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Does the association between substance use and sexual risk behaviors among high school students vary by sexual identity?

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Abstract

Objective: Limited information exists on whether associations between substance use behaviors (SUBs) and sexual risk behaviors (SRBs) vary by sexual identity.

Methods: Data from the 2015 national Youth Risk Behavior Survey (n=15,624), were analyzed to assess associations between SUBs (cigarette smoking, alcohol use, binge drinking, marijuana use, prescription drug misuse, injection drug use, illicit drug use) and SRBs (sexual activity, number of partners, condom use). Logistic regression models calculated adjusted prevalence ratios (aPR), stratified by sexual identity, and interaction effects for sexual identity were introduced to models to determine if associations varied by sexual identity.

Results: All SUBs had significant associations with current sexual activity and 4+ sexual partners for both heterosexual and LGB students. No condom use during last sexual intercourse was significantly associated with all SUBs except alcohol use among heterosexual students, while no condom use was only significantly associated with injection drug use among LGB students. Associations between current sexual activity and SUBs were significantly stronger among heterosexual compared to LGB students for smoking (aPR=2.39;95% CI:2.15,2.65 vs aPR=1.49;95% CI:1.14,1.95), marijuana use (2.41;2.15,2.71 vs 1.86;1.58,2.19) and prescription drug misuse (2.10;1.93,2.28 vs 1.60;1.28,2.00). Associations between no condom use and SUBs were significantly stronger for heterosexual compared to LGB students only for smoking (1.32;1.16,1.50 vs 0.96;0.73,1.25) and marijuana use (1.22;1.07,1.38 vs 0.90;0.72,1.12).

Conclusions: The relationship between most SUBs and SRBs did not vary significantly by sexual identity. These findings underscore the importance coordinating school-based programs to prevent substance use and promote sexual health.

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INTRODUCTION

The association between substance use behaviors and risky sexual behaviors among adolescents has been well described. Substance use behaviors, such as the use of tobacco, alcohol, marijuana, cocaine, methamphetamines, heroin, ecstasy, and nonmedical use of prescription drugs, have been associated with current sexual activity, having multiple lifetime sexual partners, inconsistent condom use, and early initiation of sexual intercourse [1–11]. Associations observed between substance use and sexual risk behaviors may be due to shared risk factors, such as economic disadvantage [9] or disinhibition [12]. When using drugs before sex, intoxication may cause disinhibition or rather a state where individuals act impulsively thereby engaging in risky sexual than they otherwise would have [12]. However, the mechanisms underlying these behaviors may not be the same for all youth (varies, but typically considered 14 to 18 years of age). For example, observed associations between substance use and sexual risk behaviors may vary by adolescents' sexual identity, as sexual minority youth have been shown to be at higher risk of engaging in both substance use behaviors and sexual risk behaviors compared to students who identify as heterosexual [13].

Specifically, data recently published from the 2015 national Youth Risk Behavior Survey (YRBS), a nationally representative cross-sectional survey of high school students in grades 9 through 12, demonstrated that, compared to heterosexual-identified high school students, students who self-identify as lesbian, gay, or bisexual (LGB) had higher prevalence of having sexual intercourse with four or more persons, being currently sexually active, and not using a condom during last sexual intercourse [13]. Furthermore, the prevalence of many substance use behaviors such as current use of cigarettes, alcohol, or marijuana, as well as ever use of illicit substances (i.e., hallucinogens, cocaine, methamphetamines, ecstasy, prescription drugs [non-medical use], or inhalants) were also higher among LGB students compared to heterosexual students [13]. This disparity between LGB and heterosexual youth, particularly for substance use behaviors, has been observed in numerous studies. According to a meta-analysis of substance use behaviors among sexual minority youth in the US, the odds of substance use were 190% greater among LGB youth [14]. The disparity between heterosexual and LGB youth in substance use behaviors appears to begin in early adolescence, and becomes more pronounced throughout adolescence into adulthood [15].

