

Sexual Orientation Disparities in Prescription Opioid Misuse Among U.S. Adults



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Introduction: The opioid epidemic in the U.S. continues to increase in severity, and misuse of prescription opioids is of particular concern since it commonly precedes heroin use. This study examined whether sexual orientation (i.e., sexual identity and sexual attraction) is a risk factor for prescription opioid misuse and use disorder among a nationally representative sample of adults in the U.S.

Methods: This study used data from adult participants (ages ≥ 18 years) in the 2015 National Survey on Drug Use and Health. Chi-square tests and logistic regression examined how sexual identity and sexual attraction relate to past-year and past-month prescription opioid misuse and past-year prescription opioid use disorder. Multivariable models examined associations controlling for demographic characteristics and other drug use. Gender-stratified analyses were also conducted. Data were analyzed in 2018.

Results: In multivariable analyses, compared with those identifying as heterosexual, bisexual individuals were at 1.53 (95% CI=1.20, 1.97) and 1.66 (95% CI=1.14, 2.42) higher odds of reporting past-year and past-month misuse, respectively. In stratified analyses, female bisexuals remained at high risk. Regarding sexual attraction, compared with being attracted to only the opposite sex, being attracted to mostly the opposite sex (AOR=2.15, 95% CI=1.77, 2.63) or being equally attracted to both sexes (AOR=1.78, 95% CI=1.38, 2.30) were associated with higher odds for past-year opioid misuse. In stratified analyses, these associations were limited to females.

Conclusions: Sexual orientation disparities in opioid misuse and use disorder among a nationally representative sample of U.S. adults was found.

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INTRODUCTION

Although prescription opioids (including painkillers such as morphine, oxycodone, and hydrocodone) have beneficial medical uses including pain treatment, their ability to produce euphoria and the intense withdrawal symptoms that users may experience with discontinuation have contributed to a public health crisis of opioid misuse and use disorder. According to the Centers for Disease Control and Prevention, opioids are involved in more overdose deaths than any other drug.¹ The rate of drug overdose deaths involving opioids increased on average by 13% per year from 1999 to 2009.² Prescription opioid misuse (commonly referred to as nonmedical use) has become particularly problematic in recent years as many users who

become dependent on prescription opioids eventually resort to intravenous heroin use,^{3–5} which has dangerous associated risks of bacteremia, HIV, and hepatitis C virus.^{6–8} Opioid misuse and dependence have received significant media attention. In March 2018, President Trump announced a national opioid epidemic, declaring it a public health emergency, and proposed allocating

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new funding of \$3 billion in 2018 and \$10 billion in 2019 to HHS.⁹

Sexual minorities, including lesbian, gay, and bisexual (LGB) adolescents and adults, have been found to be more likely to report recent substance use (such as marijuana and cocaine) as well as substance use disorders.^{10–19} Regarding prescription opioid misuse, a study conducted among a sample of 596 LGB youth in Los Angeles, California, and New York, New York, found that LGB youth were more likely to report misuse of prescription opioids and initiated misuse earlier than did their heterosexual counterparts.²⁰ Emerging research has examined disparities in opioid misuse among adults.^{21–23} A recent study conducted among electronic dance music party attendees in New York City found that compared with individuals identifying as heterosexual, those identifying as gay/lesbian had decreased odds of reporting current nonmedical opioid misuse, and also reported use of fewer opioid products. By contrast, identifying as bisexual/other sexuality was associated with using more types of opioids.²¹

No studies, to the authors' knowledge, have examined whether there are potential sexual orientation differences in opioid misuse among a national sample of U.S. adults. Although various studies have examined sexual orientation disparities in substance use among sexual minority populations as previously discussed, many samples are limited to non-population based LGB samples.¹⁰ Therefore, a nationally representative sample is needed in order to help better determine more accurate estimates of risk in LGB populations. In addition, most of these non-nationally representative studies have defined sexual orientation as either sexual identity or sexual attraction,¹⁰ which is not a comprehensive assessment of sexual orientation–related disparities. Sexual identity and sexual attraction are distinct constructs and it is important to examine both. Sexual identity labels reflect societal concepts of sexuality, whereas sexual attraction refers to experiencing sexual or romantic feelings for people of particular gender identities. Sexual identity may not encompass the full scope of all existing sexual minorities.²⁴ By contrast, sexual attraction has been shown to capture the largest cross section of individuals, likely closing the gaps left in sexual orientation by measures of sexual identity alone.²⁵ As such, the purpose of the current study is to examine sexual orientation (including both sexual identity and sexual attraction) differences in prescription opioid misuse and prescription opioid use disorder among a nationally representative sample of adults in the U.S.

METHODS

Study Population

Data from the 2015 publicly available National Survey on Drug Use and Health (NSDUH) were analyzed, which is the first year that NSDUH included items asking about sexual identity and attraction. NSDUH is an ongoing cross-sectional survey of non-institutionalized individuals in the 50 U.S. states and the District of Columbia. Data are derived from a nationally representative probability sample of populations living in households; non-institutional group quarters (e.g., dormitories); and shelters, obtained through four stages. Surveys were administered via computer-assisted interviewing conducted by an interviewer and audio computer-assisted self-interviewing (ACASI). Sample weights were provided by NSDUH to address unit- and individual-level nonresponse. Further information on sampling and survey methods can be found elsewhere.²⁶ The weighted interview response rate was 69.7%. A two-sample strategy was used in order to avoid multicollinearity in models because there is extensive overlap between sexual identity and sexual attraction. For example, 94% of those identifying as heterosexual also reported being only attracted to the opposite sex. This study focuses on adults who provided data on sexual identity ($n=42,802$) or sexual attraction ($n=42,356$).

