



Brief Report

Differences in Quit Attempts, Successful Quits, Methods, and Motivations in a Longitudinal Cohort of Adult Tobacco Users by Sexual Orientation

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Abstract

Introduction: Sexual minority (SM) tobacco users are less likely to successfully quit than heterosexuals, yet little evidence describes cessation behaviors in this population over time.

Aims and Methods: Our study investigated quit motivations, attempts, and methods in a longitudinal cohort of adult tobacco users by sexual orientation. Participants ($N = 1177$) completed interviews every 6 months through 48 months and reported quit attempts (24-hour tobacco free), successful quits (7-day point prevalence abstinence), motivations, and methods. Chi-squared and Fisher's exact tests assessed differences by heterosexual and SM orientation, gender, and quit outcome (attempt-only vs. successful quit).

Results: Quit rates were similar for heterosexual and SM adults. Over half attempted to quit at least once over 48 months, but few remained abstinent (SM: 16.9%; heterosexual: 12.1%). Most used nicotine replacement therapy (SM: 31.9%; heterosexual: 26.1%) or tobacco product substitution (SM: 27.7%; heterosexual: 21.2%). Few used quitlines (SM: 4.3%; heterosexual: 1.3%) or Internet-based programs (SM: 6.4%; heterosexual: 1.3%). Quit motivations included health concerns, family, and physical fitness. Participants reporting a successful quit were more likely to report a household member quit smoking than 24-hour quit attempters. Among participants reporting a successful quit, more SM than heterosexual participants reported that a coworker quit smoking (55.6% vs. 33.1%, $p = .009$).

Conclusions: We found few differences between heterosexual and SM tobacco users in our sample. Many repeatedly attempt to quit, yet few used evidence-based methods. Leveraging online quit programs, health messages, and family members in tailored cessation interventions may help SM and heterosexual tobacco users successfully quit.

Implications: SM and heterosexual tobacco users evidenced few differences in quit behaviors. Over 4 years, a majority attempted to quit, with over a third making repeated quit attempts. Nicotine replacement therapy and tobacco product substitution were mostly used during quit attempts; however, more SM than heterosexual men reported using web-based quit programs. Personal health and family concerns were universal motivations to quit, yet SM women also cited physical fitness as a primary motivation. Tobacco users reporting that a household member stopped

smoking were more likely to successfully quit. More SM than heterosexual men reported that a coworker quit smoking.

Introduction

Despite consistent declines over recent decades, combustible tobacco smoking remains a leading driver of premature morbidity and mortality. Tobacco use is unevenly distributed across the population, with sexual minority (SM) groups (eg, lesbian, gay, bisexual) bearing a greater burden of tobacco-related disease.¹ In the United States, between 30% and 38% of SM adults (vs. 16%–20% heterosexuals) report current cigarette smoking² and alternative tobacco product use is disparately high among adult SM women.³ For example, among US adult women, 10%–23% of SM (vs. 2%–5% heterosexuals) report regularly using cigars and 6%–11% of SM (vs. 2%–3% heterosexuals) regularly use e-cigarettes.³ Accordingly, increasing tobacco cessation in SM adults is a public health priority.

Limited epidemiological evidence describing cessation among SM tobacco users suggests that SM tobacco users report similar desire to quit as their heterosexual peers,⁴ but are less successful. Among adult tobacco users in the 2009–2010 US National Adult Tobacco Survey (NATS), bisexual women were less likely to report past quit attempts than heterosexual women.⁴ Similarly, lesbian and bisexual women smokers in Oregon and Washington reported a lower quit ratio compared with heterosexual women, and gay men had a lower quit ratio than heterosexual men.⁵

