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Similarities and Differences in Substance Use Patterns Among Lesbian, Gay, Bisexual, and Heterosexual Mexican Adult Smokers

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Abstract

Purpose: This study aimed to characterize the patterns of smoking, e-cigarette use, other substance use (alcohol and marijuana), and depression by sexual orientation in a sample of Mexican adult smokers.
Methods: Data came from a 2018–2020 (six waves) online survey of adult smokers, recruited from a commercial research panel (92.5% heterosexual, $n = 4786$; 3.1% lesbian/gay, $n = 160$; and 4.4% bisexual, $n = 229$). After stratifying the data by sex, logistic, multinomial, and linear logistic regression models were estimated (depending on the outcome), including as independent variables sexual orientation (i.e., gay/lesbian, bisexual, heterosexual = Reference), age, education, household income, and wave.
Results: Being a gay male was independently associated with greater smoking dependence ($\beta = 0.20$; 95% confidence interval [CI]: 0.02 to 0.39), greater likelihood of preference for flavored capsule cigarettes (adjusted odds ratio [AOR] = 2.10, 95% CI: 1.33 to 3.28), and depression diagnosis (AOR = 2.85, 95% CI: 1.64 to 4.95). Bisexual males had higher e-cigarette dependence ($\beta = 0.37$; 95% CI: 0.05 to 0.68, among dual users only) and were more likely to have been diagnosed with depression (AOR = 2.34, 95% CI: 1.30 to 4.18). Lesbian females were more likely to prefer menthol cigarettes (AOR = 3.32, 95% CI: 1.60 to 6.86), to have used marijuana more than once (AOR = 3.23, 95% CI: 1.83 to 5.72), and to have depressive symptoms (AOR = 1.85, 95% CI: 1.04 to 3.29). Bisexual females had a greater likelihood of depressive symptoms (AOR = 1.71, 95% CI: 1.14 to 2.56) and depression diagnosis (AOR = 2.22, 95% CI: 1.43 to 3.42).
Conclusion: Lesbian, gay, and bisexual adult smokers in Mexico appear more likely than heterosexual adult smokers to report having depression. Substance use and depression among sexual minority populations need to be addressed further.

Keywords: depression, sexual minorities, sexual orientation, substance use, tobacco use

Introduction

Disparities in substance use are increasingly evident among people from sexual minority (SM) groups who identify as lesbian, gay, or bisexual (LGB) people.[1–4] Studies conducted in high-income countries (HICs) have found that LGB people are more likely to smoke cigarettes, use a hookah, use smokeless tobacco, use e-cigarettes, and concurrently use cigarettes and e-cigarettes than their heterosexual peers.[5–9] SM people in HICs are also more likely to binge drink and consume marijuana, as well as other illicit drugs.[6,10–12] The one study to describe tobacco product use among SM adults

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in low- or middle-income countries (LMICs) was in Brazil,[13] finding some similar patterns to those in HICs. This study aims to expand understanding of substance use in LMICs by examining patterns of use by sexual orientation among adult smokers in Mexico.

A systematic review of research mostly published in HICs identified depression, stress, alcohol consumption, and victimization as common risk factors for smoking among SM groups and the general population.[2] Unique risk factors for SM groups include homophobia and reactions to disclosure of sexual orientation.[2] Furthermore, people who identify as LGB have been found to be more likely than those who identify as heterosexual to report impaired mental health as a result of ''minority stress,''[14] which can lead to a variety of negative health-related behaviors.

In the United States, LGB adults are also more likely than heterosexual adults to use substances besides tobacco products, such as alcohol and illicit drugs.[1,10] For example, among young LGB adults, bars and nightclubs are strongly linked to binge drinking and the use of other tobacco products in this group.[6] Likewise, LGB adults are more likely to use marijuana,[12] to engage in heavy alcohol consumption,[7] and to smoke more frequently[7] than heterosexual adults. Although use of a range of substances appears to be higher among SM groups in HICs, we are unaware of any studies that have evaluated specific patterns of substance use among SM adult smokers. Nevertheless, as substance use often co-occurs,[15,16] we expect that the prevalence of use will be higher among smokers than among nonsmokers. However, differential patterns of use among smokers and e-cigarette users, including use of other substances, have not been studied extensively in any LMICs.