The high prevalence of substance use behaviors among sexual minorities has been explained through both minority stress hypotheses [16–18] as well as the presence of permissive norms around substance use in the LGBTQ community [19]. Stigma-related stress, victimization, lack of supportive environments, psychological stress, internalizing/externalizing problem behavior, negative disclosure reactions, and housing status are all risk factors for substance use [20, 21]. These stressors, particularly stigma-related stress, may cause increased emotional dysregulation, social or interpersonal problems, and disruptive cognitive processes which in turn lead to substance use [21]. Additionally, structural stigma related to sexual minority identity such as low density of same-sex couples, a lack of Gay-Straight Alliances in the public high school setting, a lack of non-discrimination policies, and negative public opinion toward homosexuality may contribute to increased rates of substance use among sexual minority adolescents [22].

Evidence suggests that substance use among sexual minority youth often occurs concurrently with sexual risk behaviors. Herrick et al., [23] found that sexual minority youth were almost twice as likely to report sex while intoxicated compared to heterosexual youth. Similarly, in 2015, among sexually active female students, lesbian and bisexual students were more likely to have drank alcohol or used drugs before last sexual intercourse (23.5%) than heterosexual female students (14.9%) [13]. However, these are measures of concurrent use. In one study looking only at sexual minority adolescent girls, substance use (e.g., heavy drinking) mediated the relationship between sexual minority-specific victimization (i.e., being teased or bullied because someone thought the victim was gay or lesbian) and risky sexual behavior [24]. Studies like this point to a link between substance use and sexual risk among sexual minorities, but do not allow for a comparison to heterosexual youth. A study of the relationship between substance use and a broader construct of social stress (which may affect both heterosexual and sexual minority youth), found that associations between social stressors and substance use did not vary significantly by sexual orientation, meaning that once the analysis was adjusted for factors such as being threatened or injured by a weapon at school, being bullied, and feeling unsafe at school, differences in associations by sexual minority status disappeared [18]. This finding suggested that the reason controlling for social stressors reduced substance use disparities by sexual orientation was not that sexual minority youth respond differently than heterosexual youth to social stress, but rather that social stressors are far more common among sexual minority than heterosexual youth. Possibly, the underlying mechanisms by which sexual minority adolescents use substances may be different from those of their heterosexual peers, leading to differential associations with sexual risk behaviors. These mechanisms include minority stress, a specific form of social stress unique to sexual minority persons, and permissive norms (e.g., perceiving that peers use substances, or engage in risky sexual behaviors), which is a result of experiences such as prejudice, harassment, discrimination and victimization [18].

While research has demonstrated that substance use and sexual risk behaviors are associated, and that these risk behaviors tend to be more common among sexual minority students, it remains unclear how these associations differ between heterosexual and sexual minority students. Some studies have begun to explore how these relationships might differ among youth with different sexual orientations, but use concurrent measures, lack generalizability, or use a restrictive sample such as only female participants [23, 24]. This study is the first study we are aware of to explore differences in the association between substance use and sexual risk by sexual minority status among a nationally representative sample of high school students. Our study objective was to explore potential differences in associations between sexual risk taking and substance use by sexual identity.

METHODS

Study Population

The national YRBS is a cross-sectional, school-based survey conducted biennially by the US Centers for Disease Control and Prevention (CDC) since 1991. The YRBS obtains a nationally representative sample of students in grades 9 to 12 (can included ages ranging from 12 to 19 years) who attend public (provided by the government through taxes) and

private (paid for directly by parents/guardians) schools in the 50 states and the District of Columbia through the use of an independent three-stage cluster sample design [25]. The YRBS adheres to local parental permission requirements, and student participation is both anonymous and voluntary. The 2015 YRBS school-level response rate was 69%, the student level response rate was 86%, and the overall response rate was 60% [26]. The sample size for the 2015 YRBS was 15,624 students [26]. YRBS data are weighted to adjust for school and student nonresponse, as well as for the oversampling of Hispanic and Black students. Imputation methods were not used for missing data. More detailed information on the national YRBS sampling strategies and psychometric properties of the YRBS questionnaire has been published previously [25, 27]. The national YRBS was reviewed and approved by an institutional review board at the CDC, Atlanta, GA.

