Published in final edited form as:

Drug Alcohol Depend. 2016 March 1; 160: 197–204. doi:10.1016/j.drugalcdep.2016.01.006.

Sexual-orientation differences in drinking patterns and use of drinking contexts among college students

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Abstract

Background—Evidence suggests there are important sexual-orientation differences in alcohol consumption, particularly among women. Little is known about where gay/lesbian and bisexual college students drink or differences in patterns of alcohol use between heterosexual, gay/lesbian, and bisexual students. The goal of this analysis was to examine patterns of alcohol consumption—including drinking prevalence, quantity, frequency, and contexts of use—by sexual orientation.

Methods—Data on sexual identity, gender, drinking behaviors, and drinking contexts were examined from repeated cross-sectional samples of undergraduate students attending 14 public California universities from 2003–2011 ($n=58,903$). Multivariable statistical techniques were employed to examine sexual-orientation differences stratified by gender.

Results—Gay males, lesbians, and bisexual females were significantly more likely to report drinking alcohol in the current semester than their same-gender heterosexual peers (relative risks ranged from 1.07 to 1.10, p -values <0.01). Among current drinkers, bisexual females consumed 7 or more drinks and lesbians consumed 10 or more drinks on significantly more days than heterosexual females. On the other hand, gay male drinkers consumed 8 or more drinks on

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Contributors

Robert W.S. Coulter led the conceptualization, data analysis, and writing of this manuscript. Miesha Marzell, Robert Saltz, Ron Stall, and Christina Mair contributed substantially to the conceptualization, data interpretation, and writing of this manuscript.

Conflicts of Interest

None declared.

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significantly fewer days than heterosexual male drinkers. Compared to their same-gender heterosexual peers: lesbian/gay and bisexual students drank less frequently at Greek parties (incidence rate ratios [IRR] ranged from 0.52 to 0.73, p -values <0.01); lesbians (IRR=0.84, $p=0.043$) and bisexual males (IRR=0.82, $p=0.009$) drank less frequently at off-campus parties; and gay males drank more frequently outdoors (IRR=1.63, $p<0.001$) and at bars/restaurants (IRR=1.21, $p=0.013$).

Conclusions—Alcohol prevention programs and future research should consider sexual-orientation differences in drinking patterns and drinking contexts.

Keywords

sexual orientation; gender; alcohol use; graduated frequency measures; drinking contexts

1. INTRODUCTION

Mounting evidence suggests that lesbian, gay, and bisexual (LGB) populations are more likely to drink alcohol and engage in heavy episodic use when compared with their heterosexual counterparts (Blosnich et al., 2014; Burgard et al., 2005; Case et al., 2004; Conron et al., 2010; Corliss et al., 2008; Marshal et al., 2008; Talley et al., 2014). However, the findings concerning sexual-orientation drinking disparities among college students are inconsistent (Eisenberg and Wechsler, 2003; Hatzenbuehler et al., 2008; Kerr et al., 2014; McCabe et al., 2003, 2005; Reed et al., 2010; Ridner et al., 2006; Schauer et al., 2013; Talley et al., 2010, 2012). We know even less about whether LGB and heterosexual students drink in similar or different contexts (e.g., bars, Greek parties, off-campus parties). Drinking locations matter because they can influence the amounts of alcohol consumed (Clapp et al., 2000; Paschall and Saltz, 2007) and risks of certain alcohol-related problems (e.g., intimate partner violence; Cunradi et al., 2012; Mair et al., 2013; Studer et al., 2014). Drinking contexts also have implications for how targeted prevention programs are designed, implemented, and evaluated (Wechsler and Nelson, 2008). The aims of this paper are to examine sexual-orientation differences in (1) drinking frequency patterns and (2) use of specific drinking contexts in a large, random sample of college students from many campuses.

