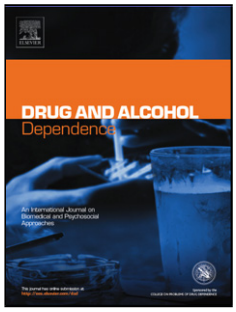

Title: Sex and orientation identity matter in the substance use behaviors of sexual minority adolescents in the United States

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Sex and orientation identity matter in the substance use behaviors of sexual minority adolescents in the United States

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Highlights

- Sexual minority females are at an elevated risk for substance use.
- Bisexual females particularly appear to be at a high risk for substance use.
- Bisexual females should be prioritized in adolescent substance use prevention.

Abstract

Background: Health sciences researchers are beginning to understand the differing experiences and health risks among sexual minority subgroups (i.e., those who describe themselves as homosexual/gay/lesbian, bisexual, or unsure/questioning). Such research can promote the allocation of resources to high-risk groups and the development of interventions tailored to their needs. The present study extends this line of research to substance use among adolescents.

Methods: The lifetime and/or past 30-day alcohol, tobacco, cigarette, e-cigarette, marijuana, prescription drug, and illicit drug use of sexual minority and heterosexual adolescents was analyzed using data from the 2015 National Youth Risk Behavior Survey. Controlling for confounders, separate logistic regression models were fit for each substance use outcome. A simulation-based strategy was employed to report adjusted risk ratios for each substance use outcome for each sexual minority subgroup.

Results: Sexual minority females, particularly bisexual females, were at an elevated risk for substance use. For example, compared to heterosexual females, sexual minority females were 1.35 (95%CI 1.16-1.56) times more likely to have used a substance in the past 30 days, and bisexual females had an even further elevated risk ratio (RR: 1.48, 95%CI 1.28-1.69).

Conclusions: Studying the variance among sexual minority subgroups will help practitioners, advocates, and policymakers identify high risk subgroups. In the case of substance use, this study suggests sexual minority females, particularly bisexual females, should become a target population for prevention and other interventions. The study conducts post-hoc analyses on secondary data, and so these results should be verified in more targeted studies.

Keywords: sexual minority; substance use; lesbian; gay; bisexual; questioning; alcohol; marijuana; prescription drugs

1. Introduction

It is now understood that differential stresses and pressures are endured by lesbian, gay, and bisexual, and questioning (LGBQ) adolescents (Drabble and Trochi, 2005; Hatzenbeuler, 2014). Consequently, it is now necessary to evaluate the differential health behaviors of these at-risk populations (Institute of Medicine, 2011; Meyer and Frost, 2013; Caputi et al., 2017). Conditions for sexual minority adolescents have changed considerably within the past decade (Russell et al., 2010; Perone, 2015; SCOTUS, 2015; Homma et al., 2016), and new risk estimates that take account for the diversity of sexual minority adolescents – including both sex and orientation identity – are necessary to discern the needs of these high-risk groups.

Intragroup variance among adolescent substance use has seldom been explored in recent years. The most comprehensive previous analysis of intragroup variance among LGBQ adolescent drug use comes from a meta-analysis of 18 studies conducted by Marshal et al. (2008). In this study, the authors find that bisexuality and female sex are significant, positive modifiers on the relative risk of LGBQ adolescent substance use. The meta-analysis by Marshal et al. (2008) is useful as it draws upon results from several different kinds of samples including high-risk groups, schools, and the general population. However, because it relies on several

different studies, it compiles different gradations of substance use (30-day, past-year, etc.) into a singular outcome of substance use. Further, it may rely too heavily on populations willing to ask their samples about adolescent sexual orientation as opposed to data representing a national sampling frame. Further, the meta-analysis uses data that is now, in some cases, two decades old, which was a different era for LGBQ sentiment in the United States.

Where intragroup variance among LGBQ adolescent substance use has been recently explored – namely, within the study of tobacco use – it has yielded significant and actionable findings. For example, several studies (Austin et al., 2004; Emory et al., 2016; Johnson et al., 2016) have found that female sexual minority subgroups, and particularly bisexual females, have higher odds of tobacco use in adolescence than their heterosexual counterparts. While the most comprehensive of these studies to date (Dai, 2017) uses odds ratios, making inference regarding relative risk difficult or impossible (Caputi, 2017), it is a signal that tobacco use interventions designed for adolescents should treat sexual minority females as a priority population.