Measures

Sexual identity was assessed on the 2015 national YRBS with the question: “Which of the following best describes you?” Response options included “Heterosexual,” “Gay or Lesbian,” “Bisexual” and “Not sure.” For the purpose of this analysis, which intended to focus on differences in associations between substance use and sexual risk behaviors by sexual minority status, students who identified as LGB were combined into one group, which was necessary due to concerns for sufficient power to conduct planned analyses. It should be noted that our analysis excluded students who reported that they were “not sure” of their sexual identity because it could not be determined if these students were questioning their sexual identity, or not sure about the meaning of the question. Of the 14,703 students who had usable data for sexual identity, 503 (3.2%) indicated they were “not sure” of their sexual identity, which resulted in a final analytic sample of 14,200 students (12,954 heterosexual, 1,246 LGB). It should be noted that according to the 2015 national YRBS results, students who identify as “not sure” tend to have a similar behavioral risk profile to LGB students [13]. Although the YRBS questionnaire also included a question assessing same- and opposite-sex sexual contact, for this study, we chose to examine sexual identity rather than behavior given that mechanisms explaining disparities in mental health and substance use outcomes primarily focus on identity-based models such as social stress, and the Minority Stress Model [16]. Students who identify as LGB may be more confident about their identity than students with same-sex behaviors, and be more likely to disclose their identity to other students – which may increase their risk for harassment, victimization and other identity-related stigma events [14, 18].

Three sexual risk behaviors were evaluated for this study as outcome variables, which correspond to indicators established by the U.S. Centers for Disease Control and Prevention [26]: (1) currently sexually active, (2) four or more sex partners in lifetime, and (3) no condom use at last sexual intercourse. Current sexual activity was assessed with the question: “During the past 3 months, with how many people did you have sexual intercourse?” Responses were coded as ≥1 persons versus 0 persons. Four or more sex partners in lifetime was assessed with the question: “During your life, with how many people have you had sexual intercourse?” Responses to this question were coded as ≥ 4 persons versus < 4 persons. No condom use at last sexual intercourse was assessed with the

question: “The last time you had sexual intercourse, did you or your partner use a condom?” Response options to this question were reverse coded as no versus yes.

Seven substance use behaviors were evaluated for this study as exposure variables: (1) current cigarette smoking, (2) current alcohol use, (3) current binge drinking (defined as 5 or more drinks of alcohol in a row, within a couple of hours) [26], (4) current marijuana use, (5) lifetime non-medical use of prescription drugs, (6) ever injected illegal drugs, and (7) ever use of illicit drugs (includes lifetime use of any of the following: cocaine, heroin, methamphetamines, ecstasy, inhalants, and hallucinogens). Substance use questions and analytic coding are provided in Table 1.

Data analysis

We conducted descriptive analyses to present the distribution of demographic and key study variables by sexual identity and compared distributions using the Chi-square test. We stratified our analyses of substance use and sexual risk behaviors by sexual identity. Adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs) were generated using logistic regression models. Each of these models included sex, race/ethnicity, and grade as covariates. The denominator for no condom use during last sexual intercourse included all sexually experienced students regardless of whether the last episode of sexual intercourse occurred during the past three months, though for analyses of condom use, students who identified as lesbians were removed as condom use among lesbian identified youth is not expected to be common. To determine if differences between the sexual-identity stratified models were significant, the models were then rerun without the stratification, but with sexual-identity and substance use variables as interaction terms (i.e., effect modification), which allowed comparisons within a model of substance use and sexual risk behavior by sexual identity. Significant interactions were denoted by p values < .05.

To account for the complex sample design of the survey, we conducted all analyses using SUDAAN statistical software (Research Triangle Institute, Research Triangle Park, North Carolina).

RESULTS

Of the 14,200 students available for this analysis, 1,246 (8.3%) identified as LGB, while 12,954 (91.7%) identified as heterosexual (Table 2). No significant variation in grade or race/ethnicity was observed between heterosexual and LGB students. However, there was substantial variation by sex, with 71.9% of LGB students indicating that they were female compared to 46.2% of heterosexual students (<.001). All sexual risk behavior and substance use variables varied significantly by sexual identity, with higher prevalence for each observed among gay, lesbian and sexual minority youth compared to heterosexual youth.