Study context

In 2015, Mexico had a population of 120 million.[17] In a national survey on discrimination,[18] 3.2% of adults reported feeling discriminated against because of their sexual orientation.[18] Among SM adults, 20.2% reported being discriminated against due to their sexual orientation, and 23.3% of older SM adults reported unjustifiable denial of their rights, such as medical care, medications, or social services.[18,19]

Mexico is unique compared to other countries where patterns of smoking and e-cigarette use have been studied. Mexico bans e-cigarettes, the same as most Latin American countries and, increasingly, LMICs around the world.[20] Furthermore, smoking patterns in Mexico and Central America[21,22] are generally more variable and lighter than in HICs, yet it is unclear whether this pattern varies based on sexual orientation. To address the lack of understanding in this area, the current study evaluates the similarities and differences in patterns of smoking, e-cigarette use, substance use (alcohol and marijuana), and depression by sexual orientation in a sample of Mexican adult smokers.

Methods

Data were analyzed from six waves of an open, longitudinal cohort study with Mexican adult smokers who either exclusively smoke or who concurrently use e-cigarettes (i.e., ''dual users'') with surveys conducted every 4 months from November 2018 to July 2020.

Procedure

In each of six separate survey waves (wave 1, $n=1501$; wave 2, $n=1500$; wave 3, $n=1501$; wave 4, $n=1504$; wave 5, $n=1499$; and wave 6, $n=1501$), participants were recruited through an online consumer panel for marketing research, applying an educational quota (at least 500 recruited with high school education or lower attainment) and a quota for current e-cigarette use (at least 500 recruited), with an average response rate of 31.2%.

The panel provider maintained participant contact information and for 2 weeks emailed participants from the prior survey wave to resurvey them; however, due to loss to follow-up, new participants were also recruited to maintain a sample size of 1500 at each wave. The present study includes data only from the first survey to which participants responded (wave 1, $n=1501$; wave 2, $n=1035$; wave 3, $n=799$; wave 4, $n=703$, wave 5, $n=631$; wave 6, $n=667$).

All questions were administered in Spanish using standard questions[23,24] that have been previously pretested and used in Mexico.[25,26] The survey was anonymous, took approximately 20–25 minutes to complete, and upon completion, the survey company gifted participants standard incentives (e.g., gift card). Participants provided an electronic informed consent before undertaking the survey; the informed consent was approved along with all the study's protocols by the Institutional Review Board and Ethics Committee of the National Institute of Public Health of Mexico.

Measures

Sexual orientation. Participants reported their biological sex (male or female) and sexual orientation (heterosexual, gay/lesbian, bisexual, other, or prefer not to answer), and those who self-identified as other ($n=47$) or preferred not to answer ($n=114$) were excluded from the analysis.

Smoking, e-cigarette use, and other substance use. Participants' responses to questions regarding combustible cigarette use in the last 30 days were applied to determine their frequency of use: (1) nondaily smoker; (2) daily smoker, ≤5 cigarettes per day (CPD); and (3) daily smoker, >5 CPD. Among daily smokers, 5 CPD is the median among Mexican smokers.[27,28] Those who reported that they also had used e-cigarettes in the last 30 days were classified as ''dual users.''