Though there are few representative and contemporary studies examining the substance use risks of sexual minority adolescents, there is a thriving body of literature for sexual minority adults. In several studies conducted over several years, researchers have shown that sexual minority adults are more likely to exhibit several risk behaviors. Since the field has developed, some researchers have examined the intragroup variance within sexual minority adults (Cochran and Mays, 2016). For example, several studies have found that sexual minority women, and particularly bisexual women, are at an elevated risk for several health risk behaviors (e.g., McCabe et al., 2009; Blosnich et al., 2014; Kerr et al., 2014). Indeed, some research has shown differential trends within the sexual minority population in which the risk difference between sexual minority males and heterosexual males is shrinking, and the same risk difference for

females is growing (Cochran and Mays, 2017). These trends over time are useful not only in describing which groups continue to be at high risk but also in diagnosing contributors to health risks among sexual minorities. Stressors change differentially for different subgroups, and so researchers may hypothesize which stressors are most significant from related changes in health behaviors. Importantly, research into intragroup variance among sexual minority adults' health behaviors has inspired action in support of the highest-risk subgroups (Cochran and Mays, 2016; Drabble and Trochi, 2005). It is reasonable that similar exploration among sexual minority adolescents may also yield significant findings and action on behalf of the high-risk subgroups.

The burden alcohol, tobacco, marijuana, non-medical prescription drug, and illicit drug use place on young people's livelihoods and society's health care resources is substantial (Whiteford et al., 2013), and a better understanding of at-risk populations can justify both the allocation of additional resources to help those communities and the development of specifically-tailored programs and services (Zaza et al., 2016). The minority stressors that are known to cause elevated high risks among sexual minorities (Meyer and Frost, 2013; Saewyc, 2016) could covary among sex and orientation identity for adolescents. If they do, that finding could promote action to support the highest-needs groups and research into how that disparity could be ameliorated. Therefore, an exploration of the risks of substance use among the diversity of sexual minority subgroups is justified.

2. Methods

2.1 Data

In this study, data from the public-use file of the 2015 National Youth Risk Behavior Survey (NYRBS) was leveraged. This file included the confidential responses of 15,624 adolescents.

The NYRBS is a biannual paper survey administered in schools using a three-stage cluster sample design of counties, schools within counties, and classrooms within schools to achieve a nationally-representative sample of American high school students (Brener et al., 2013). For the 2015 iteration, the NYRBS had an overall response rate of 60% (69% school response rate * 86% participant response rate).

The 2015 NYRBS is an approved protocol by the Centers for Disease Control and Prevention's Institutional Review Board, which required appropriate consent from parents and assent from youth participants. Because the data was previously existing, publicly available, and entirely de-identified, the current study did not require further review under HHS regulation 45CFR 46.101(b)(4), which was confirmed by the University of Pennsylvania Institutional Review Board.

2.2 Dependent variable

The reported use of alcohol, cigarettes, e-cigarettes, marijuana, and prescription drugs were assessed. Tobacco use altogether (incorporating use of cigarettes, cigars, smokeless tobacco, and/or e-cigarette use) and illicit drug use altogether (incorporating use of cocaine, ecstasy, hallucinogens, heroin, inhalants, marijuana, methamphetamine, prescription drugs, steroids, and/or synthetic marijuana) were also studied. It is noted that some use of marijuana captured within this measure may be medically motivated and, therefore, permitted under state law. However, because all marijuana use is illegal under federal law (i.e., U.S. Controlled Substances Act), and only approximately 0.35% of children age 12-17 reported using medical marijuana in the past year in the 2015 National Survey on Drug Use and Health, marijuana use is included in illicit drug use. Aggregate measures were developed for any and poly-drug (2 or

more drugs) use for both the 30-day timeframe and the lifetime time-frame, based upon data availability for each timeframe.

Substance use outcomes were selected/developed based upon having an overall prevalence conducive to executing reasonably precise analyses within each of the sexual minority subgroups. That is, drug-specific data was available for cigar, smokeless tobacco, cocaine, ecstasy, hallucinogens, heroin, inhalants, methamphetamine, steroids, and synthetic marijuana use, but because each of these substance use outcomes are rare, they were aggregated in order to support reasonably precise analyses. Prescription drug misuse refers to reported use of a prescription medication without a prescription. E-cigarette use refers to reported use of an electronic vapor device, although it is not explicitly stated in the questionnaire that the electronic vapor device was used to vape liquid nicotine.

2.3 Independent variables

Each participants' sexual minority subgroup was determined both by sexual orientation and sex. Sex was evaluated with the question, "what is your sex?" with possible responses, "female" and "male" (respondents can only choose one).