Measures

Sexual identity and sexual attraction were queried among adults, age ≥ 18 years. For sexual identity, participants were asked, *Which one of the following do you consider yourself to be?* and answer options were *heterosexual, that is, straight; lesbian or gay; and bisexual*. For sexual attraction, it was first explained to participants that *People are different in their sexual attraction to other people* and then asked, *Which statement best describes your feelings?* Answer options were *I am only attracted to opposite sex, I am mostly attracted to opposite sex, I am equally attracted to males and females, I am mostly attracted to same sex, and I am only attracted to same sex*. Participants were also able to report that they were *not sure, don't know, or refuse*. Only 1.7% and 1.6% chose such answer options for sexual identity and sexual attraction, respectively, and these cases were removed from analyses.

Participants were asked about misuse of prescription pain reliever (opioid) drugs. They were reminded that they were not being asked about over-the-counter pain relievers, such as aspirin, Advil, Tylenol, or Aleve, and they were presented images and names of multiple products and formulations of prescription opioid pills. They were then asked about misuse of listed pills. Misuse was defined as using without one's own prescription; using in greater amounts, more often, or for longer than directed; or use in any way not directed by a doctor.²⁷ NSDUH provided imputation-revised variables indicating past-year (past 12-month) misuse and past-month (past 30-day) misuse based on participants' responses about 38 different opioid products/formulations. Both past-month and past-year opioid misuse were analyzed to provide a comprehensive investigation of misuse in this understudied population. Participants also answered a series of questions that determined whether criteria were met for opioid abuse or dependence via questions from the DSM-IV.²⁸ Although not a diagnostic interview, this provided a proxy diagnosis for opioid use disorder, defined as abuse or dependence in the past year.

Participants were also asked their age, gender, race/ethnicity, education, marital status, annual family income, whether they

receive government assistance, and their past-year use of marijuana, cocaine, methamphetamine, and prescription tranquilizer misuse. NSDUH also provided a variable indicating population density where the participant resides. These covariates were selected to be consistent with past research.^{29,30}

Statistical Analysis

Descriptive statistics were first examined to estimate the weighted prevalence of sexual identity, sexual attraction, past-year prescription opioid misuse, past-month prescription opioid misuse, and past-year prescription opioid use disorder among adults. Then, sexual identity and sexual attraction were compared according to the three opioid use variables using chi-square analyses. Next, separate binary logistic regressions were computed examining how sexual identity and sexual attraction relate to each of the three outcomes: past-year prescription opioid misuse, past-month prescription opioid misuse, and past-year prescription opioid use disorder. Each model was first conducted in a bivariable manner (without covariates), and then in a multivariable manner controlling for demographic characteristics and past-year use of other drugs even when bivariable tests were not significant. All analyses were then repeated stratified by gender, given documented gender differences in substance use.³¹ Analyses were weighted to account for the complex survey design using Stata SE, version 13, which used Taylor series estimation methods to provide accurate SEs.³² Statistical significance was determined by 95% CIs and *p*-values < 0.05. This secondary data analysis was exempt for review by the New York University Langone Medical Center Institutional Review Board (IRB). These data were analyzed in 2018.

RESULTS

Table 1 presents sample characteristics according to sexual identity. The majority (95.6%) of the sample identified as heterosexual (95% CI=95.3, 95.8); 1.8% (95% CI=1.7, 2.0) identified as gay/lesbian, and 2.6% (95% CI=2.4, 2.8) identified as bisexual. **Table 2** presents sample characteristics according to sexual attraction. The majority (90.0%) of participants also reported only being attracted to the opposite sex (95% CI=89.5, 90.4); 5.0% (95% CI=4.7, 5.3) reported being mostly attracted to the opposite sex, 2.6% (95% CI=2.4, 2.8) reported being equally attracted to both sexes, 0.9% (95% CI=0.7, 1.0) reported being attracted to mostly the same sex, and 1.6% (95% CI=1.5%, 1.8%) reported being attracted only to the same sex. Regarding prescription opioid misuse, 4.7% (95% CI=4.5, 5.0) of the sample reported misuse in the past year; 1.4% (95% CI=1.3, 1.6) reported misuse in the past month; and 0.8% (95% CI=0.7, 0.9) reported prescription opioid use disorder in the past year.

Table 3 shows the prevalence of prescription opioid misuse and opioid use disorder by sexual identity. The prevalence of past-year opioid misuse was lowest (4.5%) among heterosexuals, 8.6% among gay-identified individuals, and highest (12.0%) among bisexual individuals (*p* < 0.001). Similar patterns were found for past-month

opioid misuse and past-year opioid use disorder (*p* < 0.001). When stratified by gender, significant differences were similar among females; however, among males, there was no significant difference in past-month misuse, and there was a higher prevalence of past-year misuse among gay males than among bisexual and heterosexual males.