Other smoking-related variables included attempts to quit smoking in the last 4 months (yes vs. no) and intention to quit smoking within the next 6 months (yes vs. no). Preferred cigarette variety was determined by asking ''What brand are you currently smoking or did you smoke most recently?'' after which participants were shown pictures of their preferred brand's varieties and asked ''Which variety of this brand is your favorite or did you use most recently?'' Their responses were classified into three categories: normal cigarette (without flavor), menthol cigarette, and cigarette with flavor capsule, which is an increasingly popular new tobacco product in Mexico and the rest of Latin America.[29,30] Participants also reported binge drinking in the last month (more than six drinks at one sitting, yes vs. no) and marijuana, using the question: ''In the last month, how often have you used marijuana/cannabis, in any forms?'' (none; once; more than once).

Smoking and e-cigarette dependence. The Heaviness of Smoking Index (HSI) is a composite measure of CPD (0–10, 11–20, 21–30, or >30) and minutes to first cigarette after waking (≤5, 6–30, 31–60, or >60), with higher scores (range of 0–6) signifying greater nicotine dependence.[31] Smoking dependence was also measured with 10 items selected from the Brief Wisconsin Inventory of Smoking Dependence Motives scale.[32] Questions were selected based on pilot research indicating that they could discriminate between relatively low levels of smoking frequency (>10 CPD; ≤10 CPD; nondaily) among U.S. smokers of Mexican ancestry, as Mexicans have relatively light smoking patterns, with less than half smoking daily.[33] In our sample, reliability was high (alpha = 0.96). Ten parallel items adapted to measure e-cigarette dependence among dual users also had high reliability (alpha = 0.94).[34]

Depression. Symptoms of depression were assessed using the 2-item Patient Health Questionnaire (PHQ-2); the two questions were as follows ''During the last two weeks, have you been often bothered by feeling down, depressed, or hopeless?,'' and ''During the last two weeks, have you often been bothered by little interest or pleasure in doing things?'' (not at all, several days, more than half the days, nearly all the days), with a PHQ-2 cutoff score of 3 (range = 0–6) as indicative of depressive symptoms.[35] In addition, self-reported medical diagnosis or treatment of depression was measured with a single question ''Are you currently being treated, or have you been treated, or diagnosed (current diagnosis) with depression?'' (yes vs. no).[36] Based on responses to these questions, participants were classified into three mutually exclusive categories: (1) no diagnosis or recent symptoms[37]; (2) depressive symptoms in the last 2 weeks; and (3) self-reported medical diagnosis of depression.

Demographic variables. Participants reported their age (i.e., 18–29, 30–39, 40–49, 50+ years old), highest educational attainment (high school graduate or less, some college, college degree or higher), and monthly household income in Mexican pesos (i.e., ≤$8000; $8001–$15,000; $15,001–$20,000; >$20,000; don't know), where the exchange rate was ~$20 pesos to $1 U.S. dollar over the data collection period.

Statistical analyses

Of the 9006 observations across the six surveys, 5336 were from the first-time participants who took the survey and they comprised the initial analytic sample for this study. After eliminating 161 participants with missing data on study variables (3.0% of the sample), the final analytic sample included 5175 smokers.

After stratifying the data by biological sex (female, male), differences in study variables by sexual orientation were evaluated using chi-square tests for categorical variables and one-way analysis of variance for continuous outcomes. Logistic models regressed having recently attempted to quit smoking (vs. no), intentions to quit (vs. no), exclusive smoking (vs. dual use), and binge drinking in the last month (vs. no). Multinomial models regressed smoking frequency (daily ≤5 CPD, daily >5 CPD vs. nondaily), preferred cigarette type (menthol cigarette, flavor capsule cigarette vs. cigarette combustion without capsule), last month marijuana use (once, more than once vs. none), and depression (depressive symptoms in the last 2 weeks, self-reported medical diagnosis of depression vs. no). Linear regression models were estimated with HSI, smoking dependence, and, among dual users, e-cigarette dependence. All models were adjusted for age, educational attainment, household income, and wave. Finally, we reestimated all the models with substance use outcomes as dependent variables while also adjusting for depression, finding that the results were consistent in terms of statistical significance, coefficient valence, and interpretation (Supplementary Tables S1–S3); hence, we do not report these results. The analyses were performed using STATA 14.[38]