Alcohol use is a major public health problem among college students. Young adults (aged 18 to 25) have a higher prevalence of heavy episodic alcohol use compared to other age groups in the United States (Centers for Disease Control and Prevention, 2010; Fryar et al., 2006; Naimi et al., 2003; Schoenborn et al., 2013; Substance Abuse and Mental Health Services Administration, 2011). Furthermore, college students have a higher prevalence of alcohol use and heavy episodic use than their non-college-attending counterparts (Slutske, 2005). Heavy alcohol use has myriad short-term consequences, such as unintentional injuries, violence, alcohol poisoning, and sexually transmitted infections, and deleterious long-term effects, including cancers and neurological problems (Centers for Disease Control and Prevention, 2014). As a result, alcohol use is the cause of approximately 100,000 deaths per year in the United States, making it the third leading cause of preventable death (Mokdad et al., 2004).

Sexual-minority college students (i.e., those who identify as lesbian, gay, or bisexual) may exhibit riskier drinking patterns than heterosexual students. Importantly, sexual-orientation differences often vary by gender, with larger differences found among sexual-minority women compared to heterosexual women than differences among sexual-minority men compared to heterosexual men (Eisenberg and Wechsler, 2003; Hatzenbuehler et al., 2008; Kerr et al., 2014; McCabe et al., 2003, 2005; Ridner et al., 2006; Schauer et al., 2013; Talley et al., 2012). Specifically, several studies have shown that lesbians have a higher prevalence of alcohol use and are more likely to engage in heavy episodic use than heterosexual females (Ridner et al., 2006; Schauer et al., 2013; Talley et al., 2010), and there is some evidence that bisexual and “mostly heterosexual” females are also at substantially elevated risk (Eisenberg and Wechsler, 2003; Kerr et al., 2014; McCabe et al., 2005; Talley et al., 2010, 2012). Contrastingly, other studies have reported no differences in alcohol consumption by sexual orientation among female college students (Hatzenbuehler et al., 2008; McCabe et al., 2003; Reed et al., 2010; Talley et al., 2012). For male college students, who generally drink greater volumes of alcohol than their female peers (American College Health Association, 2014; Ham and Hope, 2003; O’Malley and Johnston, 2002; Pedersen, 2013), many studies have found no differences in the prevalence of alcohol use or heavy episodic use by sexual orientation (Hatzenbuehler et al., 2008; McCabe et al., 2005; Reed et al., 2010; Ridner et al., 2006; Schauer et al., 2013; Talley et al., 2010, 2012); however, one cross-sectional study has reported that gay and bisexual men had higher prevalence of drinking (Kerr et al., 2014). Though two prospective studies have found that gay and bisexual males were more likely to report heavy episodic use and drinking to intoxication (Hatzenbuehler et al., 2008; Talley et al., 2010), other studies have found less heavy episodic use among gay (McCabe et al., 2003) and bisexual men (Eisenberg and Wechsler, 2003; McCabe et al., 2003; McCabe et al., 2005) than heterosexual men.

There are likely multiple reasons for these divergent findings. First, many previous studies sampled populations from a single institution (Hatzenbuehler et al., 2008; Reed et al., 2010; Ridner et al., 2006; Talley et al., 2010, 2012), and alcohol use is shown to vary widely by campus (Wechsler et al., 1994). Second, sexual orientation has been measured using a variety of constructs (i.e., sexual identity, attraction, or behavior), which have been shown to produce varied results (McCabe et al., 2005, 2012). Third, several studies have aggregated same-gender lesbian/gay and bisexual people into a single category (Hatzenbuehler et al., 2008; McCabe et al., 2003; Reed et al., 2010; Ridner et al., 2006; Talley et al., 2012), which may hide important subgroup differences. In spite of the diverse methodologies and findings, there is enough evidence to suggest that important sexual-orientation differences in alcohol consumption exist, particularly among women.

Previous studies about sexual-orientation differences in alcohol use often employed quantity-frequency measures of alcohol consumption (Hatzenbuehler et al., 2008; McCabe et al., 2003; Reed et al., 2010; Talley et al., 2010, 2012) or a single-item measure about heavy episodic use (Eisenberg and Wechsler, 2003; McCabe et al., 2005; Reed et al., 2010; Schauer et al., 2013; Talley et al., 2010). While these measures are informative about average consumption and heavy episodic alcohol use, graduated frequency measures provide more specific information about drinking patterns and are able to illustrate the wide range of drinking behaviors of populations (Gmel and Rehm, 2004; Gruenewald and Nephew, 1994).

For example, graduated frequency measures can examine the number of days in which people consumed specific quantities of alcohol, providing rich descriptions of drinking patterns.

