Differential Decline in Illicit Drug Use by Sexual Identity Among United States High School Students, 2005–2017

Dylan Felt,¹ Xinzi Wang, MA,¹ Megan M. Ruprecht,¹ Blair Turner, MPH,¹ Lauren B. Beach, PhD/JD,¹ Morgan Mari Philbin, PhD,² Michelle Birkett, PhD,¹ and Gregory Phillips II, PhD, MS¹

Abstract

Purpose: Adolescent drug use remains a significant public health concern. Sexual minority youth (SMY) are at elevated risk for illicit drug use compared with their heterosexual peers. We investigated this pattern at the national level, exploring whether trends and disparities in drug use vary over time and by sexual identity.

Methods: This study used Youth Risk Behavior Survey (YRBS) data, which were collected at seven time points from 2005 to 2017. Trends and disparities over time in the use of five drugs, as well as any drug use, were analyzed by self-reported sexual identity.

Results: The results demonstrated a general decrease in drug use behaviors from 2005 to 2017. The greatest number of significant decreases was among heterosexual and bisexual students; the fewest were among gay and lesbian students. Disparities between heterosexual youth and SMY persisted across years, and were greater for gay and lesbian students in 2017 than for bisexual and not-sure youth.

Conclusions: Our results represent the most comprehensive analysis of recent trends in drug use by sexual identity to date. Disparities in drug use remained significant despite overall downward trends within our sample. The significant decreases among bisexual students are not readily explained. We emphasize the need for ongoing research in this area, particularly given the currently volatile social position of sexual minority populations in the United States, and for culturally responsive and trauma-informed responses to SMY drug use.

Keywords: disparities, drug use, sexual minority, trends, youth, Youth Risk Behavior Survey

Introduction

DRUG USE AMONG adolescents remains a significant public health concern. 2019 data from the Monitoring the Future study estimated that 14.2% of high school-aged youth nationwide had used illicit drugs (excluding marijuana) in their lifetime, the same prevalence as in 2018.¹ Adolescent drug use is associated with detrimental developmental and health risks that have implications across the lifecourse.² Given these concerns, it is important to track trends in the prevalence of drug use over time to ensure that population-level patterns are well understood, especially for illicit drugs, including cocaine, inhalants, methamphetamines, heroin, and MDMA (methylenedioxymethamphetamine; more commonly known as “Ecstasy” or “Molly”). Through better understanding of population-level trends, we can ensure that targeted research approaches and intervention designs are responsive to areas of greatest overall need.

There are apparent disparities in drug use between sexual minority (e.g., lesbian, gay, bisexual [LGB]) and sexual majority (i.e., heterosexual) populations regardless of age.^{3–11} Among youth, this disparity is particularly notable; one meta-analysis concluded that the odds of substance use were, overall, 190% higher for LGB youth; the effect size was even higher for some subpopulations, with sexual minority girls and bisexual individuals being particularly affected.⁵ These findings have been further confirmed in multiple cross-sectional and cohort studies, which found elevated levels of illicit drug use among sexual minority youth (SMY), including cocaine,³ ecstasy,³ misuse of prescription drugs,⁴ and polysubstance use.¹²

Minority Stress Theory (MST), originally developed to explain disparities in mental health among LGB populations, holds that experiences of stigma or discrimination on the basis of one’s minority identity or identities produce mental and physical stress responses, which then lead to downstream health disparities among minority groups.^{13,14} The model

¹Department of Medical Social Sciences, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA.

²Department of Sociomedical Sciences, Columbia University Mailman School of Public Health, New York, New York, USA.

also illustrates that multilevel imbalances in social power and stigma exposure are important in determining health outcomes among sexual minority individuals.¹⁵ Consistent with this application, experiences of stigma and victimization have been consistently linked to negative health outcomes, including drug use and abuse among sexual minority individuals, particularly SMY.^{8,16,17}

Despite these disparities, there is a paucity of comprehensive population research on drug use among SMY. Recent analyses of trends in SMY health behaviors have focused on alcohol,¹⁸ cigarette,¹⁹ and marijuana²⁰ use resulting in a dearth of literature addressing other drug use behaviors. In addition, less work has explored these relationships over time. For example, Monitoring the Future, a national surveillance system of American adolescents, recently reported that youths' illicit drug use has remained largely stable since reaching the lowest levels seen in decades.²¹ In 1997, 30% of 12th graders reported trying an illicit drug other than marijuana at some point in their lives. Lifetime prevalence fell to 24% by 2009, and 19% by 2018, although it remained stable in recent years.²¹ However, these analyses did not consider sexual orientation, masking key subpopulation risk.²²