Sexual orientation was measured in the YRBS through both orientation identity, i.e., how the respondent identifies, and sex of previous sexual contacts. These two measures showed some discordance. Because the sample size is larger for orientation, orientation comprises a more actionable group (i.e., it is much easier to observe a person's orientation than their sexual history), and including only children with a sexual history may bias the sample, sexual orientation rather than sex of past sexual contacts is used. This practice is in line with other studies of this sample (Dai, 2017; Zaza et al., 2016)

Sexual orientation was evaluated with the question, "which of the following best describes you?" with possible responses, "heterosexual (straight)," "gay or lesbian," "bisexual," and "not sure". Sex was evaluated with the question "What is your sex?" with possible responses "female" and "male". From these questions, participants were then categorized into sexual orientation subgroups as "heterosexual" (88.8% total, 84.5% female (N=6105), 93.1% male (N=6779)), "gay or lesbian" (2.0% total, 2.0% female (N=167), 2.0% male (N=154)), "bisexual" (6.0% total, 9.8% female (N=734), 2.4% male (N=178)), or "not sure," i.e., questioning (3.2% total, 3.7% female (N=296), 2.6% male (N=199)).

2.4 Covariates

Controls were added for the participants' sex (male/female), age (continuous), race/ethnicity (7 categories: 1. American Indian/Alaska Native, 2. Asian, 3. Black, 4. Hispanic, 5. Native Hawaiian/Pacific Islander, 6. White, and 7. Multiple Races (non-Hispanic)), English proficiency (1. very well or well or 2. not well or not well at all), and average academic grades (1. B or higher or 2. C or lower). These covariates were chosen to account for known differences in substance use behaviors among those with different sexes, ages, races, acculturation, and school/community connectedness (respectively).

2.5 Statistical analysis

First, descriptive analyses were conducted to describe prevalence rates of each of the substance use outcomes by sexual minority subgroup. Then, the data were analyzed to yield the relative risk of sexual minority adolescents compared with their heterosexual peers. Separate logistic regression models were fit for each of the substance use outcomes. Because odds ratios can be misleading for common outcomes (Davies et al., 2016), risk ratios are reported. Risk

ratios represent the ratio of estimated prevalence among sexual minority adolescents to the estimated prevalence of their heterosexual counterparts.

Risk ratios were computed by simulating 10,000 vectors of model coefficients based upon random draws from each logistic regression model's variance-covariance matrix and then estimating a distribution of predicted probabilities for an individual in that sexual minority subgroup with covariates held at their mean values (King et al., 2010). The mean of this distribution of risk ratio is interpreted as the point estimate for the risk ratio, and the 2.5th and 97.5th percentile are interpreted as the 95% confidence interval. All analyses were conducted in R version 3.4.1 and were adjusted for the NYRBS's complex survey design using the "survey" package (Lumley, 2004).

3. Results

3.1 Absolute prevalence

The prevalence of substance use among sexual minority adolescents was higher than that among heterosexual peers (Table 1). For example, 83.4% (95%CI 79.7%-87.1%) of sexual minority females reported using a substance in their lifetime compared to 71.0% (95%CI 66.1%-75.8%) for heterosexual females, and 55.0% (95%CI 50.5%-59.6%) of sexual minority females reported use of a substance within 30 days of taking the survey compared to 40.2% (95%CI 36.0%-44.4%) for heterosexual females.

3.2 Adjusted analyses

In adjusted analyses, sexual minority males did not show a clear elevated risk of substance use relative to heterosexual males; however, sexual minority females were at a significantly higher risk for substance use relative to heterosexual females (Table 2). For example, sexual minority females were significantly more likely to report using alcohol (RR:

1.23, 95%CI 1.07-1.4), tobacco (RR: 1.99, 95%CI 1.32-2.88), and marijuana (RR: 1.71, 95%CI 1.41-2.05) in the past 30 days. Further, sexual minority females were significantly more likely to report using alcohol (RR: 1.17, 95%CI 1.07-1.29), cigarettes (RR: 1.88, 95%CI 1.59-2.22), marijuana (RR: 1.59, 95%CI 1.4-1.79), prescription drugs (RR: 1.7, 95%CI 1.41-2.03), and illicit drugs (RR: 2.13, 95%CI 1.52-2.9) in their lifetime.

Among sexual minority females, only bisexual females showed a clear elevated risk of reporting recent or lifetime substance use. Bisexual females were at an elevated risk for substance use in all 11 studied substances. In contrast, lesbian and questioning females were at an elevated risk for only four substances, and only for two substance use outcomes (i.e., lifetime cigarette use and lifetime prescription drug use) were all female sexual minority subgroups at an elevated risk. That is, there was insufficient evidence to suggest that lesbian or questioning females were at significantly elevated risks of substance use generally.