Colleges have been successful in developing, implementing, and evaluating targeted drinking prevention programs with specific high-risk student populations (e.g., Greek fraternity/sorority members; Toomey et al., 2007; Toomey and Wagenaar, 2002; Turrisi et al., 2006), but, to our knowledge, there are no effective drinking interventions that specifically target LGB college students. One reason for this may be that we know little about *where* LGB college students are drinking. A previous study showed that gay men and LGB women drank more frequently at bars, and LGB women also drank more frequently at parties than heterosexual people (Trocki et al., 2005). However, this study was conducted with a probability sample of adults, and no studies to our knowledge have investigated differences specific to college students and college drinking environments. Knowing if there are sexual-orientation differences in use of certain drinking environments might assist interventionists in directing interventions to specific populations and contexts.

To extend the knowledge about sexual-orientation differences in drinking among college students, we analyzed data from random cross-sectional samples of undergraduate students from 14 University of California (UC) and California State University (CSU) campuses collected over a 9-year period. The aims of this study were to: (1) examine the prevalence of alcohol use by sexual orientation; (2) among drinkers, investigate the relative sexual-orientation differences in the number of days in which specific quantities of alcohol were consumed using graduated frequency measures of alcohol consumption; and (3) examine sexual-orientation differences in the settings where college students drank. Our analyses investigated sexual-orientation subgroup differences by examining self-identified heterosexuals, gays/lesbians, and bisexuals separately, and were stratified by gender because previous research showed that sexual-orientation differences in alcohol use varied by gender (Eisenberg and Wechsler, 2003; Hatzenbuehler et al., 2008; Kerr et al., 2014; McCabe et al., 2003, 2005; O'Malley and Johnston, 2002; Ridner et al., 2006; Schauer et al., 2013; Talley et al., 2012).

2. METHODS

2.1. Study Design

Serial cross-sectional data were collected from random samples of undergraduate students at 14 UC and CSU campuses annually in the fall semester from 2003 through 2011. Data were collected to assess the effectiveness of environmental alcohol prevention interventions using a randomized controlled trial design (Saltz et al., 2010). Interventions were implemented in seven campuses in 2005–2006 and the remaining seven campuses in 2008. The purpose of the current investigation was not to evaluate intervention effects, but to examine sexual-orientation differences in drinking patterns and use of drinking contexts; thus, we adjusted for intervention effects in all analyses. The intervention is described elsewhere (Saltz et al., 2010)—but campuses implemented interventions in specific years, thus we dichotomously coded for presence/absence of intervention for each campus and year. Original study procedures were approved by the Institutional Review Board of the [blinded].

There were 60,898 participants who completed the survey 10.8 weeks, on average, into their semester. Response rates ranged from 50% in 2003 to 39% in 2008. Since these were less than optimal, post-hoc sample weights correcting for gender, ethnic group, age, and grade distributions by campus were developed to adjust for differences in non-response. In total, only 3.3% of participants were missing data on sociodemographic characteristics or alcohol use, making a total analytic sample of 58,903 students.

2.2. Measures

2.2.1. Sociodemographic characteristics—We selected sociodemographic characteristics associated with sexual orientation, drinking behaviors, and/or contexts of use in previous studies (Saltz et al., 2010; Wechsler et al., 1995), as they may confound the relationships we planned to examine. Gender was reported as male or female, and sexual orientation was measured with the following question: “Which of the following best describes your sexual orientation?” Response options were heterosexual, lesbian/gay, and bisexual. Henceforth, females who selected “lesbian/gay” are referred to as “lesbian”, and males who selected “lesbian/gay” are referred to as “gay.” Participants also reported their age (treated here as less than 21 years and greater than or equal to 21 years); class (freshman, sophomore, junior, senior, and not seeking a degree or “other”); race/ethnicity (treated here as White, Latino, Asian, Black, or other); Greek sorority/fraternity membership (yes/no); employment status (full- or part-time vs. none); and whether they had a vehicle at school (yes/no).