Increasing quit rates among SM adults may reduce sexual orientation-based tobacco disparities, yet a paucity of evidence-based smoking cessation interventions target SM adults.⁶ While research indicates that pharmacotherapy (including nicotine replacement therapy) and cognitive-behavioral interventions are as effective for SM adults as they are for heterosexuals,⁷ most SM tobacco users quit unassisted (ie, without evidence-based pharmacological or cognitive-behavioral counseling).⁸ In a cross-sectional study using 2009–2010 NATS data, no differences were found between SM and heterosexual adults in awareness of quitlines, pharmacotherapy, or counseling.⁸ Similarly, among adults in the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions, there were no differences in lifetime tobacco cessation treatment-seeking for SM women (relative to heterosexual women); however, gay men reported over twice relative odds of treatment-seeking as heterosexual men (odds ratio: 2.1–2.5).⁹ These studies did not assess use of nontraditional quit methods, including Internet or app-based cessation programs or tobacco product substitution, that SM tobacco users may also leverage during quit attempts.

Relapse is high among smokers who quit unassisted, and one goal of population-level efforts is to motivate smokers who have previously attempted to quit, but relapsed, to try again. To date, one published qualitative study describes motivations for quitting among SM adults. Focus group respondents described how friends and family, health concerns, aging, social stigma, and desire to increase dating prospects motivated their prior quit attempts.¹⁰ However, all participants reported a high level of readiness to quit; thus, it is unclear whether these quit motivations extend to SM smokers more generally.

Understanding motivations and methods that lead to quitting over time may guide the development of targeted interventions to effectively promote cessation among SM tobacco users. This study aimed to build on existing literature by describing (1) smoking

cessation behaviors—including quit attempts, methods, and motivations—in a longitudinal cohort of adult tobacco users by sexual orientation and (2) differences in demographic and tobacco-related characteristics by sexual orientation and in participants reporting successful quits (ie, abstinence) versus 24-hour quit attempts.

Methods

Study Design

The analytic sample included tobacco users enrolled in the Tobacco User Adult Cohort (TUAC) study¹¹ during 2014–2015 who completed follow-up through 2018–2019 ($N = 1177$). Participants completed six face-to-face interviews (baseline, 6, 12, 18, 24, and 36 months) and two phone interviews (42 and 48 months). Phone interviews were condensed and some items from in-person interviews were omitted. Participants received \$50 for each interview.

Eligibility Criteria

Participants were eligible for the TUAC cohort if they were (1) ≥ 18 years old; (2) a resident of designated urban Franklin county, Ohio or one of six rural Appalachian Ohio counties; (3) willing to provide informed consent; and (4) self-reported every day or some days/week tobacco use as follows: (a) exclusive combustible user; (b) exclusive smokeless tobacco user; (c) exclusive electronic nicotine delivery system user; or (d) dual user (ie, two or more categories).

Measures

Baseline characteristics included (1) age, (2) gender, (3) sexual orientation, (4) race/ethnicity, (5) education, (6) household income, (7) marital status, (8) employment status, and (9) county of residence. We assessed sexual orientation with questions used in the Population Assessment of Tobacco and Health Wave 1.¹² Participants were asked to self-identify as gay or lesbian; straight, that is not lesbian or gay; bisexual; or something else. Those responding “something else” were asked for further information; participants responding as “not straight, but identify with another label such as queer, trisexual, omnisexual or pan-sexual” were operationalized as “non-heterosexual orientation.” Based on their response, participants were further categorized as (1) heterosexual (ie, straight) or (2) SM (ie, gay, lesbian, bisexual, non-heterosexual orientation). Tobacco-related factors included nicotine dependence,¹³ cessation interest¹² and cessation efficacy,¹⁴ and stage of change.¹⁵ For cessation interest, participants were asked to rate their interest in quitting tobacco (0 = Not at all interested, 10 = Extremely interested).¹² For cessation self-efficacy, participants were asked to rate their confidence in their ability to “quit tobacco now” (0 = Not at all confident, 10 = Extremely confident).¹⁴

Quit attempts were reported at all interviews and defined as at least one 24-hour period of abstinence from all tobacco for purposes of quitting since last interview.¹⁶

Successful quits were reported at all interviews and defined as 7-day point prevalence abstinence from all tobacco at interview.¹⁷

Quit methods included any use of nicotine replacement therapy, tobacco product substitution, books or pamphlets, Internet or

web-based programs, quit lines, counseling, quit tobacco clinic, or cessation videos within the 48-month period for the purpose of quitting tobacco.¹⁶

Social quit influences were assessed at each follow-up interview through 36 months, and reflected if a household member, friend, or coworker quit using tobacco.