3.3 Aggregate measures

Risk ratios for aggregate measures (any use of substance or use of two or more substances) were significant among sexual minority females, and particularly bisexual females, but were not significant among sexual minority males.

4. Discussion

Sexual minority females, specifically bisexual females, are at a greater risk for substance use (including tobacco use, alcohol use, marijuana use, non-medical prescription drug use, and illicit drug use) compared to their heterosexual counterparts. The NYRBS data is insufficient to conclude that sexual minority males, lesbian females, and questioning females are at an elevated risk for substance use.

This study contributes to the growing body of literature (Marshal et al., 2008) documenting how relative risk for substance use among sexual minority adolescents is changing and developing as steps are taken to improve stressors for LGBQ adolescents. Further, previous research has shown that, among sexual minority adults, bisexual females are at a particularly high risk for drug use (McCabe et al., 2009; Cochran and Mays, 2017). This study's findings show that this pattern is also present among a nationally representative sample of adolescents.

The findings of this study are significant for two reasons. First, female sexual minority adolescents appear to be a high priority population. Because females are less likely to use most drugs (SAMHSA, 2014), and fewer females enter substance use disorder treatment programs (TEDS, 2012), female adolescents may be discounted in both the development of interventions and the allocation of intervention resources. There is evidence that the etiology of drug use is different in girls and boys and that only a small subset of evidence-based prevention programs are effective for girls (Kumpfer et al., 2009). Future research may investigate, if current drug prevention programs are indeed ineffective for girls, whether this may compound the substance use risks of sexual minority adolescents.

Second, the bisexual identity group is often not taken as seriously as gay or lesbian adolescents in a variety of arenas (Alarie and Gaudet, 2013). Our findings suggest that bisexual adolescents, particularly bisexual females, were at a particularly high risk of substance use. Therefore, advocates and practitioners should recognize the substance use risks of bisexual adolescents and begin to explore the needs of that community. For example, researchers may consider the risk and protective factors for substance use within this specific subgroup and whether current intervention and treatment programs are tailored to meet the needs of that community.

There are several limitations to this study. Conducting subgroup analyses of sexual minorities presents significant challenges (Yusuf et al., 1991), and readers are advised to interpret findings judiciously. Ideally, researchers should conduct a survey that is representative of sexual minorities with an a priori hypothesis that a difference in sexual minority subgroup exists for a specific outcome (in this case, substance use; see Stall et al., 2001). However, conducting such a survey – a survey with a prospectively stated hypothesis to be tested and targeting a representative population of sexual minority adolescents – would likely be prohibitively resource-intensive. Instead, we perform post hoc analyses of existing secondary data from a survey that was not specifically designed to test whether significant intragroup variance exists. Such subgroup analyses can be misleading; conducting several tests for different subgroups, which inherently have diminished sample sizes, may result in spurious findings. These smaller sample sizes have significant implications for the current study. For example, because there were significantly fewer males than females reporting sexual minority status, the confidence intervals of analyses for females was typically wider than comparable analyses for females. Further, only a subset of all substances evaluated on the NYRBS were analyzed because analysis of rarer substances by sexual minority subgroup would have insufficient sample sizes. Overall, these findings should be treated as hypothesis generating, requiring replication in future studies with more well-suited datasets. Even with the limitations of post-hoc secondary data analysis, however, this analysis is important. These findings represent contemporary responses to a survey that pulls from adolescents in different ethnic/racial groups located across the country. Indeed, the same dataset used in this study (i.e., 2015 NYRBS) has been used to evaluate similar questions in previous studies (e.g., Dai, 2017; Caputi et al., 2017).

To improve the state of the literature, further study, particularly surveys with prospectively-stated hypotheses targeting the sexual minority population, should be conducted to confirm the current study's findings. In the immediate future, analyses of pooled data from several years of NYRBS datasets will have sufficient sample size to suggest a broader range of hypotheses with greater precision. Eventually, surveys that prospectively investigate intragroup variance in sexual minority adolescent substance use with large (and ideally representative) samples of sexual minority participants should be conducted.

Two broader limitations of the NYRBS are noted: first, the overall response rate of the NYRBS was low (60%), which may have an impact on generalizability. Second, although the survey employed confidentiality protections, there is a risk that sexual minority children may have been unwilling to admit their identity.