Describing longitudinal trends and drug use patterns among SMY on a national scale is thus helpful to accurately depict health disparities, evaluate the changing state of sexual minority health, inform research, and direct prevention and harm reduction efforts. Moreover, assessing the degree of differences between sexual minority and heterosexual students in the context of trend analyses is helpful to better understand whether trends represent meaningful changes in drug use disparities.^{19,23} Therefore, this study used pooled data from the biennial jurisdiction-level Youth Risk Behavior Survey (YRBS) to examine trends and disparities in drug use among sexual minority and heterosexual youth between 2005 and 2017.

Methods

Data source

The YRBS is a Centers for Disease Control and Prevention (CDC)-funded survey administered biennially to students in grades 9–12 on national and local levels.²⁴ To achieve a representative sample of students, jurisdictions use a two-stage cluster sample design.²⁴ A new sample is selected each year; students are not followed over time. This study was reviewed by the Northwestern University Institutional Review Board and received a designation of “exempt” as it is based on secondary data analysis.

Analytic sample

Local YRBS data were pooled across multiple city and state level jurisdictions, biennially from 2005 to 2017, from sites that assessed sexual identity. The dataset consists of 52 total jurisdictions composed of 20 cities and 32 states across 7 time points, resulting in 156 jurisdiction years (529,999 students). For the present analysis, students were excluded if they were missing any primary demographic variables and all drug use variables (grade: 0.4%; race/ethnicity: 3.2%; sex: 0.8%; drug use: 2.7%; not mutually exclusive), resulting in a final sample of 508,539 participants.

Measures

Sex. Sex was determined by asking participants “What is your sex?” with the choices: (1) male or (2) female. The YRBS does not consistently assess gender identity, therefore we do not infer gender within our sample.

Sexual identity. Sexual identity was assessed by asking, “Which of the following best describes you?” Response options included: (1) heterosexual (straight); (2) gay or lesbian; (3) bisexual; and (4) not sure.

Race/ethnicity. Race/ethnicity was assessed using two questions. First, participants were asked if they identified as Hispanic or Latino (yes/no). Second, participants were asked to select all of the relevant races from the following list: American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or Other Pacific Islander; and White. Using the CDC's classification, these variables were combined into seven racial/ethnic groups: (1) American Indian or Alaska Native; (2) Asian; (3) Black or African American; (4) Hispanic/Latino (regardless of reported race); (5) Native Hawaiian/Other Pacific Islander; (6) White; and (7) Multiple Races (Non-Hispanic). Due to sample size, individuals who reported a Native Hawaiian/Other Pacific Islander, American Indian or Alaska Native, or Multiple Races identity were collapsed as “another race.”

Grade. Participants were asked, “In what grade are you?” Response options were “9th,” “10th,” “11th,” “12th,” and “ungraded or other grade.” Participants that selected “ungraded or other grade” were removed from analysis ($N=809$; 0.1%).

Drug use. Drug use was assessed by asking “During your life, how many times have you used [drug]?” for 5 drugs. For cocaine (any form, including powder, crack, or freebase), inhalants (such as glue, aerosol, paints, etc.), methamphetamine, heroin, and MDMA, the response options ranged from, “0 times” to “40 or more times.” Responses were dichotomized as yes/no for lifetime use of each drug. A composite variable was created to represent lifetime use of any drug—individuals who reported ever using any substance were coded “yes,” individuals who did not were coded “no.”

Statistical analyses

Data cleaning and recoding were conducted in SAS Version 9.4 (SAS Institute Inc., Cary, NC). Analyses were conducted using SAS-Callable SUDAAN Version 11.0.1 (RTI International, Research Triangle Park, NC) to appropriately weight estimates and to account for the YRBS' complex sampling design. The YRBS data weights adjust for student nonresponse and distribution of students by grade, sex, and race/ethnicity in each jurisdiction.