Among heterosexual students, all substance use behaviors were significantly associated with being currently sexually active, with aPRs ranging from 2.10 to 2.82 (Table 3). Among LGB students, all substance use behaviors were also significantly associated with being currently sexually active, with aPRs ranging from 1.49 to 2.29. Although the aPRs for both sexual identity groups were significantly and positively associated with being currently sexually

active, the analyses that included the interaction terms (sexual identity X substance use variables) indicated that the magnitude of the positive association between these behaviors was significantly lower among LGB students for three of the seven substance use behaviors: current cigarette smoking ($p < .001$), current marijuana use ($p = .04$), and ever took prescription drugs without a doctor's prescription ($p = .04$).

Among both the heterosexual and the LGB groups, all substance use behaviors were significantly associated with having ≥ 4 lifetime sexual partners with aPRs among heterosexual students ranging from 3.46 to 5.36, and aPRs among LGB students ranging from 2.36 to 4.75 (Table 4). None of the associations between substance use behaviors and having four or more lifetime sexual partners varied by sexual identity.

Six of the seven substance use behaviors among heterosexual students were significantly and positively associated with not using a condom during last sexual intercourse, with aPRs ranging from 1.22 to 1.59 (Table 5). Among gay and bisexual students (lesbians restricted from analyses), only injection drug use was significantly associated with not using a condom during last sexual intercourse (aPR=1.48; 95% CI: 1.07,2.03). Significant differences in associations between two substance use behaviors and not using a condom during last sexual intercourse by sexual identity were observed: current cigarette smoking ($p = .03$) and current marijuana use ($p < .01$).

DISCUSSION

The association between substance use and sexual risk behaviors for both heterosexual and sexual minority students was generally supported by data from the 2015 YRBS. In fact, although the strength of these associations differed for sexual minority students in a few key instances, they were largely comparable across sexual identity subgroups. For the outcome of current sexual activity, we found a weaker risk relationship with the exposure variables of current cigarette use, marijuana use, and nonmedical use of prescription drugs among sexual minority students than heterosexual students. Similarly, for the outcome of not using a condom during last sexual intercourse, we found a weaker, and non-significant, risk relationship with exposure variables current cigarette use and current marijuana use among sexual minority compared to heterosexual youth. No differences were found between sexual minority and heterosexual students in the associations between having four or more lifetime partners and any of the substance use behaviors.

With the well-documented relationship between minority stressors and high rates of substance use [18, 20] and sexual risk [28] among sexual minority youth, and the connection between substance use and sexual risk among adolescents [1–11, 29], we had anticipated that LGB-identified youth might experience a stronger risk relationship between substance use and sexual risk. Interestingly, in this sample, the strength of the relationships between substance use and sexual risk behaviors was similar for sexual minority and heterosexual students in the majority of instances. This finding is critical in that it suggests that the underlying drivers of these patterns of risk may be generalizable among adolescents regardless of their sexual identity. More specifically, sources of stress likely both overlap and differ by sexual identity (e.g. social stress, minority stress), but the effects of the stress (such

as experiences with socio-economic challenges, as well as experiences such bullying, feeling unsafe at school, and having been threatened at school likely have similar effects on substance use behavior for both heterosexual and LGB youth).

Highlighting areas of similarity between sexual minority and heterosexual youth remains an important component of health research with this population. While a focus on differences between these groups is critical given the need to investigate and intervene upon sexual minority youth's experiences of stigma and related negative health outcomes [30, 31], overlooking areas of similarity may have the unintended consequence of exaggerating differences and erasing shared experiences among adolescents [32]. There are explanatory models for substance use and sexual risk behaviors among adolescents broadly. Some suggest these behaviors are linked through contextual factors, such as economic disadvantage, which place adolescents at risk for elevated rates of both substance use and sexual risk behaviors [9]. Evidence from other researchers does suggest that some adolescents may use substances to lower inhibition and facilitate sexual activity, which in turn leads to sexual risk behaviors [12]. It is unclear whether or not disinhibition explains the link between substance use and sexual risk behavior similarly for heterosexual and LGB youth. Unfortunately the YRBS does not collect data on reasons for substance use, so we are not able to determine the impact of the motive of disinhibition on our findings. Our evidence does not suggest that these pathways are substantially different for sexual minority youth.

