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Sexual Identity and Substance Use Among Undergraduate Students

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This study examined the association between sexual identity and use of alcohol and other drugs (AOD) among college undergraduate students. A survey regarding AOD use was administered to a random sample of 3607 undergraduate students. The sample included 65 self-identified lesbian or bisexual (LB) women and 54 self-identified gay or bisexual (GB) men. Multivariate logistic regression indicated that while alcohol use did not differ for LB and heterosexual women, LB women were significantly more likely to experience certain AOD-related consequences, smoke cigarettes, and use marijuana, ecstasy, and other drugs. GB men were significantly less likely than heterosexual men to drink heavily but were more likely to use some drugs. These findings provide evidence that sexual identity is an important predictor of AOD use among undergraduate students. These findings support the need for continued research and intervention efforts that target LGB collegians.

KEY WORDS: sexual identity; substance use; AOD; consequences; college.

INTRODUCTION

The majority of alcohol and other drug (AOD) research suggests that lesbian, gay, and bisexual (LGB) adolescents and young adults in the United States are substantially more likely to smoke cigarettes, report alcohol disorders, and use other drugs than are heterosexual youth (1–4). However, several researchers have noted the limitations of research on LGB populations and called for improved research designs and sampling methods (5, 6). These researchers encouraged large-scale surveys, using random sampling methods, because LGB health research has relied too often on convenience sampling methods. Although research using convenience samples

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has raised awareness about the potential and unique health concerns within LGB populations, the generalizability of results from these studies is limited.

Although studies of LGB populations that have used random sampling methods have generally found higher rates of AOD use than have studies using convenience samples, there are notable exceptions (2, 4, 7, 8). Results of these studies raise questions about the relative risk of substance abuse among LGB groups compared with their heterosexual counterparts. One of the difficulties in comparing results across studies has to do with the lack of consistent definitions of sexual orientation (1, 2, 4, 7, 8). For instance, Bloomfield (7) used a random sample of urban adult women in the San Francisco Bay area and found no significant differences in the levels of alcohol consumption between women who identified as lesbian or bisexual and those who identified as heterosexual. In contrast, using sexual behavior as a proxy for lesbian or gay identity, Cochran *et al.* (2) found that homosexually active women (at least one female sex partner in the year before the survey) in the 1996 National Household Survey on Drug Abuse were at greater risk for alcohol abuse and alcohol-related morbidity than were exclusively heterosexually active women. Alcohol abuse did not differ between homosexually and exclusively heterosexually active men in the study. Gruskin *et al.* (1) found that women aged 20–34 who self-identified as lesbian or bisexual were more likely than heterosexual women to be drinkers and to report higher weekly alcohol consumption. In a random sample of 4159 high school students, Garofalo *et al.* (4) found that sexual identity was significantly associated with several risk behaviors including drug use, attempted suicide, and unsafe sexual practices. Finally, Russell *et al.* (8) compared substance use among 13- to 18-year-old adolescents in a nationally representative sample on the basis of romantic attraction. Adolescent females with romantic attractions to other females or to both females and males were more likely than adolescent females with only other-sex attractions to report higher rates of alcohol intoxication, marijuana use, and other illicit drug use. In contrast, adolescent males who reported attraction to both sexes had significantly higher rates of substance use than did adolescent males with other-sex attractions but there were no differences between adolescent males with same-sex attractions and those with other-sex attractions.

Lack of consistent research results supports the need for further investigations regarding the relationship between AOD use and sexual identity—especially probability studies that examine gender differences in AOD use.

The study of sexual orientation and AOD use among college students has been limited by the fact that these studies have generally lacked questions about sexual orientation (9–11). As in the general literature on AOD use among LGB populations, existing data provide some support for the relationship between sexual orientation or homosexual activity and AOD use among college students (3, 12, 13). For example, DeBord *et al.* (12) surveyed a random sample of college students over 4 years and found heavier alcohol use among self-identified LGB college students than among a matched control group of heterosexual college peers. However, there were no differences observed in other drug involvement, suicidal ideation, or measures of psychological distress. In contrast, Pope *et al.* (13) found that undergraduate students who reported at least one same-sex sexual experience since coming to college reported higher rates of drug use. Boyd *et al.* (3) found a significant relationship

between ecstasy use and LGB status after adjusting for several other factors; in fact, self-identified LGB students were three times more likely to report monthly and annual ecstasy use than were heterosexual students. Unfortunately, other measures of AOD use were not examined. The authors concluded that more research on the relationship between sexual orientation and AOD use was needed.