Descriptive analyses were conducted to determine weighted drug use prevalence by sex and sexual identity at each time point.²⁵ Trends in drug use behaviors by sexual identity from 2005 to 2017 were assessed using the CDC's recommended approach to trend analysis; time was modeled as a continuous variable using orthogonal coefficients to reflect the biennial spacing of the surveys.²⁶ Trend analyses

were stratified by sex, controlled for grade, jurisdiction, and race/ethnicity, and assessed linear, quadratic, and cubic trends. The linear, cubic, and quadratic time component was considered significant at $p < 0.05$. There were no significant cubic trends. The linear regression slope serves as a measure of the average increase or decrease over the 10-year period, and whether the slope was significantly different from zero is a measure of whether the trend of drug use behaviors was, on average, upward or downward. Finally, to assess disparities by sexual identity among drug use by year, we used Fish and Baams' approach²³ to conduct logistic regressions for each drug in each survey year to compare within-year drug use prevalence among sexual minority subgroups relative to heterosexual students.

Results

Demographics

The total weighted pooled sample across all years was 50.5% male and 49.5% female; the majority identified as White (45.3%), followed by Hispanic (30.0%), Black (14.9%), Asian (4.9%), and another race (4.9%). Most reported a heterosexual identity (87.0%) whereas 6.7% identified as bisexual, 3.9% as not sure, and 2.5% as gay/lesbian (Table 1).

Drug use prevalence

Just over 1/10th of students in all survey years reported any drug use (10.2%) (Table 1). Inhalants were the most

TABLE 1. SAMPLE DEMOGRAPHICS AND SUBSTANCE USE PREVALENCE BY SEX

	Total		Females		Males	
	N	Column %	n	Column %	n	Column %
Sexual identity	506,367	100	260,424	100	245,943	100
Heterosexual	444,045	86.98	217,714	82.66	224,928	91.44
Gay/Lesbian	11,827	2.48	5755	2.25	5867	2.63
Bisexual	32,062	6.65	24,986	10.31	6772	3.01
Not sure	20,605	3.89	11,969	4.78	8376	2.93
Grade	502,858	100	258,143	100	242,955	100
9th	137,401	27.03	70,531	26.71	66,418	27.35
10th	134,288	25.96	69,373	25.88	64,381	25.99
11th	124,500	23.98	63,752	24.18	60,309	23.79
12th	106,669	23.03	54,487	23.24	51,847	22.87
Race	508,539	100	260,424	100	245,943	100
White	217,845	45.28	110,580	45.37	106,455	45.28
Black	76,456	14.86	40,112	15.09	36,068	14.63
Hispanic	133,553	30.01	69,387	30.17	63,484	29.86
Asian	36,810	4.92	18,299	4.63	18,381	5.20
Other	43,875	4.92	22,046	4.74	21,555	5.04
Region	494,381	100	253,052	100	239,217	100
Northeast	264,758	26.28	135,151	26.38	128,318	26.21
Midwest	59,025	18.45	30,549	18.51	28,283	18.43
South	79,616	24.13	41,180	24.20	38,055	24.03
West	90,982	31.15	46,172	30.91	44,561	31.33
Cocaine use	392,393	100	202,918	100	188,014	100
Yes	20,134	5.17	7660	3.85	12,154	6.34
No	372,259	94.83	195,258	96.15	175,860	93.66
Inhalant use	322,356	100	165,980	100	154,992	100
Yes	26,854	7.31	13,589	7.34	12,929	7.14
No	295,502	92.69	152,391	92.66	142,063	92.86
Meth use	350,239	100	179,998	100	168,970	100
Yes	11,275	2.87	3912	1.90	7131	3.68
No	338,964	97.13	176,086	98.10	161,839	96.32
Heroin use	381,856	100	196,765	100	183,663	100
Yes	10,140	2.36	3048	1.31	6801	3.27
No	371,716	97.64	193,717	98.69	176,862	96.73
MDMA ^a use	286,809	100	148,228	100	137,635	100
Yes	16,159	5.32	6558	4.19	9376	6.24
No	270,650	94.68	141,670	95.81	12,8590	93.76
Any drug use	490,620	100	252,039	100	236,519	100
Yes	50,576	10.16	23,139	9.06	26,832	11.04
No	440,044	89.84	228,900	90.94	209,687	88.96