Results

Of the 5175 smokers newly recruited for this study, almost half (48.0%) identified as female (Table 1), among whom 2.6% identified as lesbian ($n = 65$) and 5.9% identified as bisexual ($n = 146$). Among male participants, 3.5% ($n = 95$) identified as gay and 3.1% ($n = 83$) as bisexual. Overall, SM smokers tended to be younger (18–29 years old), especially those who identified as lesbian (65%) or bisexual (69% among females and 62% among males). Lesbian and bisexual females had higher prevalence of depressive symptoms in the last 2 weeks (35.4% and 32.2%, respectively), and bisexual females had higher depression diagnosis (26.0%) than other female smokers. Gay and bisexual males had higher prevalence of depressive symptoms in the last 2 weeks (28.4% and 26.5%, respectively). Patterns of tobacco product use were generally comparable across groups, except for less frequent smoking among SM females. In addition, lesbian females had more frequent marijuana use than other female groups. SM status was not associated with quit attempts, quit intentions, e-cigarette use, and binge drinking (Table 2).

In adjusted multinomial models (Table 3), gay male smokers were more likely than heterosexual male smokers to prefer cigarettes with flavor capsules (adjusted odds ratio [AOR] = 2.10; 95% confidence interval [CI]: 1.33 to 3.28). Among female smokers, lesbian smokers were more likely to prefer menthol cigarettes (AOR = 3.32; 95% CI: 1.60 to 6.86). Lesbian smokers also were more likely to have used marijuana more than once in the last month (AOR = 3.23; 95% CI: 1.83 to 5.72) and report depressive symptoms in the last 2 weeks (AOR = 1.85; 95% CI: 1.04 to 3.29) compared with heterosexual female smokers (Table 4). Bisexual females were more likely than heterosexual females to report depressive symptoms (AOR = 1.71; 95% CI: 1.14 to 2.56) and having been diagnosed with depression (AOR = 2.22; 95% CI: 1.43 to 3.42). This association with depression diagnosis was also found when comparing gay males (AOR = 2.85; 95% CI: 1.64 to 4.95) and bisexual males (AOR = 2.34; 95% CI: 1.30 to 4.18, respectively) with their heterosexual counterparts.

In adjusted linear models (Table 5), gay male smokers had higher smoking dependence ($\beta = 0.20$; 95% CI: 0.02 to 0.39), and bisexual male dual users had higher e-cigarette dependence ($\beta = 0.37$; 95% CI: 0.05 to 0.68) than their heterosexual counterparts.

Discussion

Our study of Mexican smokers found that LGB cigarette smokers had patterns of tobacco product use that were

Table 1. Sample Characteristics by Sex and Sexual Orientation Among Adult Smokers and E-Cigarette Users in Mexico