For the few differences in the strength of the relationship between substance use and sexual risk behaviors by sexual identity, our results pointed to a *weaker* relationship between substance use and sexual risk for sexual minority students. Most health frameworks for sexual minority populations have been conceived in terms of the risks driving health disparities facing sexual minorities. Our findings suggest that this disparate risk may be more impactful for substance use than sexual risk behaviors, as sexual minority students in our study tended to have a consistently higher underlying prevalence of substance use compared to heterosexual students, regardless of sexual risk taking [13]. Researchers have suggested that this finding is possibly driven by both a coping response to minority stress [18, 33] and permissive substance use norms in the LGBTQ community [19]. These high rates of substance use among both sexual minority youth who participate in sexual risk behaviors and those who do not may weaken the association between substance use and sexual risk for this population. Conversely, heterosexual students, who are not influenced by minority stress related to sexual identity or norms in the LGBTQ community, have a lower prevalence of all substance use behaviors, which makes the relationship between substance use and sexual risk behaviors more readily identifiable, compared to sexual minority youth.

Additionally, consideration of which substances had this diminished risk relationship to sexual risk behaviors among sexual minority youth may be illuminating. Current cigarette and marijuana use both had weaker relationships to sexual risk behavior (i.e., currently sexually active and no condom used at last sex) for sexual minority youth. Research on substance use and sexual risk behaviors among adolescents in general indicates that the strength of these associations varies by substance type. For example, a recent study found that marijuana and cocaine use were more predictive of sexual risk than alcohol use for adolescents [34]; while another study found that alcohol use was more predictive of sexual

risk behavior than marijuana use [29]. Possibly, cigarette and marijuana use may impact the sexual risk behaviors of sexual minority youth differently than they impact heterosexual youth. Unfortunately our data did not allow for a more in-depth investigation of these observed associations. Further study into why these differences exist specifically for these two substance use behaviors is warranted.

Furthermore, the current measures of sexual risk may be influencing the observed patterns. With regard to the conceptualization of sexual risk behaviors and their connection to substance use for sexual minority youth, the way in which sexual risk is assessed potentially may affect its relationship to other risk behaviors. Generally, current sexual activity continues to be categorized as risk behavior among adolescents [26]; however, some have begun examining positive aspects of adolescent sexuality, including the relationship between sexual activity and increased self-esteem and positive sexual self-concept [35]. Research in this tradition notes that being sexually active in itself may not constitute significant risk if, for example, adolescents are using condoms, have only one partner, and are testing regularly for sexually transmitted infections [35]. Little research in this area has been done with sexual minority populations [36]; however, given that some research suggests that romantic relationships, particularly those that include communication about sexual risk, may be protective for the health of sexual minority youth [37, 38], this calls into question whether sexual activity is a risk factor for them. If current sexual activity is not a clear marker of risk, the expected link to other risk behaviors like substance use is difficult to discern.

In the case of condom use at last sex, only one substance use behavior (i.e., ever injected illegal drugs) was predictive of condom use at last sex for gay and bisexual students (lesbians excluded from this analysis because condom use is not expected to be common). Conversely, with the exception of current alcohol use, all substance use behaviors were associated with a decreased likelihood of condom use at last sex for heterosexual students. Because of the disproportional burden of HIV/AIDS among young gay and bisexual men, sexual minority youth are frequently the intended audience of many HIV risk reduction efforts [39]. Possibly, such efforts influence the knowledge and use of condoms among sexual minority youth in ways that distinguish them from heterosexual youth. Such distinctions may affect the decisional process by which sexual minority adolescents choose to use condoms, and thus affect the relationship between substance use and condoms in this population. This hypothesis warrants additional empirical inquiry.

Limitations

There are several important limitations to note with our study. As these data are cross-sectional, temporality between the association of substance use and sexual risk behaviors could not be determined. Additionally, it was not possible to determine the extent to which over-reporting and under-reporting of behaviors included in this analysis may have occurred, however, YRBS questions have generally demonstrated good test-retest reliability [25, 27]. Furthermore, these data are not representative of all individuals in this age group, as results only apply to adolescents who attend school. In 2012, about 3% of individuals aged 16-17 years had either not completed high school nor were enrolled in a high school program [40]. It is possible that there are urban versus rural differences in our observations, but this

information was not available for our analysis. Finally, due to limited sample size for LGB youth, we were not able to stratify our results by biological sex. It is possible that biological sex is an important effect modifier.