^aMethylenedioxymethamphetamine; more commonly known as "Ecstasy" or "Molly." MDMA was assessed by asking participants, "How many times have you used ecstasy (also called MDMA)?"

frequently used substance (7.3%), followed by MDMA (5.3%), cocaine (5.2%), meth (2.9%), and heroin (2.4%). Drug use also varied by sex, with drug use across all categories, except inhalants, more prevalent among male students than female students (Table 1). A total of 53.5% of bisexual students reported any drug use, much higher than gay/lesbian (28.0%), not sure (20.6%), or heterosexual (11.1%) students. These differences varied by type of drug used. The prevalence of sexual identity and drug use by survey year is provided in Supplementary Tables S1 and S2.

Drug use trends by sexual identity—males

Bisexual and heterosexual males demonstrated the greatest number of significant linear decreases, observed in all drug use categories, except for heroin (Supplementary Table S3). Among not-sure male youth, cocaine (2009–2017) and MDMA (2013–2017) use decreased significantly with minor fluctuations year to year, but other drug use categories tended to fluctuate by year with overall nonsignificant decreases over time. No significant changes were observed among gay male youth. Trends are visualized in Figure 1.

Drug use trends by sexual identity—females

Among females, bisexual students demonstrated significant decreases across all substance use categories other than heroin use (Supplementary Table S4). Heterosexual students demonstrated an overall significant decrease in the use of all drugs over time with fluctuations; heroin use increased from 2005 to 2015 and decreased from 2015 to 2017. Other drugs demonstrated no change in early years, followed by a significant decrease (inhalants and any drug use decreased from 2009 to 2017 and MDMA decreased from 2013 to 2017). Lesbian and not-sure female youth demonstrated the fewest significant trends; among lesbian youth, only cocaine, MDMA, and any drug use showed significant decreases; however, all other drug use among lesbian youth demonstrated nonsignificant decreases. Among not-sure female youth, only cocaine, inhalants, and any drug use decreased significantly. Notably, there was a nearly 50% drop in any drug use between 2005 (21.0%) and 2017 (9.8%) among not-sure females (Supplementary Table S4). Trends are visualized in Figure 2.

Within-year disparities by sexual identity—males

Compared with heterosexual males, odds of drug use among sexual minority males were significantly elevated for all drugs in all years, except for cocaine use among not-sure males in 2005 and 2009, and for inhalant use among gay males in 2005 and not-sure males in 2009 (Table 2). In general, disparities between heterosexual and sexual minority males persisted yet fluctuated from year to year. For example, odds of cocaine use among gay males as compared with heterosexual males were higher in 2013 than in 2015 (adjusted odds ratio [aOR]=4.56, 95% confidence interval [CI] 3.43–6.07 in 2013; aOR=3.86, 95% CI 2.72–5.47 in 2015). The same disparity was greater in 2017 (aOR=5.79, 95% CI 4.62–7.26) than in 2013 or 2015, almost the same in 2011 (aOR=3.90, 95% CI 2.59–5.85) as in 2015, and narrower in 2009 (aOR=3.20, 95%

CI 1.81–5.65) than in 2011–2017. Caution should be exercised in interpreting these findings due to large CIs in certain drug use prevalence in certain years as a result of small sample sizes (Supplementary Table S3).

Within-year disparities by sexual identity—females

Similar to males, odds of drug use among sexual minority females were generally significantly elevated, although there were several instances of nonsignificant elevation in 2005 and 2007, and elevated odds of heroin use among bisexual females in 2011 were nonsignificant (Table 2). Disparities between sexual minority and heterosexual females also tended to fluctuate from year to year in a similar way as observed among males. In 2017, all disparities were significant, and were greater among lesbian females than among bisexual and not-sure females. Caution should be exercised in interpreting these findings due to large CIs in certain drug use prevalence in certain years as a result of small sample sizes (Supplementary Table S4).

Discussion

Our results present the most recent trend analysis of use of less common, illicit substances among U.S. youth by sex and sexual identity. We noted declines from 2005 to 2017 in all substance use regardless of sex and sexual identity, although not all declines were significant across groups. The greatest decreases were observed among heterosexual and bisexual students. Despite these decreases, disparities between heterosexual and SMY persisted, tended to fluctuate across all years, and were greatest among gay and lesbian youth in 2017, although odds were notably elevated among gay, lesbian, bisexual, and not-sure youth. Interpreted in light of MST, such results seem to indicate that overall levels of stigma and discrimination against SMY continue to have an impact on drug use despite broader downward trends in youth drug use nationally.