	Female, n = *2484*				*Male,* n = *2691*			
	Heterosexual	*Lesbian*	*Bisexual*		*Heterosexual*	*Gay*	*Bisexual*	
	n = *2273*	n = *65*	n = *146*		n = *2513*	n = *95*	n = *83*	
	%	%	%	p	%	%	%	p
Age, years								
18–29	36.3	64.6	69.2	<0.001[a]	35.4	48.4	61.5	<0.001[a]
30–39	30.3	23.1	22.6		32.0	23.2	16.9	
40–49	16.2	6.2	6.2		17.4	13.7	14.5	
50 or more	17.2	6.2	2.1		15.3	14.7	7.3	
Education attainment								
High school graduate or less	49.5	44.6	41.1	<0.001[a]	39.7	41.1	42.2	0.557[a]
Some college	20.2	32.3	37.7		23.7	29.5	21.7	
College degree or higher	30.3	23.1	21.2		36.6	29.5	36.1	
Household income (MX pesos)								
≤$8000	26.1	43.1	35.6	<0.001[a]	21.8	30.5	28.9	0.008[a]
$8001–$15,000	27.3	30.8	30.1		29.3	30.5	37.4	
$15,001–$20,000	16.1	16.9	13.0		18.6	16.8	3.6	
More than $20,000	24.7	6.2	15.8		27.1	22.1	27.7	
Don't know	5.8	3.1	5.5		3.2	0.0	2.4	
Recent attempt to quit (last 4 months)								
Yes	45.6	50.0	41.6	0.508[a]	41.9	40.2	47.4	0.581[a]
Intention to quit (next 6 months)								
Yes	37.4	40.3	36.5	0.871[a]	38.5	32.6	41.0	0.463[a]
Smoking/e-cigarette use status								
Exclusive smoker	67.2	68.9	69.8	0.818[a]	62.5	68.1	55.3	0.231[a]
Dual user	32.8	31.2	30.2		37.5	31.9	44.7	
Binge drinking in the last month								
Yes	16.5	23.1	15.8	0.357[a]	27.7	30.5	15.7	0.042[a]
Smoking frequency								
Nondaily	57.2	77.4	68.6	<0.001[a]	54.1	51.1	64.1	0.461[a]
Daily ≤5 CPD	21.4	11.3	19.0		20.2	22.8	15.4	
Daily >5 CPD	21.4	11.3	12.4		25.8	26.1	20.5	
Preferred cigarette type								
Combustion (without capsule)	43.6	30.5	43.3	0.036[a]	64.1	47.7	65.3	0.007[a]
Menthol cigarette	12.0	23.7	9.0		7.3	6.8	2.7	
Flavor capsule cigarette	44.4	45.8	47.8		28.7	45.5	32.0	
Marijuana use in the last month								
None	79.6	58.5	70.6	<0.001[a]	73.8	69.5	63.9	0.205[a]
Once	9.9	7.7	14.4		11.3	11.6	18.1	
More than once	10.4	33.9	15.1		14.9	19.0	18.1	
Depression								
No	60.5	44.6	41.8	<0.001[a]	64.5	49.5	51.8	<0.001[a]
Depressive symptoms in the last 2 weeks[b]	24.6	35.4	32.2		25.8	28.4	26.5	
Self-reported medical diagnosis of depression	14.9	20.0	26.0		9.7	22.1	21.7	
Heaviness of Smoking Index[c]	1.18 (1.33)	0.42 (0.85)	1.27 (1.50)	0.077[d]	1.20 (1.30)	1.26 (1.58)	1.07 (1.18)	0.120[d]
Smoking dependence[c]	2.77 (0.98)	2.72 (0.86)	2.73 (0.96)	0.419[d]	2.69 (0.91)	2.87 (0.86)	2.76 (0.92)	0.799[d]
E-cigarette dependence[c]	2.60 (1.02)	2.44 (1.02)	2.31 (1.05)	0.938[d]	2.52 (0.98)	2.62 (1.13)	2.81 (0.95)	0.518[d]

[a]Pearson chi-squared test.
[b]Assessed with the PHQ-2 ≥ 3.
[c]Mean (standard deviation).
[d]One-way ANOVA, Bonferroni.
ANOVA, analysis of variance; CPD, cigarettes per day; MX pesos, Mexican pesos; PHQ-2, 2-item Patient Health Questionnaire.

Table 2. Prevalence and Logistic Adjusted Odds Ratios for Quit Attempts, Intention to Quit, Exclusive Smoker Versus Dual User, and Binge Drinking by Sex and Sexual Orientation