There are several compelling reasons for colleges and universities to learn more about the subgroups of undergraduate students who are at increased risk for AOD misuse. First, AOD misuse among traditional-age undergraduate students is associated with significantly higher rates of unsafe sex (14, 15), more emergency care visits (16, 17), and higher incidence of sexual assault (18–20). Second, not only is AOD use associated with adverse consequences for students who engage in such behavior, AOD use also has secondary adverse consequences for other students including sleep disturbances, vandalism, and physical attacks (10, 21, 22). Finally, although noncollegiate LGB populations have been found to be at greater risk for adverse consequences (8, 23–26), there is growing consensus that more research is needed that examines the relationship between sexual orientation and consequences of AOD use among college students (27, 28).

To better understand the relationship between sexual identity and substance use among undergraduate students, we examined the following hypotheses: (a) self-identified LB women have significantly higher rates of AOD use and AOD-related consequences than do heterosexual women after controlling for other demographic factors and (b) self-identified GB men have significantly higher rates of AOD use and AOD-related consequences than do heterosexual men after controlling for other demographic factors.

METHODS

The University of Michigan's Institutional Review Board approved the protocol for this study. The study was conducted during a 1-month period in March and April of 2001 at the University of Michigan, drawing on a total undergraduate population of 21,055 full-time students (10,732 women and 10,323 men). The University Registrar Office randomly selected 7000 full-time undergraduate students from the population. The 7000 randomly selected undergraduate students were randomly assigned to either the web mode ($n = 3500$) or U.S. mail mode ($n = 3500$). Informed consent was obtained from each student participant.

Several strategies were used to maximize response to the study and to encourage valid responses to survey questions. All participants were informed that a research firm, unaffiliated with the University, was contracted to set up the web survey as well as store and maintain data from both modes of data collection. University officials, faculty, and staff were unable to access any contact information connected with the data of any respondent. The web survey was maintained on a hosted secure Internet site running under the secure sockets layer (SSL) protocol to insure respondent data were safely transmitted between the respondent's browser and the server. Finally, all potential respondents were sent letters explaining that participation was voluntary, describing the relevance of the study, and assuring that all responses would be kept confidential.

The response rate was 63% for the web mode and 40% for the U.S. mail mode, and the overall response rate for the study was 52%. Despite the mode differences in response rate, there were no substantive differences in substance use observed between the two modes (29). In fact, the rates of AOD use found in this study were the same as those obtained by major national surveys of college students (9, 30, 31). Also, the percentage of respondents who identified as gay, lesbian, or bisexual did not differ by mode. Finally, a telephone follow-up survey of 727 randomly selected nonresponders in both modes found that reasons for nonresponse were unrelated to the study variables.

Sample

The final sample included 3607 undergraduate students (demographic characteristics of the sample are summarized in Table I) Given that the response rates were different by mode, the demographic characteristics of the U.S. mail and web respondents were compared. Respondents differed by survey mode on gender ($\chi^2 = 16.4$, df $= 1$, $p < 0.001$), with fewer males responding in the U.S. mail mode. There were no significant differences in the race, class year, living arrangement, or GPA between the two survey modes.

Overall, the final sample was 58% female, 68% White, and 32% had a senior class standing in college. Student characteristics from the overall undergraduate student population ($N = 21,055$) and the final sample ($n = 3607$) were compared. Significant differences were found for gender and race with the final sample entaining more women and white students and fewer African-American students. Living arrangement and GPA were not known for the population, and thus we could not assess whether the sample was representative with respect to these characteristics. Approximately 3.3% of the sample identified themselves as LGB, which is consistent with other research using self-report of sexual identity among random samples of adolescents and young adults (1, 4, 32, 33). We were encouraged that 3.3% of both the U.S. mail and web survey subsamples reported being LGB, which suggests that both survey modes were reasonably successful in reaching LGB students. Among LGB students, more women self-identified as bisexual ($n = 49$) than as lesbian ($n = 16$) and more men self-identified as gay ($n = 40$) than as bisexual ($n = 14$). Demographic characteristics of LGB students were comparable to heterosexual students except for living arrangement. LGB students were less likely to live in residence halls or fraternity or sorority houses and more likely to live in apartments or houses. In comparisons of the demographic characteristics of LGB and heterosexual samples by gender, no significant differences were found between gay/bisexual and heterosexual men. However, lesbian/bisexual women were more likely than heterosexual women to live in houses or apartments ($\chi^2 = 18.4$, df $= 3$, $p < 0.001$).