Quit motivations were assessed through 36 months and are reported from the most recent interview where the participant reported quitting any tobacco product since the last interview. Motivations included health concerns, personal beliefs, receiving cessation information, social influences, and environmental context.

Analyses

Summary and descriptive statistics depicted demographic and tobacco-related characteristics at baseline, and the proportion of respondents reporting quit attempts and successful quits over 48 months. Student's *t*, Pearson chi-squared, and Fisher's exact tests compared demographic and tobacco-related characteristics at baseline, quit methods, and motivations for quitting by sexual orientation, and between groups reporting quit attempts and successful quits. We also conducted exploratory gender-based comparisons within groups stratified by sexual orientation. Due to small sample size, covariates are not adjusted for in our analyses. We used a significance level of 0.05 and software SAS 9.4 (SAS Institute, Cary, NC) in all analyses. This study was approved by The Ohio State University Institutional Review Board (2014C0029).

Results

Sample Characteristics

As reported in [Supplementary Table 1](#), 6% ($N = 71$) of the sample identified as SM (gay or lesbian: 43.7%; bisexual: 53.5%; other non-heterosexual identity: 2.8%). Compared with heterosexuals, SM women and men were younger ($p < .001$ and $p = .004$, respectively). No other significant differences emerged between heterosexual and SM women. More SM than heterosexual men identified as persons of color (27.3% vs. 11.8%, $p = .03$), single/never married (63.6% vs. 25.8%, $p < .001$), and that a coworker quit smoking (59.3% vs. 32.6%, $p = .005$). Fewer SM than heterosexual men

lived in rural areas (21.2% vs. 52.1%, $p = .001$) and used smokeless tobacco (6.1% vs. 31.8%, $p = .002$). At baseline, most SM and heterosexual participants were exclusive combustible users (63.4% and 59.7%, respectively), reported moderate nicotine dependence (45.0% and 40.2%, respectively), and were in a precontemplation stage of change (56.7% and 62.7%, respectively). Mean cessation interest ranged from 6.0 to 6.5 and mean cessation efficacy ranged from 3.9 to 5.0.

Quit Attempts and Successful Quits

Per [Table 1](#), we found no statistically significant differences in quit behaviors by sexual orientation in the full or gender-stratified samples. A majority of SM (66.2%) and heterosexual (56.7%) participants reported at least one 24-hour quit attempt over 4 years ([Table 1](#)). Over a third of SM (38.0%) and heterosexual (33.2%) adults reported trying to quit at more than one interview. Few SM and heterosexual participants who reported a quit attempt were able to successfully quit for 7 days (29.6% and 20.9%, respectively). Ultimately, few SM and heterosexual tobacco users reported sustained abstinence (16.9% and 12.1%, respectively).

As represented in [Supplementary Table 2](#), SM adults reporting at least one successful quit were more likely than those making a 24-hour quit attempt to report a household member also stopped using tobacco (22.2% vs. 77.8%, $p = .02$). Similar trends were identified for heterosexual adults (45.6% vs. 54.4%, $p < .001$). Among participants reporting at least one successful quit, more SM than heterosexual tobacco users reported a coworker quit smoking (55.6% vs. 33.1%, $p = .009$).