	Recent attempts to quit vs. no (Ref.)			*Intention to quit vs. no (Ref.)*			*Exclusive smoker vs. dual user (Ref.)*			*Binge drinking in the last month vs. no (Ref.)*		
	%	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*
Female												
Heterosexual	45.6	1.00		37.4	1.00		67.2	1.00		16.5	1.00	
Lesbian	50.0	0.96	0.58 to 1.59	40.3	0.95	0.56 to 1.60	68.9	0.87	0.49 to 1.55	23.1	1.13	0.67 to 1.89
Bisexual	41.6	1.33	0.93 to 1.90	36.5	1.12	0.77 to 1.61	69.8	0.75	0.50 to 1.12	15.8	1.00	0.69 to 1.41
Male												
Heterosexual	41.9	1.00		38.5	1.00		62.5	1.00		27.7	1.00	
Gay	40.2	1.15	0.75 to 1.77	32.6	1.39	0.88 to 2.16	68.1	0.77	0.47 to 1.24	30.5	1.09	0.71 to 1.65
Bisexual	47.4	0.83	0.52 to 1.32	41.0	0.94	0.59 to 1.50	55.3	1.17	0.71 to 1.91	15.7	0.71	0.45 to 1.12

% Unadjusted prevalence. Models adjusted for age, educational attainment, household income, and wave.
AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category.

generally similar to their heterosexual counterparts, regardless of whether they were male or female. Nevertheless, some differences appear to distinguish LGB adult smokers and heterosexual adult smokers. For example, our findings point to greater use of flavored cigarettes among SM people (i.e., lesbian smokers were 3.3 times more likely to use menthol cigarettes; gay males were 2 times more likely to use flavor capsule cigarettes) consistent with studies of menthol cigarette use in HICs.[39] No other studies have evaluated LGB Mexican smokers' preferences for flavor capsules, a relatively recent innovation that allows smokers to crush a capsule in the filter that flavors the smoke. This product innovation has taken off in Latin America, including in Mexico where almost half of smokers prefer them over traditional combustible cigarettes.[40] Although preference for flavor capsules is higher among Mexican females than males,[29,41] our sex-stratified analyses suggest that preference for capsules is relatively higher only among gay males but not among other SM groups.

Our findings suggest that nicotine dependence may be higher among gay males in Mexico. This finding is inconsistent with some prior research in HICs, which has found higher smoking dependence among bisexual males and lesbian or bisexual females relative to their heterosexual counterparts.[1,42] When we examined e-cigarette dependence among dual users, we found that dependence was higher among bisexual males than their heterosexual counterparts. To our knowledge, no other studies have evaluated e-cigarette dependence in the LGB population, highlighting the importance of this study given that research on e-cigarette dependence, in general, is in the initial stages.[43] Furthermore, our finding is in the context of Mexico having banned e-cigarettes, as in most other Latin American countries and, increasingly, around the world.[20]

We found that the prevalence of binge drinking in the last month was similar across SM groups, although it was slightly higher than in a previous survey of Mexican SM people.[44] In general, our results are in line with findings about heavy alcohol consumption among LGB people.[7] The lack of differences between SM and heterosexual smokers may be due to a relatively high prevalence of binge drinking in the general population of Mexico,[45] which future research should evaluate.

We also found that lesbian female smokers were more likely to have used marijuana more than once in the last month compared with heterosexual female smokers. One study found that 70% of gay/bisexual men and lesbian/bisexual females

Table 3. Prevalence and Multinomial Adjusted Odds Ratios for Smoking Frequency and Preferred Cigarette Type by Sex and Sexual Orientation

	Cigarette consumption: daily ≤5 CPD vs. nondaily (Ref.)			*Cigarette consumption: daily >5 CPD vs. nondaily (Ref.)*			*Preferred menthol cigarette vs. combustion cigarette without capsule (Ref.)*			*Preferred cigarette with flavor capsules vs. combustion cigarette without capsule (Ref.)*		
	%	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*
Female												
Heterosexual	21.4	1.00		21.4	1.00		12.0	1.00		44.4	1.00	
Lesbian	11.3	0.49	0.21 to 1.10	11.3	0.63	0.27 to 1.45	23.7	**3.32**	1.60 to 6.86	45.8	1.35	0.73 to 2.48
Bisexual	19.0	1.00	0.63 to 1.58	12.4	0.85	0.49 to 1.49	9.0	0.81	0.42 to 1.55	47.8	0.97	0.66 to 1.40
Male												
Heterosexual	20.2	1.00		25.8	1.00		7.3	1.00		28.7	1.00	
Gay	22.8	1.34	0.78 to 2.28	26.1	1.30	0.77 to 2.20	6.8	1.23	0.51 to 2.94	45.5	**2.10**	1.33 to 3.28
Bisexual	15.4	0.73	0.38 to 1.40	20.5	0.87	0.48 to 1.58	2.7	0.31	0.07 to 1.33	32.0	1.05	0.63 to 1.74