The results presented in this paper serve not only as a call to action to provide better and perhaps tailored services to sexual minority adolescents but also to provide an idea of which sexual minority subgroups may be most at risk. Before, females and bisexuals were likely to be marginalized from substance use prevention programming; however, our results imply sexual minority females, particularly bisexual females, should be prioritized in the fight against adolescent substance use.

Author Disclosures

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Conflict of Interest

No conflict declared

Contributors

TLC is the only author. TLC conceptualized the paper, performed all data analysis, and wrote and revised the manuscript and approves of the final submission.

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Figures and table

Table 1. Prevalence of Substance Use Among Lesbian, Gay, Bisexual, Questioning, and Heterosexual Adolescents

Male Adolescents										
		Sexual Minority (N=531)			**Gay (N=154)**			**Bisexual (N=178)**		
Substance	**Timeframe**	**Unweighted N**	**Weighted Prevalence**	**95%CI**	**Unweighted N**	**Weighted Prevalence**	**95%CI**	**Unweighted N**	**Weighted Prevalence**	**95%CI**
Alcohol	Past 30 Days	436	37.3%	31.4%-43.2%	110	36.1%	22.8%-49.5%	158	39.0%	29.8%-48.2%
Alcohol	Lifetime	482	64.3%	57.2%-71.3%	135	69.5%	57.6%-81.4%	165	61.3%	51.9%-70.8%
Tobacco Use	Past 30 Days	438	18.9%	14%-23.8%	118	13.8%	4.5%-23%	155	15.6%	7.5%-23.6%
Cigarettes	Past 30 Days	464	17.3%	12.5%-22.2%	124	14.5%	5.6%-23.4%	165	16.2%	8.3%-24.2%
Cigarettes	Lifetime	431	40.8%	31.9%-49.7%	117	40.8%	25.7%-55.9%	154	44.5%	35.1%-53.9%
Vaping	Past 30 Days	505	26.4%	21%-31.9%	145	22.7%	14.5%-30.9%	170	23.7%	14.4%-32.9%

Vaping	Lifetime	490	39.6%	33.8%-45.4%	139	41.1%	26.3%-55.8%	166	39.4%	28.2%-50.5%
Marijuana	Past 30 Days	485	27.2%	21%-33.4%	130	28.0%	16.7%-39.3%	169	23.8%	14%-33.5%
Marijuana	Lifetime	476	40.7%	31.1%-50.3%	126	47.3%	29.4%-65.3%	169	38.1%	26.5%-49.7%
Prescription Drugs	Lifetime	522	28.7%	22.2%-35.3%	151	37.2%	24.9%-49.6%	175	23.2%	13.4%-33.1%
Illicit Drugs	Lifetime	331	21.8%	14.9%-28.7%	81	22.5%	9.6%-35.5%	122	17.0%	9.8%-24.2%
Any Drug Use	Past 30 Days	385	43.0%	35.4%-50.6%	96	40.0%	24.8%-55.2%	142	45.1%	34.4%-55.9%
Any Drug Use	Lifetime	314	71.8%	64.2%-79.5%	76	83.2%	74.5%-91.9%	120	67.8%	55.3%-80.3%
Poly-Drug Use	Past 30 Days	385	26.7%	20%-33.4%	96	21.3%	10.9%-31.7%	142	26.7%	16.9%-36.5%
Poly-Drug Use	Lifetime	314	54.6%	48.7%-60.6%	76	53.9%	36.1%-71.7%	120	54.2%	43.2%-65.3%
Female Adolescents										
		Sexual Minority (N=1197)			**Lesbian (N=167)**			**Bisexual (N=734)**		
Substance	**Timeframe**	**Unweighted N**	**Weighted Prevalence**	**95%CI**	**Unweighted N**	**Weighted Prevalence**	**95%CI**	**Unweighted N**	**Weighted Prevalence**	**95%CI**
Alcohol	Past 30 Days	1044	39.6%	35.5%-43.7%	135	37.7%	27.2%-48.2%	644	42.5%	36.7%-