Quit Methods

Quit methods are presented in [Table 2](#). Among participants reporting at least one quit attempt, most used nicotine replacement therapy (SM: 31.9% and heterosexual: 26.1%). Few participants used behavioral interventions, including quitlines (SM: 4.3% and heterosexual: 1.3%), literature (SM: 6.4% and heterosexual: 2.8%), or Internet-based programs (SM: 6.4% and heterosexual: 1.3%). In gender-stratified analyses, more SM than heterosexual men reported using Internet/web-based programs to quit (SM: 14.3 vs. heterosexual: 1.1; $p = .005$).

Table 1. Quit Behaviors Among Adults in the Tobacco Adult User Cohort, by Sexual Orientation and Gender ($N = 1152$)

	Full sample		<i>p</i>	Women		<i>p</i>	Men		<i>p</i>
	Sexual minority	Heterosexual		Sexual minority	Heterosexual		Sexual minority	Heterosexual	
	(<i>n</i> = 71)	(<i>n</i> = 1081)		(<i>n</i> = 38)	(<i>n</i> = 468)		(<i>n</i> = 33)	(<i>n</i> = 612)	
	<i>n</i> (%)		<i>n</i> (%)		<i>n</i> (%)		<i>n</i> (%)		
24-Hour quit attempt since baseline	47 (66.2)	612 (56.7)	.12	26 (68.4)	254 (54.4)	.09	21 (63.6)	358 (58.5)	.56
Number of interviews with a 24-hour quit attempt reported			.64			.54			.87
0	24 (33.8)	468 (43.3)		12 (31.6)	213 (45.6)		12 (36.4)	254 (41.5)	
1	20 (28.2)	253 (23.4)		10 (26.3)	96 (20.6)		10 (30.3)	157 (25.7)	
2–3	15 (21.1)	206 (19.1)		10 (26.3)	88 (18.8)		5 (15.2)	118 (19.3)	
4–5	8 (11.3)	103 (9.5)		4 (10.5)	46 (9.9)		4 (12.1)	57 (9.3)	
6–8	4 (5.6)	50 (4.6)		2 (5.3)	24 (5.1)		2 (6.1)	26 (4.3)	
Successful quit ^a since baseline	21 (29.6)	226 (20.9)	.09	11 (29.0)	87 (18.6)	.12	10 (30.3)	138 (22.6)	.30
Successful quit, then relapsed	9 (12.7)	95 (8.8)	.27	3 (7.9)	38 (8.1)	1.00 ^b	6 (18.2)	56 (9.2)	.12 ^b
Successful quit with sustained abstinence	12 (16.9)	131 (12.1)	.24	8 (21.1)	49 (10.5)	.06 ^b	4 (12.1)	82 (13.4)	1.00 ^b

^aSuccessful quit defined as no tobacco use within the past 7 days, asked at each interview. *p* values were calculated with chi-square tests unless otherwise noted.

^bFisher's exact test.

Table 2. Quit Methods Among Sexual Minority and Heterosexual Adults in the Tobacco User Adult Cohort Who Made At Least One 24-Hour Quit Attempt (*N* = 659)

	Full sample			Women		Men			
	Sexual minority (<i>n</i> = 47)	Heterosexual (<i>n</i> = 612)	<i>p</i>	Sexual minority (<i>n</i> = 26)	Heterosexual (<i>n</i> = 254)	<i>p</i>	Sexual minority (<i>n</i> = 21)	Heterosexual (<i>n</i> = 358)	<i>p</i>
	<i>n</i> (%)			<i>n</i> (%)			<i>n</i> (%)		
NRT	15 (31.9)	160 (26.1)	.39	8 (30.8)	68 (26.8)	.65	7 (33.3)	92 (25.7)	.45
Tobacco product substitution	13 (27.7)	130 (21.2)	.36	7 (26.9)	55 (21.7)	.62	6 (28.6)	75 (21.0)	.41
Books/pamphlets	3 (6.4)	17 (2.8)	.17	1 (3.9)	8 (3.2)	.59	2 (9.5)	9 (2.5)	.12
Internet/web-based program	3 (6.4)	8 (1.3)	.037	0 (0.0)	4 (1.6)	1.00	3 (14.3)	4 (1.1)	.005
Quit line	2 (4.3)	8 (1.3)	.16	0 (0.0)	2 (0.8)	1.00	2 (9.5)	6 (1.7)	.07
Counseling	1 (2.1)	17 (2.8)	1.00	1 (3.9)	8 (3.2)	.59	0 (0.0)	9 (2.5)	1.00
Quit tobacco clinic	1 (2.1)	3 (0.5)	.26	1 (3.9)	3 (1.2)	.32	0 (0.0)	0 (0.0)	n/a
Videos	1 (2.1)	4 (0.7)	.31	1 (3.9)	2 (0.8)	.25	0 (0.0)	2 (0.6)	1.00