Instrument

The Student Life Survey (SLS) was developed and pilot-tested in 1993. The SLS draws from items in the Monitoring the Future study (9), CORE study (10), and

Table I. Sample Characteristics by Sexual Identity, Overall and For Men and Women Separately

Sample characteristics	Overall					Men			Women		
	Total Sample ($n = 3607$)		Hetero ($n = 3488$) (%)	LGB ($n = 119$) (%)	χ^2 (df) (p value)[a]	Hetero ($n = 1446$) %	GB ($n = 54$) %	χ^2 (df) (p value)[a]	Hetero ($n = 2042$) %	LB ($n = 65$) %	χ^2 (df) (p value)[a]
	n	%									
Gender											
Female	2107	58.4%	58.5%	54.6%	0.7 (1)						
Male	1500	41.6	41.5	45.4	0.393						
Race/ethnicity											
White	2454	68.0	68.0	68.1	4.9 (3)	66.9	70.4	1.6 (4)	68.8	66.2	8.5 (4)
Asian	437	12.1	12.3	7.6	0.296	12.4	7.4	0.809	12.1	7.7	0.075
African-American	177	4.9	4.9	5.9		3.0	3.7		6.2	7.7	
Hispanic	127	3.5	3.6	2.5		3.9	5.6		3.3	0.0	
Other	412	11.4	11.3	16.0		13.6	13.0		9.6	18.5	
Class year											
Senior	1150	32.0	32.0	33.1	5.2 (3)	34.5	29.6	6.6 (3)	30.1	35.9	5.2 (3)
Junior	947	26.3	26.3	28.0	.161	27.7	22.2	0.086	25.3	32.8	0.155
Sophomore	864	24.0	23.9	28.8		23.8	38.9		23.9	20.3	
Freshmen	633	17.6	17.9	10.2		14.0	9.3		20.6	10.9	
Living Arrangement											
Residence hall	1524	42.5	42.7	35.3	14.4 (3)	43.2	48.1	3.7 (3)	42.4	24.6	18.4 (3)
Fraternity or sorority	193	5.4	5.5	0.8	.002	4.2	1.9	.298	6.4	0.0	<.001
House or apartment	1734	48.3	48.1	55.5		49.1	42.6		47.4	66.2	
Other	136	3.8	3.6	8.4		3.5	7.4		3.7	9.2	
Grade point average											
3.5–4.0	1528	42.4	42.1	51.3	5.1 (3)	41.3	44.4	0.7 (3)	42.6	56.9	6.0 (3)
3.0–3.4	1396	38.7	38.8	34.5	0.165	38.3	38.9	0.872	39.2	30.8	0.113
2.5–2.9	515	14.3	14.4	9.2		15.1	11.1		14.0	7.7	
Below 2.5	168	4.7	4.6	5.0		5.3	5.6		4.2	4.6	

Note. Not all categories sum to total because of refusals and missing cases.
[a]Chi-square p values indicate whether distributions are significantly different by sexual identity.

the College Alcohol study (11). Study design, procedures, and reliability measures in SLS are described in more detail elsewhere (34, 35).

Measures

Sexual identity was assessed using a single item that asked whether respondents considered themselves to be (1) heterosexual, (2) lesbian or gay, or (3) bisexual.

Heavy episodic drinking was measured using the following single-item question: "Over the past two weeks, how many occasions have you had five or more drinks in a row (four or more for women)?" A drink was defined as a glass of wine, bottle of beer or wine cooler, a shot of liquor, or a mixed drink. For purposes of this analysis, response categories were collapsed into the following categories: (1) none, (2) 1–2 occasions, (3) 3 or more occasions.