										48.3%
Alcohol	Lifetime	1145	74.9%	70.8%-79%	152	68.6%	59.3%-77.9%	713	81.4%	76.6%-86.2%
Tobacco Use	Past 30 Days	1107	15.7%	12.2%-19.2%	149	15.0%	7.2%-22.8%	680	18.2%	14%-22.5%
Cigarettes	Past 30 Days	1136	18.2%	14.2%-22.1%	153	16.2%	7.3%-25.2%	697	21.5%	16.9%-26.2%
Cigarettes	Lifetime	1059	50.2%	45.1%-55.4%	144	48.6%	37.3%-59.8%	655	54.2%	48.1%-60.3%
Vaping	Past 30 Days	1180	29.4%	25.9%-32.9%	162	30.7%	21.5%-39.8%	726	31.6%	26.7%-36.5%
Vaping	Lifetime	1155	55.9%	51.7%-60.1%	156	56.9%	48.6%-65.1%	715	59.3%	54.3%-64.3%
Marijuana	Past 30 Days	1163	31.6%	28.6%-34.5%	161	37.1%	26.7%-47.5%	714	33.7%	29.6%-37.8%
Marijuana	Lifetime	1159	53.9%	50.1%-57.7%	161	58.8%	47.9%-69.7%	713	56.8%	52.6%-60.9%
Prescription Drugs	Lifetime	1184	25.1%	22.3%-27.8%	165	28.0%	20.6%-35.4%	725	26.1%	23.2%-29%
Illicit Drugs	Lifetime	848	21.5%	17.9%-25%	113	21.1%	11.7%-30.6%	538	24.0%	19.4%-28.7%
Any Drug Use	Past 30 Days	974	55.0%	50.5%-59.6%	125	50.9%	40.1%-61.8%	596	60.5%	54.5%-66.5%
Any Drug	Lifetime	820	83.4%	79.7%-	107	76.8%	67.1%-	523	89.6%	86.2%

Use				87.1%			86.6%			- 93.1%
Poly-Drug Use	Past 30 Days	974	36.2%	31.8%- 40.6%	125	37.8%	27.3%- 48.2%	596	39.8%	33.5% - 46.1%
Poly-Drug Use	Lifetime	820	71.3%	66.4%- 76.2%	107	67.3%	57.2%- 77.3%	523	77.5%	72.3% - 82.8%

Table 1 Continued

Male Adolescents							
		Questioning (N=199)			**Heterosexual (N=6779)**		
Substance	**Timeframe**	**Unweighted N**	**Weighted Prevalence**	**95%CI**	**Unweighted N**	**Weighted Prevalence**	**95%CI**
Alcohol	Past 30 Days	168	36.4%	28.1%-44.7%	6159	32.0%	30.2%-33.8%
Alcohol	Lifetime	182	63.6%	54.3%-72.9%	6579	61.6%	59.2%-64%
Tobacco Use	Past 30 Days	165	25.7%	15.6%-35.7%	6320	15.8%	13.7%-18%
Cigarettes	Past 30 Days	175	20.3%	11.2%-29.4%	6513	11.5%	9.8%-13.1%
Cigarettes	Lifetime	160	37.0%	25.6%-48.4%	5974	33.5%	30.4%-36.7%
Vaping	Past 30 Days	190	31.7%	19.2%-44.2%	6706	25.4%	22.7%-28.2%
Vaping	Lifetime	185	38.7%	27.7%-49.7%	6602	46.5%	43.2%-49.9%
Marijuana	Past 30 Days	186	29.8%	20.9%-38.7%	6659	23.2%	20.1%-26.2%
Marijuana	Lifetime	181	38.8%	28.6%-49.1%	6590	40.2%	36.9%-43.6%
Prescription Drugs	Lifetime	196	27.2%	18.1%-36.2%	6707	17.0%	15.4%-18.7%
Illicit Drugs	Lifetime	128	25.5%	15%-36%	4831	15.0%	13.3%-16.7%
Any Drug Use	Past 30 Days	147	42.7%	32.7%-52.6%	5772	44.2%	41.6%-46.8%
Any Drug Use	Lifetime	118	68.6%	57%-80.1%	4673	71.3%	68.7%-73.9%