We also observed differential patterns of drug use both by year and over time within sexual minority subpopulations. In addition to demonstrating the fewest statistically significant decreases in drug use, gay and lesbian youth also demonstrated greater disparities in drug use than bisexual and not-sure youth as of 2017. Conversely, bisexual youth were the only sexual minority group to demonstrate a statistically significant decrease in all drug use categories regardless of sex, with the exception of heroin use. This observation was unexpected, and may be explained by bisexual students reporting greater prevalence of drug use initially than other sexual identity groups (Supplementary Tables S3 and S4), meaning that bisexual students may simply have had more opportunity for decrease than other groups. However, it was also notable that in the 2017 data, bisexual students demonstrated less elevated disparities as compared with gay and lesbian youth regardless of sex. This result is especially striking due to the significant body of prior research which highlights the uniquely elevated risk that bisexual people face for drug use and abuse.^{3,5,7}

One prior study using the YRBS dataset has similarly found a “narrowing of disparities” among bisexual populations with regard to several domains of alcohol use.²³ However, it should be noted that this study reported changes between two survey years only. Given the fluctuation in

FIG. 1. Trends in drug use for heterosexual, gay, bisexual, and not-sure male youth, 2005–2017, pooled Youth Risk Behavior Survey dataset. MDMA, methylenedioxymethamphetamine; more commonly known as “Ecstasy” or “Molly.”

FIG. 2. Trends in drug use for heterosexual, lesbian, bisexual, and not-sure female youth, 2005–2017, pooled Youth Risk Behavior Survey dataset.

