex	25.11 (0.63)	18.60 (0.56)	32.93 (0.72)	24.59 (0.61)
Sample size	*19,978*	*19,978*	*15,557*	*15,557*

Source: 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III).

*** Note: The asterisks ($p < 0.001$) refer to significant overall associations based on design-adjusted Rao-Scott tests, and do not indicate which subgroups differ from one another.

Table 3.

Weighted estimates of adjusted odds ratios from multivariable logistic regression models, indicating differences in odds of DSM-5 tobacco use disorder across sexual identity, sexual attraction and sexual behavior subgroups

	Women		Men	
Sexual orientation measures	**Lifetime tobacco use disorder**	**Past-year tobacco use disorder**	**Lifetime tobacco use disorder**	**Past-year tobacco use disorder**
	AOR (95% CI)[a]	**AOR (95% CI)[a]**	**AOR (95% CI)[a]**	**AOR (95% CI)[a]**
Sexual identity				
Lesbian/Gay	2.0 (1.4, 2.8)***	1.8 (1.3, 2.6)**	1.3 (1.0, 1.7)	1.2 (0.8, 1.7)
Bisexual	2.0 (1.5, 2.6)***	2.0 (1.5, 2.7)***	2.1 (1.3, 3.2)**	1.8 (1.1, 3.0)*
Not sure	1.8 (1.2, 2.9)*	2.2 (1.3, 3.5)**	1.0 (0.5, 2.1)	1.0 (0.5, 1.9)
Heterosexual	Referent	Referent	Referent	Referent
Sample size	*20,271*	*20,271*	*15,724*	*15,724*
Sexual attraction				
Only same sex	1.6 (1.3, 2.0)***	1.3 (1.0, 1.7)*	0.8 (0.6, 1.0)*	0.8 (0.6, 1.0)
Mostly same sex	1.9 (1.1, 3.4)*	1.6 (0.9, 3.1)	1.0 (0.6, 1.8)	1.0 (0.5, 1.7)
Equally both sexes	1.8 (1.4, 2.3)***	1.9 (1.5, 2.4)***	1.1 (0.7, 1.6)	1.4 (0.8, 2.2)
Mostly other sex	1.7 (1.4, 2.0)***	1.7 (1.4, 2.0)***	1.0 (0.8, 1.3)	1.0 (0.7, 1.2)
Only other sex	Referent	Referent	Referent	Referent
Sample size	*20,250*	*20,250*	*15,724*	*15,724*
Sexual behavior				
Only same sex	1.5 (1.1, 1.9)**	1.3 (1.0, 1.8)	0.9 (0.7, 1.1)	0.9 (0.7, 1.2)
Both sexes	3.0 (1.9, 4.7)***	3.1 (1.9, 4.9)***	1.6 (0.8, 3.1)	1.7 (0.9, 3.3)
Never had sex	0.6 (0.6, 0.7)***	0.5 (0.5, 0.6)***	0.7 (0.6, 0.7)***	0.6 (0.5, 0.7)***
Only other sex	Referent	Referent	Referent	Referent
Sample size	*19,978*	*19,978*	*15,557*	*15,557*

Source: 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III).

[a]AOR for each outcome indicates odds ratios adjusted for race/ethnicity, age, educational level, personal income, employment status, marital status, health insurance status, geographic location, and metropolitan statistical area; the results for these variables are not shown. Sample sizes varied due to missing responses. We found all models to have adequate fit based on design-adjusted goodness of fit tests.[22]

*$p < 0.05$

**$p < 0.01$

***$p < 0.001$.

Table 4.

Estimated prevalence of lifetime tobacco cessation treatment-seeking behaviors among those with any lifetime tobacco use disorder by sexual identity, sexual attraction, and sexual behavior