NRT = nicotine replacement therapy. All tests of statistical significance were calculated from Fisher's exact tests.

Bolded *p*-values indicate a statistically significant difference between sexual minority and heterosexual participants (*p* < .05).

Over one in five participants who attempted to quit reported using other tobacco products as a cessation method (SM: 27.7% and heterosexual: 21.2%). Exploratory analyses indicated no statistically significant differences in quit methods by gender.

Motivations for Quitting

Both SM and heterosexual participants reported that their predominant motivations to quit were health related (Supplementary Table 3). These included concerns about future health (SM: 84.2% and heterosexual: 77.1%), current health problems (SM: 57.9% and heterosexual: 60.1%), and having a concerned family member (SM: 57.9% and heterosexual: 44.0%). More SM than heterosexual women reported that physical fitness was a motivation for quitting (72.7% vs. 38.6%, *p* = .049). Cost of tobacco was also a leading quit motivation for SM adults (63.2%).

Discussion

Over 48 months, tobacco users in the TUAC repeatedly attempted to quit smoking, yet few were successful. Almost two-thirds of our sample attempted to quit at least once over 4 years, but only 12.1% of heterosexual and 16.9% of SM tobacco users remained abstinent. Contrary to prior studies in which SM adults reported fewer quit attempts than heterosexuals,⁴ quit rates were similar for heterosexual and SM adults in our sample. Most TUAC participants attempted to quit unassisted (ie, without evidence-based behavioral or pharmacological intervention), which is concerning as 95% of unassisted quit attempts result in relapse.¹⁸ Only one in five SM tobacco users who attempted a quit reported using nicotine replacement therapy, a rate similar to heterosexual adults in our sample and which has been previously reported for SM adults.⁸ Few tobacco users used evidence-based behavioral cessation interventions, regardless of sexual orientation. Yet, more SM men reported using Internet-based programs during a quit attempt. SM adults regularly engage in online health-information seeking^{19,20}; with the highest rates evidenced among gay men.¹⁹ It is possible that online or app-based cessation interventions could effectively reach SM tobacco users. However, given our low overall use of web-based quit methods, more evidence is needed to determine effective strategies for engaging SM tobacco users and increasing uptake of evidence-based cessation programs disseminated online.

One in four SM tobacco users reported using other tobacco products, including e-cigarettes, to help them quit. These rates were

similar for heterosexual tobacco users in our sample. The effectiveness of e-cigarettes for quitting is not supported by substantial evidence.²¹ Recent studies have documented smoking cessation claims in e-cigarette advertising,²² which may mislead tobacco users to believe that e-cigarettes are quit smoking tools. To reduce sexual orientation-related tobacco disparities, evidence is needed to quantify the breadth of targeted e-cigarette marketing to SM tobacco users and how e-cigarette marketing influences tobacco product substitution among SM smokers trying to quit.