TABLE 2. SEXUAL IDENTITY DIFFERENCES IN SUBSTANCE USE, WITHIN YEAR: YOUTH RISK BEHAVIOR SURVEY, 2005–2017

	2005	2007	2009	2011	2013	2015	2017
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Males							
Cocaine							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gay	3.72 (1.67–8.29)	6.59 (3.49–12.44)	3.20 (1.81–5.65)	3.90 (2.59–5.85)	4.56 (3.43–6.07)	3.86 (2.72–5.47)	5.79 (4.62–7.26)
Bisexual	6.83 (3.35–13.93)	5.13 (2.78–9.45)	5.14 (3.29–8.01)	3.89 (2.72–5.56)	4.05 (2.82–5.81)	3.64 (2.57–5.16)	4.41 (3.44–5.65)
Not sure	1.72 (0.67–4.41)	5.61 (3.00–10.52)	1.85 (0.92–3.71)	4.80 (3.18–7.25)	4.94 (3.80–6.43)	3.71 (2.73–5.05)	4.15 (3.37–5.11)
Inhalants							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gay	1.99 (0.76–5.19)	3.02 (1.83–4.98)	2.64 (1.52–4.58)	3.21 (2.04–5.04)	6.13 (4.80–7.83)	3.26 (2.20–4.83)	3.69 (2.58–5.27)
Bisexual	5.77 (2.19–15.19)	4.04 (2.07–7.91)	3.71 (2.34–5.87)	3.89 (2.53–5.73)	5.12 (3.44–7.62)	3.26 (2.36–4.49)	3.00 (2.07–4.35)
Not sure	3.43 (1.52–7.72)	2.61 (1.31–5.20)	1.66 (0.97–2.83)	2.68 (1.75–4.10)	3.20 (2.35–4.38)	3.83 (2.56–5.71)	3.57 (2.60–4.89)
Meth							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gay	4.21 (1.89–9.36)	8.72 (4.72–16.11)	4.50 (2.35–8.58)	8.53 (5.57–13.07)	9.25 (6.69–12.78)	5.99 (3.83–9.34)	5.00 (3.37–7.44)
Bisexual	15.31 (6.16–38.09)	9.42 (4.90–17.39)	5.74 (3.62–9.07)	6.01 (3.94–9.16)	8.18 (5.43–12.31)	6.16 (4.13–9.17)	4.64 (3.21–6.69)
Not sure	3.90 (1.64–9.27)	6.99 (4.05–12.09)	3.62 (2.01–6.51)	6.07 (3.66–10.04)	6.23 (4.39–8.83)	6.72 (3.55–12.72)	4.97 (3.36–7.35)
Heroin							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gay	5.30 (2.26–12.42)	12.27 (6.12–24.60)	6.44 (3.87–10.73)	11.62 (7.82–17.28)	8.69 (5.77–13.08)	10.15 (7.13–14.46)	9.97 (7.36–13.49)
Bisexual	20.42 (8.09–51.53)	13.29 (6.91–25.56)	5.07 (2.99–8.61)	10.82 (7.10–16.50)	7.74 (4.88–12.30)	6.85 (4.39–10.68)	8.94 (6.51–12.28)
Not sure	6.75 (3.28–13.86)	11.08 (5.70–21.54)	4.35 (2.35–8.04)	10.00 (6.24–16.04)	8.85 (6.24–12.56)	6.95 (5.11–9.45)	7.56 (5.85–9.77)
MDMA							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gay	2.83 (1.11–7.24)	6.96 (3.55–13.67)	3.06 (1.78–5.28)	3.68 (2.19–6.17)	4.53 (3.21–6.39)	3.42 (2.02–5.77)	4.38 (2.72–7.06)
Bisexual	14.76 (6.22–35.06)	6.51 (3.55–11.92)	4.90 (3.07–7.81)	5.05 (3.45–7.41)	5.12 (3.22–8.12)	3.65 (2.07–6.41)	2.99 (2.08–4.30)
Not sure	3.73 (1.60–8.71)	5.65 (2.83–11.27)	2.26 (1.23–4.15)	3.70 (2.43–5.61)	2.75 (1.93–3.91)	2.67 (1.73–4.11)	2.59 (1.70–3.95)
Any drug use							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gay	2.90 (1.46–5.77)	4.29 (2.45–7.50)	2.64 (1.69–4.12)	3.11 (2.09–4.62)	4.47 (3.56–5.62)	3.58 (2.67–4.80)	4.33 (3.36–5.57)
Bisexual	9.60 (5.02–18.37)	3.93 (2.38–6.49)	4.13 (2.93–5.83)	3.51 (2.55–4.83)	4.25 (3.18–5.67)	3.47 (2.60–4.65)	3.36 (2.68–4.20)
Not sure	2.36 (1.26–4.42)	4.16 (2.58–6.69)	1.43 (0.91–2.26)	2.51 (1.84–3.43)	3.47 (2.78–4.33)	3.78 (2.93–3.88)	3.18 (2.63–3.84)
Females							
Cocaine							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	2.95 (0.69–12.52)	5.24 (2.61–10.55)	6.26 (3.18–12.32)	5.99 (3.45–10.38)	3.55 (2.24–5.62)	4.59 (3.11–6.78)	3.50 (2.56–4.77)
Bisexual	6.66 (4.29–10.34)	4.32 (2.77–6.74)	3.90 (2.42–6.29)	3.67 (2.56–5.26)	4.44 (3.46–5.70)	3.48 (2.21–5.48)	2.78 (2.24–3.46)
Not sure	3.27 (1.21–8.83)	1.57 (0.79–3.11)	2.99 (1.56–5.72)	2.83 (1.87–4.28)	3.90 (2.85–5.37)	2.39 (1.68–3.41)	2.40 (1.82–3.16)

(continued)

TABLE 2. (CONTINUED)