Poly-Drug Use	Past 30 Days	147	30.1%	19.9%-40.4%	5772	29.0%	26.4%-31.5%
Poly-Drug Use	Lifetime	118	55.5%	44.2%-66.8%	4673	52.6%	48.6%-56.5%
Female Adolescents							
		Questioning (N=296)			**Heterosexual (N=6105)**		
Substance	**Timeframe**	**Unweighted N**	**Weighted Prevalence**	**95%CI**	**Unweighted N**	**Weighted Prevalence**	**95%CI**
Alcohol	Past 30 Days	265	33.2%	25.4%-41%	5621	32.3%	28%-36.5%
Alcohol	Lifetime	280	60.6%	51.4%-69.7%	5974	63.8%	59.7%-67.9%
Tobacco Use	Past 30 Days	278	9.5%	5%-14.1%	5792	7.7%	6%-9.3%
Cigarettes	Past 30 Days	286	10.5%	5.6%-15.5%	5942	7.9%	6%-9.7%
Cigarettes	Lifetime	260	40.5%	33.2%-47.8%	5458	27.1%	22.3%-31.9%
Vaping	Past 30 Days	292	22.9%	17.1%-28.6%	6038	21.0%	18.8%-23.3%
Vaping	Lifetime	284	46.4%	38%-54.9%	5963	41.4%	37.4%-45.4%
Marijuana	Past 30 Days	288	23.3%	18.3%-28.4%	6063	17.8%	15.2%-20.4%
Marijuana	Lifetime	285	44.0%	36.2%-51.8%	6016	34.4%	30.3%-38.5%
Prescription Drugs	Lifetime	294	20.9%	15.1%-26.6%	6064	13.8%	12.4%-15.1%
Illicit Drugs	Lifetime	197	14.8%	10.6%-19%	4421	10.0%	7.9%-12.1%
Any Drug Use	Past 30 Days	253	43.8%	36.2%-51.5%	5324	40.2%	36%-44.4%

Any Drug Use	Lifetime	190	69.8%	61.9%-77.8%	4320	71.0%	66.1%-75.8%
Poly-Drug Use	Past 30 Days	253	27.0%	21%-33%	5324	22.5%	19.4%-25.7%
Poly-Drug Use	Lifetime	190	56.5%	47.2%-65.7%	4320	49.7%	44.3%-55.1%

Caption: Risk ratios for each substance use outcome compared to heterosexual peers of the same sex, i.e., gay males were compared to heterosexual males and lesbian females were compared to heterosexual females, are presented. The risk ratios are based upon data from the NYRBS and are adjusted for the NYRBS complex survey design. Tobacco use includes cigarette, cigar, smokeless tobacco, and e-cigarette use. Prescription drug use refers only to use not recommended by a healthcare professional. Illicit drug use includes cocaine, ecstasy, hallucinogens, heroin, inhalants, marijuana, methamphetamine, prescription drugs, steroids and synthetic marijuana use. Lifetime aggregate measures (i.e., lifetime any drug use and lifetime poly-drug use) account for all drug use outcomes that were measured at the lifetime timeframe. The NYRBS contains the responses of 15,624 adolescents. Among these responses, 921 did not report their sexual orientation, and 118 did not report their sex. After list wise deletion for sex and/or sexual orientation, the relevant sample size is 14,612.

Table 2. Relative Risk of Substance Use among Lesbian, Gay, Bisexual, and Questioning Adolescents

Male Adolescents

		Sexual Minority (N=531)		Gay (N=154)		Bisexual (N=178)		Questioning (N=199)	
Substance	**Timeframe**	**RR**	**95%CI**	**RR**	**95%CI**	**RR**	**95%CI**	**RR**	**95%CI**
Alcohol	Past 30 Days	1.18	0.92-1.46	1.23	0.67-1.91	1.09	0.78-1.44	1.24	0.85-1.67
Alcohol	Lifetime	1.06	0.9-1.21	1.22	0.99-1.4	0.9	0.71-1.09	1.09	0.9-1.28
Tobacco Use	Past 30 Days	0.88	0.53-1.35	0.65	0.22-1.48	0.79	0.42-1.34	1.22	0.61-2.11
Cigarettes	Past 30 Days	1.22	0.71-1.93	1.07	0.41-2.20	1.32	0.69-2.22	1.31	0.62-2.39
Cigarettes	Lifetime	1.17	0.84-1.55	0.94	0.48-1.51	1.33	0.94-1.75	1.18	0.82-1.59
Vaping	Past 30 Days	0.97	0.7-1.29	0.7	0.41-1.08	0.93	0.5-1.52	1.23	0.75-1.82
Vaping	Lifetime	0.87	0.72-1.04	0.86	0.5-1.26	0.89	0.63-1.17	0.88	0.59-1.20
Marijuana	Past 30 Days	1.12	0.8-1.55	1.04	0.58-1.63	1.05	0.67-1.52	1.27	0.82-1.83
Marijuana	Lifetime	1.02	0.8-1.26	1.1	0.65-1.57	0.96	0.66-1.32	1.02	0.72-1.34
Prescription Drugs	Lifetime	1.52	1.06-2.1	1.97	1.13-3.04	1.29	0.66-2.16	1.45	0.93-2.13
Illicit Drugs	Lifetime	1.42	0.93-2.04	1.67	0.80-2.88	1.17	0.68-1.83	1.54	0.88-2.44
Any Drug Use	Past 30 Days	1.05	0.82-1.30	1.01	0.51-1.57	1.06	0.74-1.4	1.07	0.77-1.39
Any Drug Use	Lifetime	1.02	0.89-1.13	1.18	1.01-1.3	0.93	0.73-1.1	0.98	0.8-1.15
Poly-Drug Use	Past 30 Days	0.96	0.72-1.24	0.84	0.37-1.52	0.97	0.69-1.29	1.07	0.68-1.56
Poly-Drug Use	Lifetime	1.05	0.92-1.18	1.01	0.61-1.39	1.04	0.82-1.27	1.08	0.78-1.38