Similar to published qualitative evidence,¹⁰ TUAC participants reported that health concerns were a primary driver for quitting tobacco; however, SM adults also cited tobacco costs as a motivation to quit. Family members were a substantial motivator for quitting and, unsurprisingly, SM and heterosexual participants living with a household member who quit using tobacco were more likely to report at least one successful quit. Nonsmoking SM women^{23,24} and SM men who smoke²⁵ have higher tobacco exposure at home than heterosexuals. Given that SM adults who live with a smoker are more likely to use tobacco,²⁴ cessation interventions may need to engage household members to increase successful quitting among SM.

Among participants reporting at least one successful quit, more SM than heterosexual participants reported that a coworker quit smoking and, in gender-stratified analyses, more SM men reported a coworker quit than heterosexual men. This may be explained by gender-based occupation differences. Population-level studies have found that SM adults avoid occupations dominated by members of the same gender; that is, SM men avoid occupations dominated by men and SM women avoid occupations dominated by women.²⁶ In the general population, women are less likely to use tobacco²⁷ and more women may attempt to quit,²⁸⁻³⁰ which could explain why more SM than heterosexual men report exposure to coworkers who quit smoking. Relatedly, more SM women nonsmokers²³ and smokers²⁵ report workplace tobacco exposure than heterosexual women, which may be explained by higher smoking prevalence among men in the general population.²⁷

Implications

Evidence-based strategies are needed to increase successful quitting in SM tobacco users. Generally, patterns of cessation behaviors were similar for heterosexual and SM but methods and motivations varied, suggesting that SM may need tailored cessation interventions. Focusing on the health effects of tobacco use and the health benefits of quitting may be effective strategies to motivate cessation in heterosexual and SM tobacco users. However, health messages

may need tailoring to address gender differences; for example, physical fitness was especially important for SM women in our sample.

Tobacco marketing studies indicate that SM subpopulations vary in their response to tobacco health messages. For example, lesbians rate graphic cigarette health warnings as less effective than heterosexual women, but no differences are evidenced for gay men or bisexual women or men.³¹ The Center for Disease Control Tips from Former Smokers campaign features three stories of SM adults, yet it is not clear how SM tobacco users perceive Tips health messages. As SM subgroups may respond differently to health messaging, pretesting and targeted marketing may be needed for antitobacco campaigns to effectively reach SM tobacco users.

Our results also suggest that cessation interventions might leverage household members to motivate SM tobacco users to quit. Targeted antitobacco communications may feature messages about secondhand smoke risks, as well as how quitting benefits household members' health. For SM adults, interventions that engage tobacco-using household members and increase home restrictions might increase smoking abstinence. Finally, policies that restrict workplace smoking and provide supported cessation for employees, regulation of tobacco marketing, and cost-related factors (eg, pricing, taxation, coupons/discounts) may benefit SM.

Limitations

This study was a subanalysis of a larger cohort of tobacco users and does not represent the US population of SM tobacco users. As participants were not oversampled for sexual orientation, our sample size was small (6.0% of the overall cohort¹¹); consequently, we mostly report pooled data for SM adults, but have included exploratory results stratified by gender. No adjustments were made for multiple comparisons due to the exploratory nature of the analysis. Tobacco use and quit behaviors vary across subgroups of SM adults by sexual identity²; as such, we may have missed subgroup differences in quit behaviors, methods, and motivations. There is also evidence that transgender and non-binary (T/NB) people use tobacco at high rates,³²⁻³⁴ and little is known about quit behaviors in this group. We did not oversample for T/NB tobacco users. Future cohort studies with larger samples of SM and T/NB adults should investigate patterns by gender and sexual orientation. We used 7-day point prevalence abstinence as a primary outcome measure, which may overestimate quitting. However, point prevalence abstinence is highly correlated with sustained smoking abstinence for several months after a quit attempt¹⁷ and is a valid indicator of long term quit success. Self-reported tobacco product use and quit behaviors were not biochemically verified; however, point prevalence is robust to recall bias.¹⁷ It is possible that interviewed participants may have overreported quit behaviors (ie, social desirability bias); however, quit rates in our sample echo annual US population estimates.^{27,30} We did not ask participants about SM culturally specific quit motivations (eg, minority stress, social resistance); asking such questions could reveal unique intervention opportunities for SM. Quit motivations were asked only of participants reporting a successful quit since last interview. Assessing quit motivations among all tobacco users who make 24-hour quit attempts may better inform interventions to encourage SM to make a quit attempt, especially after smoking relapse.