Monthly alcohol use was measured using the following question: "On how many occasions (if any) have you had alcohol to drink — more than just a few sips during the past 30 days?" The response scale was: (1) no occasions, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, and (7) 40 or more occasions.

Cigarette use was measured using the following question: "How many cigarettes did you smoke during the past 30 days?" The response scale was: (1) none, (2) less than 1 cigarette per day, (3) 1–5 cigarettes per day, (4) about 0.5 pack per day, (5) about 1 pack per day, (6) about 1.5 packs per day, and (7) 2 or more packs per day.

Monthly marijuana use was assessed using the following question: "On how many occasions have you used marijuana in the past 30 days?" Seven response choices were provided: (1) none, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, and (7) 40 or more occasions.

Annual alcohol use was measured using the following question: "On how many occasions (if any) have you had alcohol to drink — more than just a few sips — during the past 12 months?" The response choices for each question were the following: (1) no occasions, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, and (7) 40 or more occasions.

Annual marijuana use was measured using the following question: "Have you used marijuana in the past 12 months?" For purposes of this analysis, annual marijuana use was considered a dichotomous outcome (at least once/none).

Annual ecstasy use was measured using the following question: "Have you used ecstasy in the past 12 months?" For purposes of this analysis, annual ecstasy use was considered a dichotomous outcome (at least once/none).

Annual and monthly illicit drug indices were developed by summing the total number of illicit drugs used in the past year and in the past month (other than ecstasy and marijuana). The illicit drugs included in the indices were *inhalants, psychedelics, LSD, cocaine, narcotics, crystal methamphetamine, downers* (e.g. *Halcion, Dalmane, barbiturates*), *heroin, GHB, rohypnol, amphetamines, and tranquilizers.* Given the skewed distribution of the drug indices, responses were collapsed into two categories: no use, one or more illicit drugs.

Primary alcohol-related consequences were assessed using items adapted from two national studies of AOD use among college students (10, 11). Participants were

asked 23 questions about primary consequences associated with their use of alcohol in the past year (e.g., drove under the influence, afraid you were alcoholic, unplanned sex, hangover, memory loss, trouble with police, damaged property).

Secondary consequences were assessed using items adapted from the College Alcohol Study (21, 22). These included 10 questions about secondary consequences associated with others' AOD use in the past year (e.g., your sleep was disrupted, you experienced an unwanted sexual advance by someone drunk or high, you had to take care of someone with a drinking or drug problem).

Place of residence was determined by asking students, "Where did you live during the school year?" For purposes of this study, responses were collapsed into the following four categories: (1) residence hall, (2) fraternity/sorority house, (3) house or apartment within the university city, and (4) other category which included cooperative housing and outside the university city.

RESULTS

Prevalence of Alcohol and Other Drug Use

We examined the association of sexual identity and several measures of AOD and other drug use separately for men and women, using chi-square tests and multivariate logistic regression. Results of chi-square tests examining the full response categories for alcohol use and cigarette smoking measures revealed that there were no significantly different distributions in any of the six alcohol use behaviors between LB women and heterosexual women (see Table II). However, chi-square results indicated that LB women were considerably more likely to report cigarette smoking. Furthermore, significant differences between GB and heterosexual men were found in four out of six alcohol use measures including alcohol use in the past year, number of drinks per week, heavy episodic drinking in the past 2 weeks, and average number of drinks per occasion. Although 91% of GB men consumed alcohol in the past year (vs. 83% of heterosexuals), a smaller percentage reported using alcohol 40 or more times (21% vs. 32% of heterosexuals). Additionally, fewer GB men (30%) than heterosexual men (48%) reported any heavy episodic drinking in the past 2 weeks. Finally, differences in the average number of drinks consumed weekly and per occasion in the past month suggest that while fewer of the GB men abstained from alcohol, they tended to drink more moderately than did heterosexual male drinkers.