Conclusions

Our results suggest that the relationship between the majority of substance use behaviors and sexual risk rarely differed by sexual minority status. The similarities observed in the strength of the relationships between substance use and sexual risk among adolescents, regardless of sexual identity, suggests that not every behavioral pathway necessitates an intervention tailored by sexual minority status. In the case of the connection between substance use and sexual risk, students' status as adolescents may be more relevant to their intervention needs than their sexual identity. These findings underscore the importance of coordinating school-based programs to prevent substance use and promote sexual health, using strategies that are inclusive of sexual minority students.

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Table 1.

Substance Use Behaviors Assessed on the 2015 National Youth Risk Behavior Survey

Substance Use Behaviors	Questionnaire Item	Analytic coding
Current cigarette use	During the past 30 days, on how many days did you smoke cigarettes?	≥ 1 day versus 0 days
Current alcohol use	During the past 30 days, on how many days did you have at least one drink of alcohol?	≥ 1 day versus 0 days
Five or more drinks in a row (Binge drinking)	During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?	≥ 1 day versus 0 days
Current marijuana use	During the past 30 days, how many times did you use marijuana?	≥ 1 day versus 0 days
Ever took prescription drugs without a doctor's prescription	During your life, how many times have you taken a prescription drug (such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription?	≥ 1 time versus 0 times
Ever used illicit drugs (includes any of the following):		
Ever used cocaine	During your life, how many times have you used any form of cocaine, including powder, crack, or freebase?	≥ 1 time versus 0 times
Ever used heroin	During your life, how many times have you used heroin (also called smack, junk, or China white)?	≥ 1 time versus 0 times
Ever used methamphetamines	During your life, how many times have you used methamphetamines (also called speed, crystal, crank or ice)?	≥ 1 time versus 0 times
Ever used ecstasy	During your life, how many times have you used ecstasy (also called MDMA)?	≥ 1 time versus 0 times
Ever used inhalants	During your life, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?	≥ 1 time versus 0 times
Ever used hallucinogenic drugs	During your life, how many times have you used hallucinogenic drugs, such as LSD, acid, PCP, angel dust, mescaline, or mushrooms?	≥ 1 time versus 0 times
Ever injected any illegal drug	During your life, how many times have you used a needle to inject any illegal drug into your body?	≥ 1 time versus 0 times

Table 2.

Variation in Demographic Characteristics by Sexual Identity, 2015 National Youth Risk Behavior Survey

Demographic characteristics	Heterosexual N (%)[b]	Lesbian, Gay or Bisexual N (%)[b]	Chi-square p-value
Total	12,954 (91.7)	1,246 (8.3)	
Sex			<0.001
Male	6779 (53.8)	332 (28.1)	
Female	6105 (46.2)	901 (71.9)	
Race/Ethnicity			0.12
White[a]	5755 (55.3)	518 (49.5)	
Black[a]	1338 (13.2)	163 (17.4)	
Hispanic	4299 (22.3)	387 (22.4)	
Grade			0.13
9th	3259 (26.8)	334 (27.4)	
10th	3226 (25.3)	328 (29.2)	
11th	3329 (24.2)	313 (23.6)	
12th	3039 (23.6)	257 (19.8)	
Sexual Risk Behaviors (yes)			
Current sexual activity[c]	3748 (30.1)	407 (35.1)	0.02
Four or more lifetime sexual partners	1346 (11.2)	176 (14.7)	0.02
Did not use a condom during last sexual intercourse[d,e]	1966 (38.5)	247 (47.5)	0.01
Substance Use Behaviors (yes)			
Current cigarette use[f]	1255 (9.8)	227 (19.2)	<0.0001
Current alcohol use[f]	3814 (32.1)	457 (40.5)	<0.001
Five or more drinks in a row[f]	2227 (17.3)	277 (21.8)	<0.01
Current marijuana use[f]	2669 (20.7)	387 (32.0)	<0.0001
Ever took prescription drugs without a doctor's prescription	2024 (15.5)	368 (27.5)	<0.0001
Ever used illicit drugs[g]	1230 (11.7)	231 (26.1)	<0.0001
Ever injected any illegal drug	157 (1.1)	64 (5.4)	<0.001

[a] non-Hispanic

[b] Observations for demographic and key study variables do not sum to total sample by sexual identity classification due to small amounts of missing data. The race/ethnic group "other" is not presented as there is limited interpretability of this heterogeneous group.