Conclusion

Understanding quit attempts, motivations, and methods used by SM tobacco users is necessary for developing targeted cessation

interventions to increase successful quitting in this tobacco disparities population. Future research is needed to develop effective antitobacco communications to encourage quit attempts among SM tobacco users generally and after smoking relapse. Cessation programs that engage household members or coworkers may increase abstinence in this group.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at <https://academic.oup.com/ntr>.

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Declaration of Interests

None declared.

References

1. Institute of Medicine Committee on Lesbian, Gay, Bisexual, and Transgender Health Issues and Research Gaps and Opportunities. The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding. Washington, DC: National Academies Press; 2011. <http://www.ncbi.nlm.nih.gov/books/NBK64806/>. Accessed January 1, 2021.
2. Li J, Berg CJ, Weber AA, et al. Tobacco use at the intersection of sex and sexual identity in the US, 2007–2020: a meta-analysis. *Am J Prev Med*. 2020;60(3):415–424.
3. Wheldon CW, Kaufman AR, Kasza KA, Moser RP. Tobacco use among adults by sexual orientation: findings from the population assessment of tobacco and health study. *LGBT Health*. 2018;5(1):33–44.
4. Fallin A, Goodin A, Lee YO, Bennett K. Smoking characteristics among lesbian, gay, and bisexual adults. *Prev Med*. 2015;74:123–130.
5. Pizacani BA, Rohde K, Bushore C, et al. Smoking-related knowledge, attitudes and behaviors in the lesbian, gay and bisexual community: a population-based study from the US Pacific Northwest. *Prev Med*. 2009;48(6):555–561.
6. Berger I, Mooney-Somers J. Smoking cessation programs for lesbian, gay, bisexual, transgender, and intersex people: a content-based systematic review. *Nicotine Tob Res*. 2016;19(12):1408–1417.
7. Matthews AK, Steffen A, Kuhns 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. *Nicotine Tob Res*. 2018;21(11):1506–1516.
8. 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(4):496–500.
9. McCabe SE, West BT, Matthews AK, et al. Sexual orientation, tobacco use, and tobacco cessation treatment-seeking: results from a National US Survey. *Behav Med*. 2020;47(2):1–11.
10. 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(1):24–33.
11. Brasky TM, Hinton A, Doogan NJ, et al. Characteristics of the tobacco user adult cohort in urban and rural Ohio. *Tob Regul Sci*. 2018;4(1):614–630.
 12. United States Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, and United States Department of Health and Human Services, Food and Drug Administration, Center for Tobacco Products. *Population Assessment of Tobacco and Health (PATH) Study [United States] Public-Use Files*. Bethesda, MD: Inter-university Consortium for Political and Social Research [distributor]; 2019.
 13. Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerström test for nicotine dependence: a revision of the Fagerstrom Tolerance Questionnaire. *Br J Addict*. 1991;86(9):1119–1127.
 14. Niaura R, Shadel W. Assessment to inform smoking cessation treatment. In: Abrams DB, Niaura R, eds. *The Tobacco Dependence Treatment Handbook: A Guide to Best Practices*. New York, NY: Guilford Press; 2003.
 15. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot*. 1997;12(1):38–48.
 16. Starr G, Rogers T, Schooley M, Porter S, Wiesen E, Jamison N. *Key Outcome Indicators for Evaluating Comprehensive Tobacco Control Programs*. Atlanta, GA: Centers for Disease Control and Prevention; 2005.