With regard to sexual attraction, prevalence of past-year misuse was lowest (4.4%) among those attracted only to the opposite sex and highest (9.0%) among those mostly attracted to the opposite sex. Differences were similar for both past-month misuse and past-year use disorder. When stratified by gender, differences for all three outcomes remained significant for females, but significance was lost for all three comparisons among males.

Table 4 shows results from logistic regression analyses examining associations between sexual orientation and past-year prescription opioid misuse, past-month prescription opioid misuse, and past-year prescription opioid use disorder. Identifying as bisexual remained a relatively consistent risk factor for past-year misuse and past-month misuse while controlling for demographics and other drug use. Specifically, bisexual individuals were at 1.53 (95% CI=1.20, 1.97) and 1.66 (95% CI=1.14, 2.42) higher odds than were heterosexual individuals of reporting past-year misuse and past-month misuse, respectively. When stratified by gender, these associations remained strong among bisexual females but disappeared among males. Sexual minority participants were at increased odds for use disorder in these models, but significance disappeared when controlling for other variables.

With regard to sexual attraction (**Table 4**), being attracted mostly to the opposite sex was a consistent risk factor for past-year prescription misuse and use disorder, and being equally attracted to both sexes was a risk factor for past-year misuse. Specifically, individuals reporting being attracted mostly to the opposite sex were at 1.40 (95% CI=1.12, 1.75) and 1.73 (95% CI=1.06, 2.83) higher odds than were heterosexuals of reporting past-year misuse and use disorder, respectively. Individuals reporting being equally attracted to both sexes were at 1.41 (95% CI=1.07, 1.85) higher odds than were heterosexuals of reporting past-year misuse. Among females, results were similar for past-year misuse and use disorder (*p* < 0.05), and being equally attracted to both sexes or mostly attracted to the same sex was a risk factor for past-month misuse. No associations held in multivariable models stratifying analyses for males. **Appendix Table 1** presents results from multivariable logistic regression models examining how each demographic and drug use covariate relate to each of the three opioid misuse outcome variables.

Table 1. Sample Characteristics and Characteristics According to Sexual Identity (N=42,802)