[c] One or more sexual partners in the 3 months before the study

[d] Among students who had ever had sexual intercourse

[e] Lesbians removed from this group because condom use among lesbians is not expected to be common.

[f] During the 30 days prior to the study

[g] Includes lifetime use of any of the following: cocaine, heroin, methamphetamines, ecstasy, inhalants, or hallucinogenic drugs.

Table 3.

Effect of Sexual Identity on Associations Between Current Sexual Activity[a] and Substance Use Behaviors, 2015 National Youth Risk Behavior Survey

Substance Use Behaviors	Heterosexual Models				Lesbian, Gay, or Bisexual Models				Interaction Models[d]
		Currently sexually active?				Currently sexually active?			
	Model #, Unweighted N	No,% (Ref)	Yes, %	aPR (95% CI)	Model #, Unweighted N	No,% (Ref)	Yes, %	aPR (95% CI)	Interaction by sexual identity: p-value
Current cigarette use[b]	Model 1a N=11,584	4.9	21.4	2.39 (2.15,2.65)	Model 1b N=1,003	15.4	28.1	1.49 (1.14,1.95)	<0.001
Current alcohol use[b]	Model 2a N=11,012	22.0	56.4	2.49 (2.19,2.84)	Model 2b N=935	31.2	56.9	1.88 (1.45,2.42)	0.10
Five or more drinks in a row[b]	Model 3a N=11,599	10.3	34.3	2.27 (2.07,2.49)	Model 3b N=1,011	14.0	33.0	1.82 (1.52,2.18)	0.07
Current marijuana use[b]	Model 4a N=11,817	12.1	40.7	2.41 (2.15,2.71)	Model 4b N=1,032	21.1	47.2	1.86 (1.58,2.19)	0.04
Ever took prescription drugs without a doctor's prescription	Model 5a N=11,829	9.6	29.1	2.10 (1.93,2.28)	Model 5b N=1,039	20.0	35.9	1.60 (1.28,2.00)	0.04
Ever used illicit drugs[c]	Model 6a N=8,924	6.9	22.3	2.11 (1.87,2.38)	Model 6b N=813	18.8	36.0	1.69 (1.39,2.07)	0.08
Ever injected any illegal drug	Model 7a N=11,474	0.2	2.3	2.82 (2.39,3.31)	Model 7b N=1,000	0.9	4.3	2.29 (1.82,2.88)	0.21

aPR: Adjusted prevalence ratio. Models adjusted for race/ethnicity, sex and grade

[a] One or more sexual partners in the 3 months before the study

[b] During the 30 days prior to the study

[c] Includes lifetime use of any of the following: cocaine, heroin, methamphetamines, ecstasy, inhalants, or hallucinogenic drugs.

[d] Seperate models were run with the sexual identity x substance use variable as an interaction term.

Table 4.

Effect of Sexual Identity on Associations Between 4 or More Lifetime Sexual Partners and Substance Use Behaviors, 2015 National Youth Risk Behavior Survey