	2005	2007	2009	2011	2013	2015	2017
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Inhalants							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	0.41 (0.12–1.46)	1.98 (1.03–3.80)	2.84 (1.53–5.26)	2.78 (1.60–4.82)	3.21 (2.11–4.87)	4.21 (2.36–7.50)	3.43 (1.99–5.93)
Bisexual	2.88 (1.85–4.47)	3.53 (2.59–4.83)	3.63 (2.67–4.95)	3.12 (2.42–4.00)	4.14 (3.30–5.19)	3.71 (2.83–4.86)	2.74 (2.10–3.58)
Not sure	2.01 (1.07–3.79)	3.52 (1.99–6.21)	2.95 (1.94–4.50)	2.80 (2.05–3.81)	2.89 (2.18–3.83)	2.54 (1.49–4.32)	1.57 (1.12–2.20)
Meth							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	6.54 (1.39–30.81)	9.82 (4.62–20.90)	6.34 (2.44–16.53)	6.40 (3.60–11.37)	7.36 (4.38–12.38)	6.59 (3.99–10.89)	5.24 (2.87–9.58)
Bisexual	5.10 (3.11–8.34)	3.72 (2.35–5.90)	4.39 (2.30–8.36)	3.87 (2.35–6.36)	4.73 (3.48–6.44)	4.61 (2.58–8.23)	2.77 (1.64–4.69)
Not sure	1.59 (0.68–3.73)	1.81 (0.74–4.41)	5.30 (2.77–10.15)	3.82 (2.13–6.85)	6.07 (4.04–9.13)	3.12 (1.79–5.44)	2.59 (1.53–4.37)
Heroin							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	18.72 (5.07–69.09)	20.47 (9.30–45.03)	7.49 (3.58–15.67)	9.30 (5.10–16.97)	12.55 (7.14–22.07)	13.57 (8.63–21.36)	8.99 (5.66–14.28)
Bisexual	8.18 (4.01–16.69)	4.59 (2.50–8.41)	6.61 (3.36–12.99)	1.51 (0.89–2.54)	4.93 (3.42–7.11)	5.72 (2.77–11.82)	4.50 (3.15–6.42)
Not sure	3.12 (1.01–9.63)	4.97 (2.30–10.73)	8.45 (3.69–19.37)	2.97 (1.76–5.00)	6.85 (4.20–11.19)	3.69 (2.09–6.51)	5.62 (3.43–9.18)
MDMA							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	6.78 (2.33–19.75)	6.74 (3.26–13.93)	4.33 (2.36–7.94)	4.89 (2.79–8.57)	3.48 (2.24–5.41)	4.12 (2.42–7.01)	3.91 (2.29–6.70)
Bisexual	5.51 (3.61–8.40)	4.56 (3.08–6.75)	4.12 (2.84–5.98)	3.99 (3.13–5.08)	4.83 (3.74–6.24)	3.08 (2.14–4.43)	3.72 (2.41–5.75)
Not sure	1.42 (0.52–3.85)	2.17 (1.10–4.29)	4.43 (2.34–8.37)	2.33 (1.47–3.70)	3.40 (2.27–5.10)	1.99 (1.26–3.13)	1.60 (1.02–2.50)
Any drug use							
Heterosexual (Ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lesbian	2.29 (0.95–5.54)	4.77 (2.89–7.89)	2.97 (1.76–5.01)	4.21 (2.76–6.44)	3.47 (2.51–4.81)	4.40 (3.05–6.34)	3.36 (2.47–4.57)
Bisexual	4.34 (3.14–5.99)	4.17 (3.21–5.41)	3.26 (2.49–4.26)	3.63 (2.93–4.50)	4.11 (3.44–4.92)	3.35 (2.75–4.08)	2.72 (2.26–3.27)
Not sure	2.61 (1.52–4.47)	2.89 (1.85–4.50)	2.92 (1.91–4.44)	2.54 (1.94–3.33)	2.72 (2.18–3.40)	2.26 (1.70–3.00)	1.71 (1.35–2.18)

Boldface indicates statistical significance at $p < 0.05$.
 CI, confidence interval; OR, odds ratio; Ref, reference group.

disparities within our results across seven different biennial survey administrations, the narrowing of disparities observed in that research could potentially represent a snapshot of fluctuation similar to what we observed. This then raises critical questions. Unless bisexual populations have begun to experience notably less stress than their gay or lesbian counterparts, an interpretation for which there is entirely no evidence, then minority stress alone may not account for these patterns. Indeed, prior research has established that bisexual populations may be at greater risk for minority stress than gay or lesbian populations, due to experiencing marginalization and stigma from both heterosexual and gay/lesbian groups.²⁷ Therefore, these findings emphasize a need for targeted research to understand differential patterns of substance use among bisexual youth populations, taking into account the role of known protective and risk factors for youth substance use such as parental support,²⁸ victimization,⁸ internalized stigma,²⁹ community engagement,³⁰ and social pressures.³¹