	Overall	Women	Men	
	Lifetime tobacco cessation treatment-seeking behaviors % (SE), n	**Lifetime tobacco cessation treatment-seeking behaviors % (SE), n**	**Lifetime tobacco cessation treatment-seeking behaviors % (SE), n**	**Design-based Chi-square test of association between sex and treatment-seeking (by row)**
Sexual identity				
Lesbian/Gay	19.4% (2.6), 319	16.0% (3.3), 144	21.9% (3.7), 175	p = 0.22
Bisexual	13.0% (2.8), 321	13.8% (3.6), 230	11.2% (3.9), 91	p = 0.64
Not sure	16.2% (4.6), 94	15.1% (5.4), 59	17.6% (8.1), 35	p = 0.80
Heterosexual	13.4% (0.4), 15088	16.7% (0.6), 7007	10.9% (0.5), 8081	p < 0.001
R-S Test, p value	F(2.8, 318.8)=2.20, p = 0.09	F(2.7, 305.2)=0.31, p = 0.80	F(2.9, 323.8)=5.08, p < 0.01	
Sexual attraction				
Only same sex	13.9% (2.0), 480	8.8% (2.0), 274	20.5% (3.5), 206	p < 0.01
Mostly same sex	20.5% (5.3), 120	13.6% (4.6), 52	24.7% (7.8), 68	p = 0.20
Equally both sexes	12.8% (2.9), 296	14.0% (3.5), 219	9.6% (3.4), 77	p = 0.32
Mostly other sex	14.3% (1.9), 675	17.4% (2.5), 446	9.1% (2.1), 229	p = 0.01
Only other sex	13.4% (0.4), 14237	17.0% (0.6), 6439	10.9% (0.5), 7798	p < 0.001
R-S Test, p value	F(3.8, 427.3)=0.77, p = 0.54	F(3.5, 400.2)=2.44, p = 0.05	F(3.6, 407.6)=5.35, p < 0.01	
Sexual behavior				
Only same sex	15.3% (2.1), 460	7.0% (1.9), 214	22.0% (3.4), 246	p < 0.001
Both sexes	8.6% (3.0), 137	10.2% (3.8), 100	5.0% (3.0), 37	p = 0.25
Never had sex	15.3% (0.7), 4312	17.9% (1.1), 2455	12.3% (0.9), 1857	p < 0.001
Only other sex	12.9% (0.5), 10760	16.7% (0.8), 4589	10.4% (0.5), 6171	p < 0.001
R-S Test, p value	F(2.8, 320.1)=3.87, p = 0.01	F(2.7, 308.7)=4.05, p < 0.01	F(2.6, 291.7)=10.7, p < 0.01	

Source: 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III).

p values based on Rao-Scott tests examining the bivariate associations between sexual identity, sexual attraction, and sexual behavior categories and tobacco cessation treatment-seeking.

Table 5.

Estimated relationships of sexual identity, sexual attraction and sexual behavior with the odds of lifetime tobacco cessation treatment-seeking, based on multivariable logistic regression analyses for those with any lifetime tobacco use disorder

	Overall	Women	Men
	Lifetime tobacco cessation treatment-seeking behaviors AOR (95% CI)[a]	**Lifetime tobacco cessation treatment-seeking behaviors AOR (95% CI)[a]**	**Lifetime tobacco cessation treatment-seeking behaviors AOR (95% CI)[a]**
Sexual identity Lesbian/Gay Bisexual Not sure Heterosexual *Sample size*	1.7 (1.2, 2.6) ** 1.1 (0.7, 1.7) 1.4 (0.7, 2.8) Referent *15639*	1.3 (0.8, 2.1) 1.1 (0.6, 2.0) 1.2 (0.6, 2.5) Referent *7354*	2.4 (1.5, 3.9) ** 1.0 (0.4, 2.2) 1.6 (0.4, 5.7) Referent *8285*
Sexual attraction Only same sex Mostly same sex Equally females and males Mostly other sex Only other sex *Sample size*	1.1 (0.7, 1.5) 1.7 (0.9, 3.4) 1.0 (0.6, 1.7) 1.1 (0.8, 1.4) Referent *15625*	0.6 (0.3, 1.0) * 1.1 (0.5, 2.6) 1.1 (0.6, 1.9) 1.2 (0.8, 1.6) Referent *7345*	2.2 (1.4, 3.5) ** 2.2 (0.9, 5.1) 0.7 (0.3, 1.7) 0.8 (0.5, 1.5) Referent *8280*
Sexual behavior Only same sex Both females and males Never had sex Only other sex *Sample size*	1.4 (1.0, 2.0) 0.8 (0.4, 1.8) 1.1 (0.9, 1.3) Referent *15502*	0.5 (0.3, 1.0) * 1.0 (0.4, 2.4) 1.1 (0.9, 1.4) Referent *7280*	2.5 (1.7, 3.9) *** 0.5 (0.1, 1.7) 1.1 (0.9, 1.3) Referent *8222*

Source: 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III).

[a]AOR for each outcome indicates odds ratios adjusted for sex (in the overall models), race, age, educational level, personal income, employment status, marital status, health insurance status, HIV status, geographic location, and metropolitan statistical area; the results for these variables are not shown. Sample sizes varied due to missing responses. We found all models to have adequate fit based on design-adjusted goodness of fit tests.[22]

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$.