2.2.2. Alcohol use—Participants were first asked about their alcohol use in the past year. Participants who drank at least monthly were asked about their drinking behaviors in the past 28 days, and participants who drank in the past year but less than monthly were asked about their drinking behaviors in the time period between the start of the current semester and the time they completed the survey. Participants who reported consuming at least one drink in the current semester were classified as current drinkers.

Using a graduated frequency scale, current drinkers were asked to report the number of occasions on which they had consumed 1 or more, 2 or more, 3 or more, 6 or more, and 9 or more drinks. Participants’ responses were scaled to a 28-day equivalent metric. An estimated continued drinking function for each respondent was fit and used to obtain a drinking probability distribution (for details, see Gruenewald et al., 2003; Gruenewald and Nephew, 1994). This probability distribution was used to estimate the proportion of occasions on which respondents drank exactly 1, 2, 3, etc. drinks. The number of occasions on which drinking at each level was expected to occur was calculated by multiplying these proportions by the frequency of drinking for each individual. Thus, for every student and drinking level, a specific rate of drinking was available (Gruenewald et al., 2003).

2.2.3. Drinking contexts—Participants were asked how many times in the current semester they drank alcohol in 6 different campus contexts: Greek fraternity/sorority parties; residence hall parties; on-campus events (e.g., sporting events); off-campus parties (e.g., house parties); bars/restaurants; and outdoor settings (e.g., parks).

2.3. Data Analyses

We conducted our analyses using Stata version 13 (College Station, TX). We described the characteristics of the total sample with percentages and chi-square tests to examine if there were differences by sexual orientation. To test if there were statistical differences in current drinking status after adjusting for sociodemographics, campus, survey year, and intervention, we used the modified Poisson regression approach to estimate risk ratios for lesbian/gay and bisexual students vs. heterosexual students, stratified by gender (Zou, 2004). All multivariable analyses in this study were stratified by gender because of previous research showing alcohol use differences by gender and sexual orientation (e.g., McCabe et al., 2005).

To investigate our second and third study aims, we restricted subsequent analyses to participants who reported past-semester drinking. Because data were overdispersed according to the likelihood-ratio test of $\alpha=0$ (p-values<0.05 for all models) and zero was not an option, we used zero-truncated negative binomial regression models to test if average frequency and quantity of alcohol consumption among drinkers differed by sexual orientation, adjusting for sociodemographics, campus, survey year, and intervention condition. To test for differences by sexual orientation in the number of days in which specific volumes of alcohol were consumed, we used negative binomial regression models.

To examine sexual-orientation differences in use of drinking contexts, we used negative binomial models because data were overdispersed according to the likelihood-ratio test of $\alpha=0$ (p-values<0.05 for all models). We adjusted for sociodemographics, campus, survey year, intervention condition, and the number of days students consumed alcohol (i.e., exposure).

3. RESULTS

Among females, 1.0% identified as lesbian, 3.2% as bisexual, and 95.8% as heterosexual (data not shown); among males, 2.9% identified as gay, 1.7% as bisexual, and 95.5% as heterosexual (data not shown). Table 1 shows the sociodemographic characteristics of the sample, and sexual-orientation differences in these characteristics.

3.1. Prevalence of current alcohol use

Table 2 shows the overall prevalence and multivariable risk ratios of current alcohol use by sexual orientation. Among females, lesbians and bisexuals were more likely to be current drinkers than their heterosexual counterparts. Among males, gays were more likely to be current drinkers than their heterosexual counterparts.

3.2. Average frequency and quantity of alcohol consumption

Table 2 also shows the average past 28 day frequency and quantity of alcohol consumption among current drinkers. Among female drinkers, bisexuals used alcohol on a greater number of days than their heterosexual counterparts. There were no differences in the average number of drinking days between lesbian and heterosexual female drinkers. There were no

differences in average quantity of consumption for lesbian and bisexual females compared to heterosexual females.

Among male drinkers, gays had a lower average quantity of alcohol consumption than heterosexuals, but there were no differences in their average frequency of alcohol consumption. Bisexual and heterosexual males had similar average frequency and quantity of alcohol consumption.

3.3. Frequency of Consuming Specific Alcohol Quantities

Figure 1 shows the incidence rate ratios for the frequency of consuming quantities of alcohol in an average 28-day period. Compared to heterosexual female drinkers, bisexual females more frequently consumed four or fewer drinks per occasion and seven or more drinks per occasion. Lesbians were significantly more likely than heterosexual female drinkers to consume two drinks per occasion and ten or more drinks per occasion, yet were less likely to consume four and six drinks per occasion.