 17. Hughes JR, Carpenter MJ, Naud S. Do point prevalence and prolonged abstinence measures produce similar results in smoking cessation studies? A systematic review. *Nicotine Tob Res*. 2010;12(7):756–762.
 18. Fiore MC, Jaén CR, Baker TB, et al. *Treating Tobacco Use and Dependence: 2008 Update*. Rockville, MD: US Department of Health and Human Services; 2008.
 19. Dahlhamer JM, Galinsky AM, Joestl SS, Ward BW. Sexual orientation and health information technology use: a nationally representative study of US adults. *LGBT Health*. 2017;4(2):121–129.
 20. Jabson JM, Patterson JG, Kamen C. Understanding health information seeking on the Internet among sexual minority people: cross-sectional analysis from the health information national trends survey. *JMIR Public Health Surveill*. 2017;3(2):e39.
 21. Kalkhoran S, Glantz SA. E-cigarettes and smoking cessation in real-world and clinical settings: a systematic review and meta-analysis. *Lancet Respir Med*. 2016;4(2):116–128.
 22. Patterson JG, LaPolt DT, Miranda AR, et al. Switching stories: user testimonials on juul.com continue to contradict JUUL's switch ≠ cessation narrative [published online ahead of print November 5, 2020]. *Tob Control*. doi:10.1136/tobaccocontrol-2020-055816.
 23. Cochran SD, Bandiera FC, Mays VM. Sexual orientation-related differences in tobacco use and secondhand smoke exposure among US adults aged 20 to 59 years: 2003–2010 National Health and Nutrition Examination Surveys. *Am J Public Health*. 2013;103(10):1837–1844.
 24. Gamarel KE, Kahler CW, Lee JH, et al. Sexual orientation disparities in smoking vary by sex and household smoking among US adults: findings from the 2003–2012 National Health and Nutrition Examination Surveys. *Prev Med*. 2016;82:1–6.
 25. Wheldon CW, Wiseman KP. Psychological, normative, and environmental barriers to tobacco cessation that disproportionately affect sexual minority tobacco users. *Nicotine Tob Res*. 2021;23(6):1030–1037.
 26. Gorsuch MM. Gender, sexual orientation, and behavioral norms in the labor market. *ILR Rev*. 2019;72(4):927–954.
 27. Creamer MR, Wang TW, Babb S, et al. Tobacco product use and cessation indicators among adults—United States, 2018. *MMWR Morb Mortal Wkly Rep*. 2019;68(45):1013.
 28. Fagan P, Augustson E, Backinger CL, et al. Quit attempts and intention to quit cigarette smoking among young adults in the United States. *Am J Public Health*. 2007;97(8):1412–1420.
 29. Henley SJ, Asman K, Momin B, et al. Smoking cessation behaviors among older US adults. *Prev Med Rep*. 2019;16:100978.
 30. 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(52):1457–1464.
 31. Tan AS, Bigman CA, Nagler RH, Minsky S, Viswanath K. Comparing perceived effectiveness of FDA-proposed cigarette packaging graphic health warnings between sexual and gender minorities and heterosexual adults. *Cancer Causes Control*. 2017;28(10):1143–1155.
 32. Wheldon CW, Wiseman KP. Tobacco use among transgender and gender non-conforming adults in the United States. *Tob Use Insights*. 2019;12:1179173X19849419.
 33. Buchtig FO, Emory KT, Kim Y, Fagan P, Vera LE, Emery S. Transgender use of cigarettes, cigars, and e-cigarettes in a national study. *Am J Prev Med*. 2017;53(1):e1–e7.
 34. Kcomt L, Evans-Polce RJ, Veliz PT, Boyd CJ, McCabe SE. Use of cigarettes and e-cigarettes/vaping among transgender people: results from the 2015 US Transgender Survey. *Am J Prev Med*. 2020;59(4):538–547.