Substance Use Behaviors	Heterosexual Models				Lesbian, Gay, or Bisexual Models				Interaction Models[c]
	Model #, Unweighted N	Had sexual intercourse with four or more persons during their life?			Model #, Unweighted N	Lesbian, gay, or bisexual: Had sexual intercourse with four or more persons during their life?			Interaction by sexual identity: p-value
		No,% (Ref)	Yes, %	aPR (95% CI)		No,% (Ref)	Yes, %	aPR (95% CI)	
Current cigarette use[a]	Model 1a N=11,570	6.8	34.0	4.36 (3.70,5.12)	Model 1b N=1,002	14.7	46.1	3.58 (2.53,5.05)	0.62
Current alcohol use[a]	Model 2a N=10,998	27.9	66.6	3.91 (3.18,4.80)	Model 2b N=935	34.2	73.1	4.13 (2.68,6.38)	0.36
Five or more drinks in a row[a]	Model 3a N=11,584	14.1	44.5	3.46 (2.94,4.07)	Model 3b N=1,010	15.9	49.3	3.70 (2.63,5.21)	0.41
Current marijuana use[a]	Model 4a N=11,803	16.5	54.5	3.87 (3.24,4.61)	Model 4b N=1,031	23.6	66.5	4.31 (3.07,6.07)	0.30
Ever took prescription drugs without a doctor's prescription	Model 5a N=11,816	12.1	42.7	3.74 (3.12,4.47)	Model 5b N=1,037	21.9	44.3	2.36 (1.65,3.39)	0.15
Ever used illicit drugs[b]	Model 6a N=8,909	8.7	34.7	4.10 (3.53,4.76)	Model 6b N=811	21.0	46.4	2.68 (1.76,4.08)	0.20
Ever injected any illegal drug	Model 7a N=11,459	0.3	4.8	5.36 (3.78,7.60)	Model 7b N=999	1.1	7.7	4.75 (3.25,6.95)	0.48

aPR: Adjusted prevalence ratio. Models adjusted for race/ethnicity, sex and grade.

[a] During the 30 days prior to the study

[b] Includes lifetime use of any of the following: cocaine, heroin, methamphetamines, ecstasy, inhalants, or hallucinogenic drugs.

[c] Seperate models were run with the sexual identity x substance use variable as an interaction term.

Table 5.

Effect of Sexual Identity on Associations Between Not Using a Condom During Last Sexual Intercourse[a] and Substance Use Behaviors, 2015 National Youth Risk Behavior Survey

Substance Use Behaviors	Heterosexual Models				Gay or Bisexual Models[d]				Interaction Models[e]
	Model #, Unweighted N	Did not use a condom used during last sexual intercourse?			Model #, Unweighted N	Did not use a condom use during last sexual intercourse?			Interaction by sexual identity: p-value
		No ,% Ref	Yes, %	aPR (95% CI)		No, % Ref	Yes, %	aPR (95% CI)	
Current cigarette use[b]	Model 1a N=4,700	17.0	24.3	1.32 (1.16,1.50)	Model 1b N=465	28.7	28.2	0.98 (0.75,1.27)	0.03
Current alcohol use[b]	Model 2a N=4,427	52.7	56.4	1.08 (0.95,1.22)	Model 2b N=432	49.8	54.7	1.10 (0.87,1.41)	0.98
Five or more drinks in a row[b]	Model 3a N=4,702	29.5	37.4	1.23 (1.07,1.41)	Model 3b N=467	25.9	28.9	1.08 (0.91,1.29)	0.29
Current marijuana use[b]	Model 4a N=4,856	36.4	42.8	1.22 (1.07,1.38)	Model 4b N=479	45.9	37.2	0.84 (0.68,1.02)	<0.01
Ever took prescription drugs without a doctor's prescription	Model 5a N=4,875	24.4	32.9	1.29 (1.17,1.43)	Model 5b N=485	30.0	31.7	1.08 (0.86,1.35)	0.14
Ever used illicit drugs[c]	Model 6a N=3,817	19.2	25.7	1.27 (1.13,1.43)	Model 6b N=385	30.2	35.5	1.18 (0.92,1.53)	0.72
Ever injected any illegal drug	Model 7a N=4,743	1.4	3.1	1.59 (1.20,2.10)	Model 7b N=472	2.2	5.3	1.48 (1.07,2.03)	0.83

aPR: Adjusted prevalence ratio. Models adjusted for race/ethnicity, sex and grade.

[a]Among students who had ever had sexual intercourse

[b]During the 30 days prior to the study

[c]Includes lifetime use of any of the following: cocaine, heroin, methamphetamines, ecstasy, inhalants, or hallucinogenic drugs.

[d]Lesbians removed from this group because condom use among lesbians is not expected to be common.

[e]Seperate models were run with the sexual identity x substance use variable as an interaction term.