In addition to chi-square comparisons, we used multivariate logistic regression to examine the relationship between sexual identity and AOD use adjusting for race, class year, living arrangement, and grade point average. We tested a separate logistic regression model for each of the variables that had shown a significant bivariate relationship with sexual identity for either sex (see Tables III and IV). Because demographic characteristics differed on the basis of sexual identity, it was important to examine the role of sexual identity after adjustment for these substance use variables. In general, White students were more likely than undergraduate students from other racial and ethnic groups to have used alcohol and other drugs. Additionally, underclass (Freshman and Sophomore) students, those with lower grade point

Table II. Prevalence of Substance Use by Sexual Identity

Substance use measures	Hetero men ($n = 1446$)	GB men ($n = 54$)	Hetero women ($n = 2042$)	LB women ($n = 65$)	χ^2 (p value differences)
Pre-college drinking					
None	32.4	28.3	32.7	21.9	
Less than Monthly	23.8	34.0	27.9	28.1	
Monthly	23.7	24.5	24.4	35.9	
Weekly	20.1	13.2	15.0	14.1	
Alcohol use in past year					
Never	16.9	9.4	12.5	3.3	A
1–2 occasions	7.5	3.8	9.9	13.1	
3–5 occasions	6.2	15.1	9.1	6.6	
6–9 occasions	6.0	9.4	9.0	8.2	
10–19 occasions	13.0	22.6	17.4	19.7	
20–39 occasions	18.1	18.9	17.9	26.2	
40 or more occasions	32.3	20.8	24.2	23.0	
Alcohol use in past month					
Never	26.2	15.1	24.1	18.3	A
1–2 occasions	16.9	32.1	21.4	23.3	
3–5 occasions	18.1	20.8	21.9	28.3	
6–9 occasions	19.8	20.8	16.6	20.0	
10–19 occasions	15.0	7.5	13.1	10.0	
20 or more occasions	4.0	3.8	2.8	0.0	
Heavy episodic drinking					
Never	51.8	69.8	49.4	48.3	A,B
1–2 occasions	21.2	22.6	29.8	41.7	
3 or more occasions	27.0	7.5	20.7	10.0	
Drinks per occasion					
Did not drink	28.6	14.8	25.6	21.7	A
1–3 drinks	23.6	48.1	35.8	46.7	
4–7 drinks	33.6	31.5	34.9	28.3	
8 or more drinks	14.2	5.6	3.7	3.3	
Weekly drinks					
None	31.1	22.2	32.0	27.7	A
1–2 drinks	9.8	25.9	13.4	16.9	
3–6 drinks	14.4	13.0	19.9	29.2	
7–20 drinks	24.6	18.5	18.4	9.2	
21 or more drinks	20.1	20.4	16.3	16.9	
Cigarette smoking					
None	77.8	68.5	77.6	51.6	A,B
<1 per day	9.9	5.6	12.1	20.3	
1–5 per day	6.4	9.3	6.3	14.1	
½ pack or more daily	5.9	16.7	4.0	14.1	

Note. Sample sizes may vary due to missing responses to substance use questions.
"A" indicates distributions for heterosexual men differed significantly from gay/bisexual men ($p < 0.05$).
"B" indicates distributions for heterosexual women differed significantly from lesbian/bisexual women ($p < 0.05$).

averages, and those living in fraternities or sororities were also more likely to have used marijuana, cigarettes, and alcohol.

After controlling for race, class year, living arrangement, and grade point average, there were no significant differences in the drinking behaviors between LB women and heterosexual women. However, as illustrated in Table III, LB women were approximately four times more likely to have smoked cigarettes in the past month, almost twice as likely to have initiated marijuana use before entering college, more than twice as likely to report marijuana use in the past month, and more

Table III. Multivariate Logistic Regression Models for Substance Use Measures Among Undergraduate Female, Odds Ratios