Compared to heterosexual male drinkers, gay men less frequently consumed eight or more drinks per occasion. Gay males also less frequently had four drinks per occasion than heterosexual males. Bisexual and heterosexual males consumed specific quantities of alcohol at similar rates.

3.4. Drinking Contexts

Table 3 shows the differences in drinking contexts by sexual orientation and stratified by gender. Multivariable models show that, compared to heterosexual female drinkers, lesbians and bisexual females drank less often at Greek parties, lesbians drank less often at off-campus parties, and bisexual females drank less often at bars/restaurants.

Among male drinkers, gay and bisexuals drank less often at Greek parties than heterosexual males. Gay males drank more frequently than heterosexual males at bars/restaurants and outdoor settings. Compared to heterosexuals, bisexual males drank less often at off-campus parties, but more frequently at on-campus events.

4. DISCUSSION

4.1 Sexual-Orientation Differences in Drinking

We found distinct sexual-orientation differences in both prevalence of drinking and frequency of consuming specific alcohol quantities among college students. Importantly, these differences vary by gender, as shown in previous studies (e.g., McCabe et al., 2005). For females, our results show that lesbian and bisexual college students are more likely to be current drinkers than their heterosexual peers. We found that, among drinkers, drinking pattern differences are bimodal in character for bisexuals compared to heterosexual females: bisexual females more frequently drink at low levels (four or fewer drinks) and high levels (seven or more drinks) than heterosexual females. On the other hand, lesbian drinkers more frequently consume 10 or more drinks than heterosexual female drinkers. Previous studies found lesbian and bisexual female college student drinkers to be at higher risk for consuming four or more drinks (Eisenberg and Wechsler, 2003; McCabe et al., 2005;

Schauer et al., 2013), but our findings show lesbian and bisexual female drinkers consumed 10 or greater drinks more frequently than their heterosexual counterparts. These disparities display how critical it is to develop, implement, and evaluate interventions aimed at reducing heavy drinking among lesbian and bisexual females.

Our study also elucidated sexual-orientation differences in alcohol consumption among males. We found that gay males are more likely to be current drinkers than their heterosexual counterparts. However, among current drinkers, gay males are less likely to consume alcohol at high levels than heterosexual males (eight or more drinks). Meanwhile, drinking patterns are similar for heterosexual and bisexual males. Though sexual-orientation disparities in alcohol use are smaller for males than females, it is well established that larger proportions of male than female college students drink heavily (American College Health Association, 2014; Ham and Hope, 2003; O'Malley and Johnston, 2002; Pedersen, 2013). Drinking among male college students is a great public health problem, and it is critical that college drinking interventions aim to reduce gay and bisexual males' heavy drinking just as much as heterosexual males' drinking.

Prior studies found divergent results on sexual-orientation disparities in alcohol use among college students (see Section 1 for a review). Thus, our study's findings are aligned with some, but not all results from previous investigations. Our study used graduated frequency measures of alcohol consumption, thereby prohibiting strict comparisons to previous studies, as this is a new approach in the sexual-orientation disparities literature. Our study design was particularly strong because we were able to disaggregate LGB people into specific subgroups, and data were collected from random samples of undergraduate students at 14 public universities.

Sexual-orientation differences in alcohol use are often explained by minority stress theory (Meyer, 2003), which posits that LGB people are at greater risk of experiencing discrimination, victimization, and stress than heterosexuals, thereby negatively impacting LGB wellbeing and making them more apt to drink alcohol to cope (Keyes et al., 2011). Empirical evidence of this is common in the literature (e.g., Hatzenbuehler, 2009). Gender expression also contributes to sexual-orientation drinking differences. For example, LGB women are more masculine than heterosexual women on average (but not always; e.g., Rieger and Savin-Williams, 2012), and because heavy drinking is more common among men than women (e.g., Pedersen, 2013), drinking is sometimes deemed a more masculine behavior—and therefore LGB women may more frequently consume 10+ drinks. A previous study (Rosario et al., 2008) showed that more frequent and heavier drinking is found among butch versus femme (i.e., more masculine versus more feminine) LGB women, empirically showing that gender expression contributes to drinking differences.