Characteristics	Full sample, % (95% CI) (N=42,802)	Heterosexual, % (95% CI) (n=40,154)	Gay/lesbian, % (95% CI) (n=900)	Bisexual, % (95% CI) (n=1,748)
Age, years				
18–25	14.4 (14.0, 14.9)	13.7 (13.2, 14.1)**	20.0 (16.9, 23.4)	38.8 (35.5, 42.3)
26–34	15.8 (15.2, 16.3)	15.4 (14.9, 16.0)	21.6 (18.1, 25.5)	23.1 (20.6, 25.9)
35–49	24.8 (24.2, 25.4)	25.0 (24.4, 25.7)	21.7 (18.2, 25.6)	19.7 (16.8, 23.0)
≥ 50	45.0 (44.1, 45.9)	45.9 (24.4, 46.8)	36.8 (30.7, 43.3)	18.3 (15.0, 22.1)
Sex				
Male	48.4 (47.6, 49.2)	48.8 (48.0, 49.6)**	56.5 (50.2, 62.6)	28.4 (24.8, 32.2)
Female	51.6 (50.8, 52.4)	51.2 (50.4, 52.0)	43.5 (37.4, 49.8)	71.6 (67.8, 75.2)
Race/ethnicity				
White	65.3 (64.3, 66.3)	65.6 (64.5, 66.5)*	62.8 (58.3, 67.2)	58.5 (54.6, 62.3)
Black	11.8 (11.2, 12.4)	11.7 (11.2, 12.3)	12.5 (10.5, 14.9)	13.3 (11.0, 15.9)
Hispanic	15.3 (14.7, 16.0)	15.2 (14.5, 15.9)	18.4 (15.0, 22.3)	17.9 (15.6, 20.5)
Asian/other	7.6 (7.2, 8.1)	7.6 (7.2, 8.0)	6.2 (4.5, 8.7)	10.3 (7.9, 13.3)
Education				
Less than high school	13.7 (13.2, 14.2)	13.7 (13.2, 14.2)**	10.3 (7.6, 14.0)	16.3 (14.2, 18.7)
High school diploma	25.4 (24.6, 26.2)	25.5 (24.7, 26.4)	17.1 (13.2, 21.8)	27.2 (24.7, 29.9)
Some college	30.8 (30.1, 31.5)	30.7 (30.0, 31.5)	31.8 (28.3, 35.6)	33.8 (30.5, 37.2)
College degree or higher	30.1 (29.2, 31.0)	30.1 (29.2, 31.0)	40.8 (36.4, 45.3)	22.7 (19.8, 25.9)
Relationship status				
Married	52.7 (51.9, 53.5)	54.1 (53.3, 54.8)**	16.1 (12.3, 20.7)	27.6 (24.2, 31.4)
Widowed	6.2 (5.8, 6.6)	6.3 (5.9, 6.7)	3.2 (1.8, 5.8)	3.1 (2.2, 4.5)
Divorced	14.0 (13.5, 14.6)	14.0 (13.5, 14.6)	11.9 (9.2, 15.3)	14.0 (10.7, 18.0)
Never married	27.1 (26.6, 27.7)	25.6 (25.0, 26.1)	68.8 (64.2, 73.1)	55.3 (52.1, 58.4)
Annual family income				
< \$20,000	17.6 (17.1, 18.2)	17.2 (16.6, 17.8)**	23.0 (19.0, 27.6)	30.6 (27.5, 33.8)
\$20,000–\$49,999	30.0 (29.2, 30.7)	29.9 (29.1, 30.7)	26.8 (23.5, 30.4)	33.3 (30.7, 35.9)
\$50,000–\$74,999	16.7 (16.1, 17.3)	16.7 (16.1, 17.4)	19.4 (15.7, 23.7)	14.1 (11.8, 16.8)
≥ \$75,000	35.7 (34.8, 36.6)	36.1 (35.2, 37.1)	30.8 (27.0, 34.8)	22.1 (19.0, 25.5)
Population density				
Large MSA	54.4 (53.3, 55.5)	54.1 (52.9, 55.3)*	60.8 (55.1, 66.3)	60.5 (57.3, 63.5)
Small MSA	30.3 (29.2, 31.4)	30.4 (29.3, 31.5)	28.4 (24.2, 32.9)	27.1 (24.1, 30.4)
Non-MSA	15.3 (14.6, 16.0)	15.5 (14.8, 16.2)	10.8 (7.4, 15.4)	12.4 (10.4, 14.8)
Government assistance recipient	19.6 (19.0, 20.2)	19.1 (18.5, 19.7)**	24.7 (20.5, 29.5)	34.2 (30.2, 38.6)
Past-year drug use				
Marijuana	13.8 (13.2, 14.4)	13.0 (12.4, 13.6)**	27.8 (23.2, 32.8)	33.8 (30.7, 37.0)
Cocaine	2.0 (1.8, 2.2)	1.8 (1.6, 2.0)**	4.5 (2.8, 7.1)	5.6 (4.3, 7.3)
Methamphetamine	0.7 (0.6, 0.8)	0.6 (0.5, 0.7)**	2.7 (1.3, 5.4)	2.2 (1.4, 3.3)
Tranquilizers (misuse)	2.4 (2.2, 2.6)	2.2 (2.0, 2.4)**	4.9 (3.2, 7.2)	7.1 (5.6, 9.0)
Sexual attraction				
Only opposite sex	90.0 (89.5, 90.4)	93.7 (93.3, 94.1)**	2.0 (1.1, 3.8)	10.4 (7.9, 13.6)
Mostly opposite sex	5.0 (4.7, 5.3)	4.4 (4.1, 4.7)	2.9 (1.4, 5.9)	30.6 (27.3, 34.1)
Equal to both sexes	2.5 (2.3, 2.8)	1.3 (1.1, 1.6)	2.3 (1.3, 4.0)	50.4 (47.3, 53.6)
Mostly same sex	0.9 (0.7, 1.0)	0.1 (0.1, 0.2)	28.5 (23.9, 33.6)	8.1 (6.2, 10.6)
Only same sex	1.6 (1.5, 1.8)	0.5 (0.4, 0.6)	64.3 (59.0, 69.3)	0.4 (0.2, 1.1)

Note: Boldface indicates statistical significance (* $p < 0.01$; ** $p < 0.001$). White and black participants were identified as non-Hispanic. MSA, metropolitan statistical area.

DISCUSSION

This is the first study to examine sexual orientation differences in prescription opioid misuse among a

nationally representative sample of U.S. adults. Results of these analyses suggest sexual orientation disparities in self-reported opioid misuse and use disorder. Female

Table 2. Sample Characteristics According to Sexual Attraction (N=42,356)