Student characteristics	Cigarette smoking in past month	Four or more drinks per occasion	Heavy episodic drinking	Alcohol use in past year	Marijuana use before college	Marijuana use in past month	Marijuana use in past year	Ecstasy use before college	Ecstasy use in past month	Ecstasy use in past year
Sexual identity										
Heterosexual	—	—	—	—	—	—	—	—	—	—
Lesbian or Bisexual	3.59***	0.81	1.15	4.15	1.92*	2.67**	3.89***	1.42	2.07	3.83***
Race										
White	—	—	—	—	—	—	—	—	—	—
Asian	0.48***	0.51***	0.45***	0.31***	0.34***	0.30***	0.31***	0.25	0.77	1.14
African-American	0.21***	0.28***	0.22***	0.33***	0.24***	0.28***	0.38***	[a]	0.21	0.28*
Hispanic	1.00	1.31	0.91	1.19	1.51	0.86	1.20	0.79	0.90	1.57
Other	0.68*	0.50***	0.41***	0.46***	0.65*	0.48**	0.61**	0.72	0.46	0.75
Class year										
Senior	—	—	—	—	—	—	—	—	—	—
Junior	0.85	1.29	1.05	0.90	1.18	1.10	1.25	1.82	1.04	1.12
Sophomore	0.95	1.35*	0.98	0.72	1.55**	1.61*	1.64**	3.21*	1.77	1.72*
Freshman	1.46	2.41***	1.59**	0.72	2.61***	3.53***	2.13***	8.36***	3.29*	2.78**
Living arrangement										
Residence hall	—	—	—	—	—	—	—	—	—	—
Fraternity or sorority	2.48***	3.29***	3.64***	6.93**	2.98***	3.64***	3.60***	2.49	1.72	3.03**
House or apartment	1.86***	2.00***	2.22***	2.53***	1.97***	2.30***	1.88***	1.75	3.07*	3.45***
Other	1.10	0.62	0.60	0.88	1.55	1.77	1.28	2.60	5.90**	3.46**
Grade point average										
3.5 or higher	—	—	—	—	—	—	—	—	—	—
3.0–3.4	1.29*	1.29*	1.28*	0.95	0.69	1.21	1.05	0.98	1.95*	1.96
2.5–2.9	1.59**	1.50**	1.50**	1.41	0.81	1.06	0.91	1.52	2.19	2.35
Below 2.5	2.10**	1.56	1.48	1.57	0.76	2.07*	1.58	0.48	2.34	2.53**

Note. Results for each variable are adjusted for other predictors. The dash (—) indicates reference group.
[a]Sample size of particular cell did not produce reliable odds ratio.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (statistically significant).

Table IV. Multivariate Logistic Regression Models for Substance Use Measures Among Undergraduate Males, Odds Ratios

Student characteristics	Cigarette smoking in past month	Four or more drinks per occasion	Heavy episodic drinking	Alcohol use in past year	Marijuana use before college	Marijuana use in past month	Marijuana use in past year	Ecstasy use before college	Ecstasy use in past month	Ecstasy use in past year
Sexual identity										
Heterosexual	—	—	—	—	—	—	—	—	—	—
Gay or Bisexual	1.68	0.61	0.43**	2.33	1.06	1.16	1.99*	6.89***	4.47**	3.14**
Race										
White	—	—	—	—	—	—	—	—	—	—
Asian	0.55**	0.40***	0.31***	0.57**	0.39***	0.39***	0.38***	0.87	0.72	0.57
African-American	0.42	0.40**	0.36**	0.59	0.91	0.76	0.48	1.10	[a]	0.53
Hispanic	0.85	0.87	0.50*	0.66	0.55	0.70	0.56	2.34	[a]	0.20
Other	0.72	0.49***	0.56**	0.75	0.50**	0.58	0.55**	0.96	0.64	0.89
Class year										
Senior	—	—	—	—	—	—	—	—	—	—
Junior	0.92	1.02	1.16	0.84	1.22	1.48*	1.16	0.86	0.41	1.04
Sophomore	1.06	1.72**	1.37	0.78	2.28***	1.98***	1.58*	1.79	0.59	0.70
Freshman	1.37	2.03**	1.41	1.22	2.53***	2.30**	1.61*	2.63	0.87	0.90
Living arrangement										
Residence hall	—	—	—	—	—	—	—	—	—	—
Fraternity or sorority	2.30**	5.63***	8.36***	[a]	4.26***	2.98***	3.54***	0.92	1.95	2.47
House or apartment	2.54***	2.45***	2.92***	4.13***	2.77***	2.23***	2.76***	0.79	1.33	1.93*
Other	2.59**	1.62	1.67	5.75**	2.17**	2.79**	2.54**	0.88	2.06	1.72
Grade point average										
3.5 or higher	—	—	—	—	—	—	—	—	—	—
3.0–3.4	1.17	1.18	1.10	1.11	0.74	1.02	1.15	0.75	1.22	1.24
2.5–2.9	1.52*	1.05	1.28	1.24	0.82	0.99	1.11	1.02	1.71	2.08*
Below 2.5	2.25**	1.17	1.50	1.23	0.87	1.15	1.18	1.38	1.88	2.75*