Our results follow a similar pattern as trend analyses of other drugs and alcohol. For example, as mentioned earlier, prior analyses of alcohol use behaviors have shown an overall decrease in alcohol use among all youth, with the greatest decreases observed among bisexual youth, although with the caveat that disparities persist despite this decline.²³ A separate trend analysis of alcohol use among SMY demonstrated overarching decreases with the greatest declines seen among lesbian and bisexual female youth, with disparities again persistent across the decline.²² Analyses of changes in cigarette smoking behaviors from 2005 to 2015 demonstrated a narrowing of disparities for lesbian female youth and male bisexual youth but not for other sexual minority or unsure youth.³² Finally, an omnibus trend analysis of alcohol, tobacco, and marijuana use among Massachusetts youth found that disparities in these substances persisted from 1999 to 2013, and narrowed among male youth while persisting or widening among female youth.³³ The similarities between these trends and those we observed affirm our results, while also highlighting the need for ongoing work to support in-depth research and targeted intervention to ensure equity in drug use outcomes for SMY.

Fortunately, prior study has illuminated potential intervention pathways. Victimization among youth—which is especially common among SMY,³⁴ and which may contribute to experiences of minority stress,³⁵ has been regularly linked to increased levels of alcohol and drug use in both sexual minority and sexual majority populations.^{8,36–38} Conversely, one of the most powerful protective factors available to sexual minority adolescents is a supportive school, social, and home environment.^{39–42} Therefore, interventions targeting school climate, familial support, and reduction of victimization are likely to be crucial to closing the gap between sexual minority and majority students' outcomes, and existing interventions of this nature should continue to be rigorously evaluated and—when effective—widely implemented. In the meantime, clinicians and school guidance counselors should consider regular screening and referral for substance use among SMY. Critically, given the known roles of stigma and minority stress in SMY substance use, school-based screening, referral, and/or resources should prioritize non-judgmental, trauma-informed, and affirming practice.

Although there is evidence to support these preventive approaches, future research is still needed to better understand

the multilevel drivers behind the trends in substance use that we and others have observed. Pairing quantitative analyses such as these with rigorous qualitative study may be helpful in more clearly illuminating causal pathways between minority stress and substance use, and how these may be changing over time.

Additional multilevel trend analyses which incorporate policy will also be critical. Policy changes such as the introduction of anti-LGB legislation may alter the degree of victimization, stigma, and minority stress experienced by marginalized individuals, therefore either increasing or decreasing illicit drug use, depending on the policy's psychosocial impact.^{17,43} Given the pervasive and structural causes of stigma and stress that lead to the elevated levels of drug use seen in SMY,¹⁵ assessing jurisdictional-level differences in use by various policy indicators of LGB acceptance/rejection will allow us to understand what policies are successful in reducing stigma, minority stress, and/or drug use on a wider scale, and should be implemented widely. Finally, future research should prioritize developing diverse samples to allow for analyses which are attentive to intersectional experiences of minority stress on the basis of oppression focused on race, ethnicity, gender, sex, and more.^{44,45}

Limitations

There are limitations to our study. First, our analyses did not disaggregate data by state or city, although this was adjusted for by controlling for jurisdiction. This may mask jurisdictional differences in drug use risk.¹⁵ Furthermore, small sample sizes in certain drug use within certain years resulted in wide CIs, which present a challenge to confident interpretation. Future work should emphasize oversampling from marginalized minority groups to eliminate this concern. In addition, we were unable to directly account for minority stress in our analyses due to limitations in the available data. Future research which directly incorporates minority stress should be conducted to confirm our interpretations.

Conclusions

Although drug use generally declined from 2005 to 2017, analyses of disparities within years revealed significant fluctuation, and statistically significant disparities remained between SMY and heterosexual youth in all years. Bisexual students demonstrated more significant downward trends than any other sexual minority group, a finding which is not readily explained and deserves additional attention. As interpreted in light of the minority stress framework, these results indicate that stigma and discrimination persist and continue to influence substance use disparities among SMY; however, factors other than minority stress are likely at play in creating the patterns we observed, and additional research is necessary to confirm this relationship.

Disclaimer

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Supplementary Material

Supplementary Table S1
Supplementary Table S2
Supplementary Table S3
Supplementary Table S4

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Address correspondence to:

Dylan Felt

Department of Medical Social Sciences

Northwestern University Feinberg School of Medicine

625 N. Michigan Avenue, Suite 1400

Chicago, IL 60611

USA

E-mail: dylan.felt@northwestern.edu