Characteristics	Only opposite sex, % (95% CI) (n=37,150)	Mostly opposite sex, % (95% CI) (n=2,718)	Equal to both sexes, % (95% CI) (n=1,335)	Mostly same sex, % (95% CI) (n=411)	Only same sex, % (95% CI) (n=742)
Age, years					
18–25	13.5 (13.1, 13.9)**	23.9 (22.1, 25.8)	24.8 (21.9, 27.9)	21.4 (16.9, 26.7)	17.1 (14.6, 19.9)
26–34	15.3 (14.8, 15.9)	22.5 (20.5, 24.7)	17.1 (14.2, 20.4)	21.5 (16.2, 27.9)	18.2 (15.0, 21.9)
35–49	25.6 (24.9, 26.3)	22.7 (20.8, 24.8)	13.2 (11.0, 15.6)	18.5 (13.9, 24.3)	21.8 (17.8, 26.5)
≥ 50	45.6 (44.6, 46.6)	30.9 (27.7, 34.3)	45.0 (39.4, 50.8)	38.6 (31.0, 46.8)	42.9 (37.9, 48.0)
Sex					
Male	49.9 (49.1, 50.7)**	32.6 (30.0, 35.4)	23.9 (19.7, 28.7)	45.3 (38.9, 51.7)	57.8 (51.4, 64.0)
Female	50.1 (49.3, 50.9)	67.4 (64.6, 70.0)	76.1 (71.3, 80.3)	54.7 (48.3, 61.1)	42.2 (36.0, 48.6)
Race/ethnicity					
White	65.4 (64.3, 66.4)**	66.1 (62.8, 69.2)	62.3 (58.2, 66.1)	62.2 (55.6, 68.3)	69.9 (64.9, 74.5)
Black	11.9 (11.2, 12.5)	9.5 (8.2, 11.0)	11.8 (9.7, 14.3)	15.1 (11.1, 20.1)	10.2 (7.8, 13.2)
Hispanic	15.6 (14.9, 16.3)	14.8 (12.4, 17.5)	13.1 (10.8, 15.9)	17.2 (12.4, 23.3)	14.8 (11.5, 19.0)
Asian/other	7.2 (6.9, 7.6)	9.7 (7.6, 12.1)	12.8 (10.0, 16.3)	5.6 (3.7, 8.4)	5.1 (3.4, 7.6)
Education					
Less than high school	13.6 (13.0, 14.2)**	14.2 (11.6, 17.2)	15.2 (12.9, 17.9)	10.9 (7.5, 15.8)	11.7 (8.5, 15.9)
High school diploma	25.6 (24.8, 26.5)	19.5 (17.1, 22.2)	32.2 (27.7, 37.0)	19.4 (13.1, 27.6)	17.9 (14.3, 22.2)
Some college	31.0 (30.2, 31.7)	31.1 (28.2, 34.1)	29.1 (25.9, 32.5)	34.7 (28.0, 42.1)	30.0 (25.2, 35.3)
College degree or higher	29.8 (29.0, 30.7)	35.3 (31.7, 39.0)	23.5 (19.4, 28.2)	35.0 (28.8, 41.8)	40.5 (34.7, 46.5)
Relationship status					
Married	54.8 (54.0, 55.6)**	40.8 (37.5, 44.1)	37.9 (32.9, 43.2)	20.3 (14.7, 27.2)	25.6 (20.9, 30.9)
Widowed	5.9 (5.5, 6.4)	5.5 (3.9, 7.6)	12.9 (9.8, 16.7)	5.4 (3.0, 9.5)	3.8 (2.2, 6.4)
Divorced	14.1 (13.5, 14.7)	14.4 (12.0, 17.2)	12.1 (9.1, 15.9)	13.1 (7.9, 20.9)	11.7 (9.1, 15.0)
Never married	25.2 (24.6, 25.8)	39.4 (36.4, 42.4)	37.1 (32.5, 42.0)	61.3 (54.0, 68.2)	58.9 (54.0, 63.7)
Annual family income					
< \$20,000	16.9 (16.2, 17.5)**	22.1 (19.2, 25.3)	28.2 (24.6, 32.2)	24.6 (19.6, 30.4)	19.7 (15.7, 24.4)
\$20,000–\$49,999	29.7 (28.8, 30.6)	29.2 (26.8, 31.7)	38.0 (34.1, 42.1)	29.7 (23.6, 36.6)	30.7 (26.6, 35.1)
\$50,000–\$74,999	16.8 (16.2, 17.4)	14.9 (12.6, 17.5)	14.1 (11.1, 17.8)	21.7 (15.2, 30.0)	17.4 (13.5, 22.3)
≥ \$75,000	36.6 (35.7, 37.6)	33.9 (30.9, 37.0)	19.6 (16.3, 23.4)	24.1 (18.6, 30.5)	32.2 (27.5, 37.3)
Population density					
Large MSA	53.9 (52.7, 55.1)*	59.7 (56.7, 62.6)	56.0 (51.1, 60.7)	60.4 (54.2, 66.2)	58.5 (53.0, 63.8)
Small MSA	30.5 (29.4, 31.6)	28.7 (26.1, 31.4)	29.5 (25.3, 34.2)	25.0 (19.1, 32.0)	30.6 (25.0, 36.9)
Non-MSA	15.6 (14.9, 16.3)	11.7 (10.0, 13.5)	14.5 (11.9, 17.6)	14.6 (9.4, 22.1)	10.9 (7.7, 15.2)
Government assistance recipient	19.2 (18.6, 19.8)**	23.1 (20.5, 25.9)	24.6 (21.0, 28.6)	19.1 (14.8, 24.2)	23.5 (18.6, 29.1)
Past-year drug use					
Marijuana	12.6 (12.1, 13.2)**	29.0 (26.4, 31.7)	19.6 (16.7, 22.8)	25.2 (19.7, 31.7)	23.5 (18.7, 29.1)
Cocaine	1.7 (1.6, 1.9)**	4.7 (3.6, 6.0)	2.6 (1.8, 3.9)	4.2 (2.2, 7.7)	3.7 (2.3, 5.9)
Methamphetamine	0.6 (0.5, 0.7)**	1.0 (0.8, 1.4)	1.7 (0.9, 3.3)	0.6 (0.2, 2.1)	2.9 (1.4, 5.8)
Tranquilizers (misuse)	2.1 (1.9, 2.3)**	5.4 (4.2, 6.9)	4.2 (2.9, 6.0)	3.7 (1.6, 8.1)	5.1 (3.2, 7.9)
Sexual identity					
Heterosexual	99.7 (99.6, 99.7)**	83.7 (81.7, 85.5)	48.7 (42.7, 54.7)	15.5 (10.9, 21.6)	27.6 (23.4, 32.4)
Gay/lesbian	0.0 (0.0, 0.1)	1.1 (0.5, 2.2)	1.6 (0.9, 2.9)	60.7 (53.6, 67.3)	71.7 (67.0, 76.0)
Bisexual	0.3 (0.2, 0.4)	15.3 (13.5, 17.3)	49.7 (44.1, 55.3)	23.8 (18.3, 30.4)	0.6 (0.3, 1.6)