Note. Results for each variable are adjusted for other predictors. The dash (—) indicates reference group.
[a]Sample size of particular cell did not produce reliable odds ratio.
$^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$ (statistically significant).

than three times likely to use marijuana and ecstasy in the past year. Additionally, LB women were more than three times as likely to report using at least one illicit drug (other than marijuana and ecstasy) from the monthly illicit drug index (OR = 3.64, from the annual illicit drug $p < 0.001$) and more than four times as likely to report using at least one illicit drug from the annual illicit drug index (OR = 4.32, $p < 0.001$). In particular, LB women reported significantly higher rates of using cocaine, downers, hareaticy, tranquilizers, amphetamines, and psychedelics in the past year. Finally, in addition to licit and illicit AOD use, we also examined the prevalence of selected prescription drugs prescribed by a doctor and found that LB women were almost five times as likely to use prescribed antidepressant drugs than heterosexual women (OR = 4.79, $p < 0.001$).

As illustrated in Table IV, multivariate logistic regression confirmed that GB men were less than half as likely to report heavy episodic drinking than were heterosexual men. After adjusting for demographic factors, there were no statistical differences between GB men and heterosexual men in cigarette smoking, alcohol use in the past year, marijuana use before college, marijuana use in the past month, or other illicit drug use. However, GB men were more than twice as likely to have used marijuana in the past year and more than six times as likely have used ecstasy before college. Finally, GB men were almost five times as likely as heterosexual men to use prescribed antidepressants (OR = 5.33, $p < 0.001$).

When considering the AOD use results overall, some similarities between men and women were apparent. For all AOD use measures except for binge drinking in the past 2 weeks and consuming four or more drinks per occasion, odds ratios indicate higher use among LGB students than among heterosexual female and male students. Finally, because response rate and gender distribution differed between the U.S. mail and web survey modes, we ran each of the logistic regression models controlling for mode. Adjusting for survey mode in the logistic regressions did not influence the study results.

Primary and Secondary Consequences of Alcohol and Other Drug Use

We examined the relationship between sexual identity and each adverse ADD-related primary and secondary consequence in the past year, by testing separate multivariate logistic regression models for each consequence, and controlling for race, class year, living arrangements, and grade point average (results not shown). Although examination of alcohol use by sexual identity suggested that LB women did not differ from heterosexual women, LB women were significantly more likely to experience 8 of 23 adverse primary AOD consequences. Most notable, LB women were more likely than heterosexual women to have reported driving under the influence of alcohol (OR = 2.98, $p < 0.001$), have unplanned sex after drinking (OR = 2.98, $p < 0.01$), have suicidal thoughts after drinking (OR = 7.17, $p < 0.001$), and sexually harass someone while drinking (OR = 7.62, $p < 0.001$). Reports of primary AOD consequences in the past year differed less for gay/bisexual and heterosexual men. Gay/bisexual men were more likely to report suicidal ideations after drinking (OR = 3.39, $p < 0.05$) and hangovers (OR = 2.10, $p < 0.05$). It is important to note that students who had not consumed alcohol in the past year were not asked about

primary consequences, as by definition they could not have experienced these events within the past year. Therefore, because heterosexual and LGB students had slightly different rates of past year abstinence, we also examined the prevalence of primary consequences among past year drinkers only. These results mirrored the overall results of the entire sample.

The LGB students were significantly more likely than their heterosexual counterparts to report only 3 of 20 secondary consequences of ADD use in the past year. Specifically, LB women were more likely to have taken care of someone with a drinking or drug problem (OR = 2.71, $p < 0.01$) and to have their sleep disrupted by someone drunk or high (OR = 1.88, $p < 0.05$). GB men were almost three times more likely to have experienced an unwanted sexual advance from someone who was drunk or high (OR = 2.47, $p < 0.01$).

DISCUSSION

These findings provided partial support for our first hypothesis. We did not find that alcohol use differed significantly between LB women and heterosexual women. However, LB women were at higher risk than heterosexual women for cigarette smoking, marijuana use, ecstasy use, and other illicit drug use among undergraduate women. Additionally, GB sexual identity was significantly associated with marijuana use in the past year and several measures of ecstasy use before college among undergraduate men.