Female Adolescents									
		Sexual Minority (N=1,197)		**Lesbian (N=167)**		**Bisexual (N=734)**		**Questioning (N=296)**	
Substance	**Timeframe**	**RR**	**95%CI**	**RR**	**95%CI**	**RR**	**95%CI**	**RR**	**95%CI**
Alcohol	Past 30 Days	1.23	1.07-1.40	1.03	0.62-1.51	1.29	1.04-1.59	1.16	0.87-1.5
Alcohol	Lifetime	1.17	1.07-1.29	1.03	0.82-1.23	1.26	1.14-1.38	0.98	0.84-1.12
Tobacco Use	Past 30 Days	1.99	1.32-2.88	1.68	0.79-3	2.34	1.75-3.06	1.21	0.58-2.19
Cigarettes	Past 30 Days	2.25	1.52-3.22	1.84	0.89-3.26	2.74	2.09-3.52	1.14	0.61-1.93
Cigarettes	Lifetime	1.88	1.59-2.22	1.58	1.02-2.24	2.04	1.7-2.44	1.57	1.15-2.05
Vaping	Past 30 Days	1.36	1.12-1.65	1.43	0.93-2.04	1.44	1.18-1.72	1.12	0.79-1.5
Vaping	Lifetime	1.35	1.19-1.51	1.22	0.97-1.49	1.43	1.26-1.6	1.18	0.94-1.43
Marijuana	Past 30 Days	1.71	1.41-2.05	1.53	0.96-2.23	1.87	1.58-2.19	1.38	0.93-1.95
Marijuana	Lifetime	1.59	1.4-1.79	1.47	1.03-1.93	1.7	1.5-1.92	1.34	0.97-1.75
Prescription Drugs	Lifetime	1.7	1.41-2.03	1.58	1.02-2.32	1.77	1.52-2.03	1.59	1.08-2.2
Illicit Drugs	Lifetime	2.13	1.52-2.90	1.62	0.77-2.87	2.41	1.88-3.03	1.62	1.06-2.36
Any Drug Use	Past 30 Days	1.35	1.16-1.56	1.12	0.79-1.47	1.48	1.28-1.69	1.13	0.87-1.39
Any Drug Use	Lifetime	1.15	1.08-1.23	1.02	0.84-1.18	1.22	1.15-1.31	1.01	0.88-1.13
Poly-Drug Use	Past 30 Days	1.62	1.3-2.00	1.48	0.93-2.16	1.72	1.44-2.02	1.40	1.09-1.76

Poly-Drug Use	Lifetime	1.40	1.27-1.54	1.24	0.99-1.49	1.51	1.36-1.68	1.17	0.92-1.41

Caption: Risk ratios for each substance use outcome compared the sexual minority subgroup's use to heterosexual peers of the same sex, i.e., gay males were compared to heterosexual males and lesbian females were compared to heterosexual females. The risk ratios are based upon data from the NYRBS and are adjusted for the NYRBS complex survey design. Tobacco use includes cigarette, cigar, smokeless tobacco, and e-cigarette use. Prescription drug use refers only to use not recommended by a healthcare professional. Illicit drug use includes cocaine, ecstasy, hallucinogens, heroin, inhalants, marijuana, methamphetamine, prescription drugs, steroids and synthetic marijuana use. Lifetime aggregate measures (i.e., lifetime any drug use and lifetime poly-drug use) account for all drug use outcomes that were measured at the lifetime timeframe. Risk ratios are computed using simulations based upon separate logistic regressions for each outcome and sexual orientation subgroup. The NYRBS contains the responses of 15,624 adolescents. Among these responses, 921 did not report their sexual orientation, and 118 did not report their sex. After list wise deletion for sex and/or sexual orientation, the relevant sample size is 14,612. The N's correspond to the number of respondents in each sexual orientation subgroup; there were 6779 heterosexual males, and 6105 heterosexual females in the comparison groups.