Note: Boldface indicates statistical significance (**p* < 0.01; ***p* < 0.001). White and black participants were identified as non-Hispanic. MSA, metropolitan statistical area.

respondents identifying as bisexual or with attraction “mostly” to the opposite sex or “equally” to both sexes were especially more likely to report opioid misuse or

use disorder. This study’s findings add to the literature and are consistent with existing studies on substance use among sexual minorities. Several studies have shown

Table 3. Prescription Opioid Misuse and Prescription Opioid Use Disorder by Sexual Orientation in U.S. Adults

Characteristics	Past-year opioid misuse, % (95% CI)	Past-month opioid misuse, % (95% CI)	Past-year opioid use disorder, % (95% CI)
Sexual identity			
Full sample			
Heterosexual	4.5 (4.2, 4.7)**	1.3 (1.2, 1.5)**	0.7 (0.7, 0.8)**
Gay/lesbian	8.6 (6.6, 11.2)	1.7 (1.0, 2.9)	1.8 (0.9, 3.4)
Bisexual	12.0 (10.2, 14.0)	4.4 (3.3, 5.8)	2.2 (1.5, 3.3)
Males			
Heterosexual	5.3 (4.9, 5.8)*	1.6 (1.4, 1.9)	1.0 (0.8, 1.1)*
Gay	10.0 (6.6, 14.9)	1.4 (0.7, 2.8)	2.4 (1.1, 4.8)
Bisexual	8.3 (5.3, 12.7)	2.4 (1.1, 5.2)	2.7 (1.1, 5.8)
Females			
Heterosexual	3.7 (3.4, 4.0)**	1.0 (0.9, 1.2)**	0.5 (0.4, 0.7)**
Lesbian	6.8 (4.8, 9.5)	2.1 (0.9, 4.8)	1.0 (0.4, 2.6)
Bisexual	13.5 (11.4, 15.9)	5.1 (3.8, 6.9)	2.1 (1.5, 2.9)
Sexual attraction			
Full sample			
Only opposite sex	4.4 (4.1, 4.6)**	1.3 (1.2, 1.5)**	0.7 (0.6, 0.8)**
Mostly opposite sex	9.0 (7.6, 10.6)	2.6 (2.0, 3.4)	1.8 (1.2, 2.6)
Equal to both sexes	7.5 (5.9, 9.5)	2.6 (1.7, 3.9)	1.0 (0.6, 1.8)
Mostly same sex	7.8 (5.1, 11.7)	1.8 (0.9, 3.3)	1.0 (0.3, 1.8)
Only same sex	6.9 (4.9, 9.7)	1.4 (0.7, 2.7)	1.5 (0.7, 3.4)
Males			
Only opposite sex	5.3 (4.9, 5.8)	1.7 (1.4, 1.9)	1.0 (0.8, 1.1)
Mostly opposite sex	7.8 (5.1, 11.7)	2.3 (1.4, 3.8)	1.9 (0.9, 3.9)
Equal to both sexes	6.3 (3.6, 10.7)	0.8 (0.2, 2.7)	1.1 (0.3, 3.4)
Mostly same sex	8.2 (4.0, 16.0)	0.2 (0.0, 1.9)	1.0 (0.1, 6.9)
Only same sex	8.2 (5.0, 6.0)	1.2 (0.6, 2.6)	2.2 (1.0, 4.8)
Females			
Only opposite sex	3.4 (3.2, 3.8)**	1.0 (0.8, 1.2)**	0.5 (0.4, 0.6)**
Mostly opposite sex	9.5 (7.9, 11.5)	2.8 (2.0, 3.8)	1.7 (1.1, 2.7)
Equal to both sexes	7.9 (6.2, 10.0)	3.1 (2.0, 5.0)	1.0 (0.5, 1.9)
Mostly same sex	7.4 (4.9, 11.0)	3.0 (1.5, 5.7)	1.0 (0.3, 3.7)
Only same sex	5.2 (2.8, 9.2)	1.7 (0.6, 4.9)	0.6 (0.1, 2.4)

Note: Boldface indicates statistical significance (* $p < 0.01$; ** $p < 0.001$).

that LGB individuals have higher odds of substance use than their heterosexual counterparts,^{10–19} including emerging research on opioid misuse.^{20,21,33}