The finding that LB women reported similar drinking behaviors as heterosexual women and GB men reported fewer instances of heavy drinking relative to heterosexual men is similar to other studies using random sampling methods (2, 7, 8). Among LB and GB students who reported drinking in the past month or past year, LGB drinkers reported more moderate drinking behaviors and less frequent alcohol consumption than did heterosexual students. The finding that GB men had significantly lower rates of heavy episodic drinking than did heterosexual men (29% vs. 48%) is especially significant when considering the negative consequences associated with this drinking behavior (10, 31, 36).

Findings also provided partial support for the second hypothesis regarding AOD-related consequences. Despite similar drinking behaviors between LB and heterosexual women, LB women reported significantly higher rates of over a third of the primary AOD-related consequences—a finding consistent with other reports in the literature (23–25). In this study, for example, LB women were more likely than heterosexual women to report drunk driving, unplanned sex, and suicidal ideations after drinking. However, there were fewer differences in secondary AOD consequences between LB and heterosexual women. Similarly we found no significant differences between GB and heterosexual men in most (more than 90%) of primary and secondary AOD-related consequences.

These results have important implications for prevention programs, especially those aimed at college students. For example, the finding that LB women and GB men reported higher rates of illicit drug use supports previous studies that found higher rates of drug use among LGB adolescents and young adults (4, 8). Additionally, GB men reported initiating ecstasy use at an earlier age than heterosexual men, while

LB women reported earlier initiation of marijuana use. This finding is important given previous research indicating that individuals who initiate AOD use at an earlier age are at greater risk for drug-related problems and dependence as young adults (37–39). Further, the fact that LB women were more likely to take care of others with a drug problem suggests a need to target this group for AOD education. Specifically, education about how to recognize and respond to AOD overdose is critical. Given the findings of higher rates of prescribed antidepressant drug use and suicidal ideation among both LB women and GB men, college counselors and administrators must be aware that these students need support services that are sensitive and nonjudgmental.

Several limitations need to be considered when evaluating the study's findings. First, nonresponses could be a potential source of bias because the overall response rate was 52%. Furthermore, there were differences in the demographic characteristics between the obtained sample and the overall student population. Although we controlled for the differences in demographic characteristics in our multivariate models, we acknowledge the departure from the student population as a limitation. Second, because the sample consisted of current full-time students attending an elite research university, it is not representative of the U.S. population attending college and is even less representative of the general U.S. population. Third, because we were unable to assess selection biases with regard to sexual orientation, it was not possible to determine how representative our sample was of the actual LGB population at the institution where the study took place. Finally, although the sample size was sufficient to examine differences between LGB and heterosexual undergraduate students, we were unable to examine differences between lesbian and bisexual women and between gay and bisexual men. Because there were higher proportions of self-identified bisexual women (vs. lesbians) and gay men (vs. bisexuals), these groups may have driven the results for the LB and GB subgroups, given the difference in substance use found within three subgroups among adolescents (8). Future research identifying differences between gay and bisexual men as well as lesbian and bisexual women among college students might be especially helpful for planning prevention and intervention efforts.

Despite a great deal of recent attention given to AOD misuse among college students, there has been inadequate research focusing on LGB student populations (28, 40). Research is needed that includes multiple measures of sexual orientation and large random samples of nationally representative undergraduate students in order to generalize results to LGB students nationally (41). Additionally, research is needed that includes large enough samples to permit examination of within-group differences based on race/ethnicity, disability, or other marginalized statuses. Finally, future research is needed that examines the risk and protective factors associated with AOD use/misuse among LGB college students. Because our data were cross-sectional, the causal relationships between sexual identity and several health behaviors remain unclear. It has been suggested that self-identified LGB identities fluctuate during the transition from adolescence to young adulthood (42). For instance, we found that female students who self-reported lesbian or bisexual sexual identity tended to be further along in school, suggesting that for female students, sexual identity may not become clear until later in young adulthood. Longitudinal

research that examines the relationship between the development of sexual identity and AOD use among young adults would be particularly helpful.

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