Bolded AORs are statistically significant ($p < 0.001$). % Unadjusted prevalence. Models adjusted for age, educational attainment, household income, and wave.

Table 4. Prevalence and Multinomial Adjusted Odds Ratios for Marijuana Use, Depressive Symptoms, and Diagnosis or Treatment of Depression by Sex and Sexual Orientation

	Marijuana use once in the last month vs. none (Ref.)			*Marijuana use more than once in the last month vs. none (Ref.)*			*Depressive symptoms in the last 2 weeks vs. no (Ref.)*			*Self-reported medical diagnosis or treatment of depression vs. no (Ref.)*		
	%	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*	*%*	*AOR*	*95% CI*
Female												
Heterosexual	9.9	1.00		10.4	1.00		24.6	1.00		14.9	1.00	
Lesbian	7.7	0.89	0.34 to 2.31	33.9	**3.23*****	1.83 to 5.72	35.4	**1.85***	1.04 to 3.29	20.0	1.60	0.82 to 3.14
Bisexual	14.4	1.31	0.79 to 2.17	15.1	1.10	0.67 to 1.80	32.2	**1.71****	1.14 to 2.56	26.0	**2.22*****	1.43 to 3.42
Male												
Heterosexual	11.3	1.00		14.9	1.00		25.8	1.00		9.7	1.00	
Gay	11.6	0.99	0.52 to 1.93	19.0	1.24	0.72 to 2.16	28.4	1.48	0.90 to 2.43	22.1	**2.85***	1.64 to 4.95
Bisexual	18.1	1.54	0.84 to 2.80	18.1	1.08	0.59 to 1.97	26.5	1.22	0.71 to 2.08	21.7	**2.34****	1.30 to 4.18

Bolded AORs are statistically significant. % Unadjusted prevalence. Models adjusted for age, educational attainment, household income, and wave.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

report marijuana use ever in their lifetimes.[44] Studies in HICs have found that concomitant consumption of alcohol and marijuana is strongly associated with current smoking.[15,16] Normalization of alcohol and drug use in LGB groups' social contexts may account for this clustering of substance use behaviors.[6] In addition, ''minority stress'' or unique stressors due to homophobia, discrimination, or violence associated with being a SM person may help explain why LGB populations are more likely to consume multiple substances.[14,16,46,47]

Consistent with the ''minority stress'' hypothesis and studies from HICs,[2,48] we found that smokers who identify as gay or bisexual males or bisexual females were more likely to self-report major diagnosis of or treatment for depression compared with their heterosexual counterparts; furthermore lesbian and bisexual smokers were more likely to report depressive symptoms.[2] Indeed, one study of adults in the United States found that binge drinking and being diagnosed with a depressive disorder were more common among LGB adults compared with heterosexual adults.[49] Illicit drug abuse, excessive alcohol use, and major depressive disorder appear more likely to co-occur among bisexual individuals than other SM groups.[48] Nevertheless, when we adjusted for depression in our models that assessed substance use (tobacco, alcohol, marijuana) (Supplementary Tables S1–S3), the results were consistent with those presented in the tables. This suggests that depression, at least as we measured it, does not explain differential patterns of substance use among SM smokers in Mexico.