This study's finding of disproportionate prescription opioid misuse among bisexually identified females and females who report not being exclusively attracted to males is also consistent with trends in the literature suggesting increased alcohol and substance use (such as smoking and illegal drug use) in bisexual females.^{34,35} For example, results from a study among an undergraduate sample of women showed greater prevalence of smoking and illegal drug use in bisexual women as compared with heterosexual women.³⁴ In addition, a recent study conducted among electronic dance music party attendees in New York City found that identifying as

bisexual/other sexuality was associated with using more types of opioids, whereas identifying as gay/lesbian was associated with decreased odds of current opioid misuse and with misuse of fewer opioids.²¹

The minority stress model may explain some of the differences in substance use among sexual minority individuals.^{36–39} This model postulates that members of minority groups tend to experience a greater degree of stress because of personal and vicarious experiences of stigma and discrimination, and that this additional stress may predispose individuals to increased rates of maladaptive coping behaviors, including substance use.^{40,41} Minority stress is particularly relevant for bisexual females: in not fully belonging to either “straight” or “lesbian” circles, they may experience both homophobia

Table 4. Associations Between Sexual Orientation, Prescription Opioid Misuse, and Prescription Opioid Use Disorder in U.S. Adults

Characteristics	Past-year opioid misuse		Past-month opioid misuse		Past-year opioid use disorder	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Sexual identity						
Full sample						
Heterosexual	1.00	1.00	1.00	1.00	1.00	1.00
Gay/lesbian	2.01 (1.51, 2.69)***	1.27 (0.88, 1.83)	1.28 (0.73, 2.25)	0.78 (0.46, 1.31)	2.37 (1.19, 4.72)*	1.44 (0.65, 3.19)
Bisexual	2.91 (2.43, 3.49)***	1.53 (1.20, 1.97)**	3.37 (2.47, 4.59)***	1.66 (1.14, 2.42)**	3.05 (2.02, 4.58)***	1.51 (0.91, 2.51)
Males						
Heterosexual	1.00	1.00	1.00	1.00	1.00	1.00
Gay	1.98 (1.28, 3.06)**	1.39 (0.74, 2.58)	0.84 (0.40, 1.78)	0.61 (0.27, 1.36)	2.47 (1.16, 5.23)*	1.87 (0.78, 4.47)
Bisexual	1.61 (1.01, 2.55)*	1.03 (0.65, 1.63)	1.46 (0.65, 3.32)	1.11 (0.48, 2.55)	2.82 (1.23, 6.45)*	1.97 (0.79, 4.92)
Females						
Heterosexual	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	1.92 (1.31, 2.81)**	1.13 (0.80, 1.60)	2.06 (0.86, 4.96)	1.17 (0.56, 2.41)	1.84 (0.71, 4.73)	1.03 (0.29, 3.66)
Bisexual	4.10 (3.27, 5.15)***	1.82 (1.36, 2.45)***	5.15 (3.63, 7.30)***	2.11 (1.37, 3.26)**	3.90 (2.66, 5.71)***	1.25 (0.73, 2.14)
Sexual attraction						
Full sample						
Only opposite sex	1.00	1.00	1.00	1.00	1.00	1.00
Mostly opposite sex	2.15 (1.77, 2.63)***	1.40 (1.12, 1.75)**	1.99 (1.50, 2.65)***	1.22 (0.87, 1.70)	2.42 (1.58, 3.69)***	1.73 (1.06, 2.83)*
Equal to both sexes	1.78 (1.38, 2.30)***	1.41 (1.07, 1.85)*	1.98 (1.26, 3.11)**	1.46 (0.90, 2.38)	1.39 (0.78, 2.49)	1.06 (0.54, 2.08)
Mostly same sex	1.84 (1.17, 2.89)**	1.43 (0.84, 2.46)	1.32 (0.68, 2.60)	1.19 (0.58, 2.45)	1.37 (0.42, 4.53)	1.33 (0.36, 4.87)
Only same sex	1.63 (1.14, 2.33)**	1.01 (0.63, 1.62)	1.06 (0.52, 2.15)	0.63 (0.34, 1.18)	2.09 (0.92, 4.70)	1.22 (0.52, 2.86)
Males						
Only opposite sex	1.00	1.00	1.00	1.00	1.00	1.00
Mostly opposite sex	1.51 (0.95, 2.39)	1.09 (0.66, 1.80)	1.40 (0.79, 2.47)	1.04 (0.55, 1.99)	1.95 (0.90, 4.26)	1.61 (0.67, 3.89)
Equal to both sexes	1.19 (0.66, 2.17)	1.28 (0.66, 2.47)	0.49 (0.14, 1.67)	0.57 (0.17, 1.92)	1.11 (0.35, 3.48)	1.27 (0.39, 4.10)
Mostly same sex	1.59 (0.75, 3.37)	1.39 (0.53, 3.66)	0.14 (0.02, 1.16)	0.16 (0.02, 1.24)	1.03 (0.14, 7.79)	1.12 (0.13, 9.89)
Only same sex	1.60 (0.95, 2.68)	1.13 (0.54, 2.35)	0.73 (0.33, 1.60)	0.56 (0.23, 1.37)	2.31 (1.03, 5.15)*	1.78 (0.80, 3.98)
Females						
Only opposite sex	1.00	1.00	1.00	1.00	1.00	1.00
Mostly opposite sex	2.97 (2.37, 3.72)***	1.66 (1.26, 2.16)***	2.80 (2.00, 3.93)***	1.41 (0.99, 2.02)	3.41 (1.96, 5.94)***	1.85 (1.00, 3.41)*
Equal to both sexes	2.41 (1.82, 3.19)***	1.58 (1.19, 2.09)**	3.21 (1.93, 5.34)***	2.01 (1.18, 3.41)*	2.00 (1.07, 3.75)*	0.90 (0.41, 1.97)
Mostly same sex	2.24 (1.41, 3.57)**	1.62 (0.94, 2.79)	3.06 (1.51, 6.18)**	2.43 (1.13, 5.22)*	2.03 (0.52, 7.59)	1.42 (0.28, 7.08)
Only same sex	1.53 (0.81, 2.90)	0.86 (0.53, 1.41)	1.69 (0.54, 5.29)	0.87 (0.37, 2.03)	1.16 (0.28, 4.88)	0.62 (0.12, 3.26)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Sexual orientation and sexual attraction were independent variables in separate models. Adjusted models controlled for age, gender, race/ethnicity, education, marital status, annual family income, population density, whether or not the participant receives government assistance, and past-year use of marijuana, cocaine, methamphetamine, and tranquilizer misuse.