Strengths and limitations

There are several limitations to this study. Our convenience sample was drawn from an online panel that was assembled for market research with key consumer segments in Mexico. Hence, it is not representative of the general population of smokers, particularly as we over-represented younger smokers, those from higher socioeconomic status, and smokers who also use e-cigarettes.[22] However, we do consider our sample to be reasonably representative of the broader population of smokers who live in urban areas of Mexico. Our survey did not measure factors that may explain differing patterns of substance use in SM groups (e.g., internalized homophobia)[4,11,12]; hence, we can only infer that these variables may explain our findings.

Table 5. Adjusted Linear Regression Models for Heaviness of Smoking Index, Smoking Dependence, and E-Cigarette Dependence by Sex and Sexual Orientation

	Heaviness of Smoking Index			*Smoking dependence*			*E-cigarette dependence*		
Variables	*Mean*	*Coefficient*	*95% CI*	*Mean*	*Coefficient*	*95% CI*	*Mean*	*Coefficient*	*95% CI*
Female									
Heterosexual	1.18	Ref.		2.77	Ref.		2.60	Ref.	
Lesbian	0.42	−0.69	−1.40 to 0.19	2.72	0.05	−0.19 to 0.29	2.44	−0.01	−0.44 to 0.41
Bisexual	1.27	0.22	−0.19 to 0.63	2.73	0.04	−0.13 to 0.20	2.31	−0.20	−0.49 to 0.09
Male									
Heterosexual	1.20	Ref.		2.69	Ref.		2.52	Ref.	
Gay	1.26	0.13	−0.27 to 0.52	2.87	**0.20**	0.02 to 0.39	2.62	0.11	−0.24 to 0.46
Bisexual	1.07	−0.17	−0.66 to 0.33	2.76	0.10	−0.10 to 0.30	2.81	**0.37**	0.05 to 0.68

Bolded coefficients are statistically significant ($p < 0.05$). Models adjusted for age, educational attainment, household income, and wave.

Another study limitation was the measurement of depression, which relied on brief self-report measures of diagnosis and depressive symptoms. Although these measures have been validated,[36] more comprehensive assessment is likely necessary to better understand the role of depression in substance use for SM groups. Furthermore, gender identity beyond the binary categories of ''male'' or ''female'' was not evaluated and merits future research. Direct comparisons between our study and those from more representative surveys are only tentative; nevertheless, our results provide early evidence of substance use patterns among smokers with different sexual orientations in Mexico, a LMIC where the sale and distribution of e-cigarettes and marijuana are banned.[50]

Conclusions

Similar to other studies of SM people, we found that LGB smokers in Mexico appear more likely than heterosexual smokers to report having depression. In addition, gay and bisexual male smokers reported higher smoking and e-cigarette dependence, respectively, than their heterosexual counterparts. We also found some evidence of greater preference for flavored cigarettes among LGB smokers, particularly use of menthol cigarettes among lesbian females and flavor capsule cigarettes among gay males. In sum, our results suggest that substance use and depression among Mexican LGB populations need to be addressed. Documenting health disparities between SM and heterosexual smokers is only the first step in addressing health inequalities based on sexual orientation. Questions about sexual orientation should be included in national surveys, while also considering evaluation of homophobia, discrimination, and stigma that are likely to affect mental health and its relationship with substance abuse.

Authors' Contributions

R.R.-B., C.G.-R., and J.F.T. contributed to the conception and design of the study, analysis, and interpretation of data and writing and revising the article critically for important intellectual content. L.C.-J. and K.G.-C. conducted the statistical analyses and interpretation and drafted sections of the article. E.A.-S. and I.B.-G. implemented data collection and conducted a literature review and critical revision of the article. A.T. made a substantial contribution to the interpretation of data for the work and revised the work critically for important intellectual content. All authors reviewed and approved the article before submission.

Disclaimer

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Author Disclosure Statement

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Supplementary Material

Supplementary Table S1
Supplementary Table S2
Supplementary Table S3

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