from heterosexual individuals and biphobia from lesbians, compounding stress while not providing the kind of community-driven support that can alleviate stigma and discrimination.^{42–45} This contention could explain why bisexual females had a greater likelihood for opioid misuse than their peers even though females overall tend to have lower rates of opioid misuse and opioid-related deaths than males.^{2,27} Intersectionality theory also might help illuminate how different identities can combine to produce different types of stress and strategies for managing that stress,^{46,47} which could explain why associations were not observed among males.

Future research should continue to examine differences in opioid misuse by sexual orientation, including to address more detailed explanations for why bisexually identified and attracted females may be at increased risk. Future research should also examine differences among gender minorities, given that transgender and gender-non-conforming individuals have elevated rates of substance use.⁴⁸ These individuals may suffer from higher rates of opioid misuse because of gender minority stress.

A major strength of this study was the use of a nationally representative sample. Many studies of sexual minority health use convenience samples, which can introduce sampling bias.^{49,50} In contrast to this predominant approach in LGB health research, data used in the current study are from a population-based sample of adults in the U.S. An additional strength is that this study had an adequate sample size of sexual minorities to detect meaningful effects in opioid misuse and opioid use disorder.

Limitations

First, this study relied on self-reported data and as such may be subject to recall bias and social desirability bias. However, NSDUH is unique in that labeled images of pills are shown to aid in recognition/memory and ACASI is used to help protect privacy and promote honest reporting. Therefore, these data may be subject to less bias. Another limitation is that the trichotomous sexual identity variable may be too simple as sexual identity is complex (and sometimes fluid), so some individuals may not truly identify with one of the three categories queried. In addition, misuse is sometimes overreported or confused with medical use. However, the 2015 NSDUH survey updated its wording and definitions to help ensure that participants understood the definition of misuse. Because this was a cross-sectional study, it could not examine trends in differences in opioid misuse by sexual orientation nor was it designed to assess the reasons underpinning why certain groups may be more or less likely to misuse opioids. Furthermore, this study does not include all populations (e.g.,

institutionalized), and adolescents (age 12–17 years) were not asked about sexual identity or attraction, so they could not be included. For example, the survey excludes homeless people who do not use shelters, military personnel on active duty, and residents of institutional group quarters, such as jails and hospitals. Finally, this study did not include heroin use with the prescription opioid misuse variables in order to keep the results more straightforward. Heroin use was very rare in this sample (e.g., 0.1% [$n=91$] using in the past month) and adding past-month heroin users to past-month prescription opioid misusers, for example, would not have had an effect on prevalence (which would increase from 1.4% to 1.5%). Extensive sensitivity analyses were conducted and all bivariable and multivariable models were nearly identical (regarding direction and significance) with or without heroin included in opioid variables, so study authors are confident that the omission of heroin did not affect study findings.

CONCLUSIONS

This study found sexual orientation disparities in opioid misuse among a nationally representative sample of adults in the U.S. Female respondents identifying as bisexual or having attraction “mostly” to the opposite sex or “equally” to both sexes were especially more likely to report prescription opioid misuse or use disorder. Therefore, proven prevention and treatment efforts for opioid misuse and opioid use disorder (e.g., methadone, buprenorphine) can and should be offered more comprehensively to sexual minority individuals, especially bisexual females. Beyond these intervention strategies, the authors believe users and potential users need to be better educated about the potential dangers associated with misuse of opioids. For example, many sexual minority individuals are already experienced with a variety of drugs,^{10–19} but while many of these drugs can in fact be dangerous, users of these drugs may underestimate the addictive potential of opioids. Thus, better education may be needed for such populations who are already possibly highly experienced with other drugs, and harm reduction information and resources are needed for those who are already using.

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All authors are responsible for this reported research. D.T. Duncan and J.J. Palamar conceptualized and designed the study, and J.J. Palamar conducted the statistical analyses. D.T. Duncan, S. Zweig, H.R. Hambrick, and J.J. Palamar drafted the initial manuscript. All authors interpreted results, and critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

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SUPPLEMENTAL MATERIAL

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