4.2 Sexual-Orientation Differences in Use of Contexts

Our study also examined differences in drinking settings by sexual orientation. Specifically, LGB males and females are less likely to drink at Greek parties than their heterosexual counterparts. Gay males drink more frequently at bars/restaurants, while bisexual females drink less often at bars/restaurants than their same-gender heterosexual peers. Lesbians and bisexual males drink less often at off-campus parties, gay males drink more frequently

outdoors, and bisexual males drink more often at on-campus events. While we controlled for campus in our analyses, it is important to remember that each individual campus' built environment is unique and influences where students drink—and may also affect sexual-orientation differences in use of drinking contexts.

Sexual-orientation differences in use of drinking contexts may be best understood in relation to niche theory and assortative drinking (Gruenewald, 2007; Gruenewald et al., 2014). Niche theory suggests that drinking contexts attract people with specific characteristics. For example, Greek parties may be more likely to attract heterosexual students because these venues have historically been places for people to meet potential opposite-gender partners. Assortative drinking suggests that drinkers return to specific drinking settings because they can find people like themselves. LGB people may not see people like themselves at Greek parties or may not even be welcome to attend such events, and are therefore less likely to attend in the future. Because fraternities and sororities are historically heterosexist (Garrett, 2002; Hesp and Brooks, 2009), it is not surprising that LGB populations frequent these venues less often than heterosexuals.

On the other hand, “gay bars” (or places catering to sexual-minority people) are more likely to attract LGB people, and thus LGB people may return to these bars for future drinking occasions; this may explain why gay males more frequently attended bars/restaurants in our study, which aligns with another study investigating sexual-orientation differences in contexts among adults (Trocki et al., 2005). The previous study showed that LGB females more frequently drank at bars, which is not what we found. This difference may be explained by different study populations (i.e., college students vs. adults in general). Additional details about why off-campus parties might be less appealing and drinking outdoors might be more appealing to certain LGB subgroups may best be answered through future investigations using qualitative methods.

4.3 Intervention and Research Implications

Our study highlights that LGB populations, especially LGB women, should be priority populations for drinking interventions. But compared with heterosexuals, LGB populations less frequently attend Greek parties—which are contexts with the highest frequency of risky drinking among college students (Glindemann and Geller, 2003; Park et al., 2009) and are commonly targeted contexts for drinking interventions (Toomey et al., 2007; Toomey and Wagenaar, 2002; Turrisi et al., 2006). Furthermore, LGB students are less likely to be members of Greek fraternities and sororities. Therefore, interventions aimed at reducing heavy drinking within the Greek system may not adequately reach LGB college students, leaving sexual-orientation drinking disparities untouched at best. Despite attending Greek parties less frequently, LGB women still consume 10 or more drinks more frequently than heterosexual females—so the question remains: in which contexts are LGB women engaging in heavy drinking? While our study does not specifically answer this question, future research among college students can investigate sexual-orientation differences in consumption patterns by drinking contexts—and this will provide interventionists with more information about which drinking contexts would be best to target to lower sexual-orientation drinking disparities.

Future research can also utilize a framework that focuses on context-specific risk and protective factors. There may be context-specific reasons for (and consequences of) heavy drinking (Cunradi et al., 2012; Jones-Webb et al., 2013; Levitt and Cooper, 2010; Mair et al., 2013; Neighbors et al., 2006; Zamboanga and Ham, 2008)—but no studies to our knowledge have investigated how these may differ by sexual orientation. Considering minority stress theory (Meyer, 2003) within a contextual perspective, we can see that some minority stressors (e.g., internalized homophobia/biphobia) and related processes (e.g., expectations of rejection, social norms) may be more prevalent and potent in certain settings, thereby influencing alcohol use within certain contexts for LGB populations. Adopting this perspective may provide fruitful insights into observed patterns about where and how much LGB populations drink—and may be applicable to other areas of health heightened among LGB students, like mental health problems and use of other drugs (Kerr et al., 2014; Oswalt and Wyatt, 2011).

4.4 Limitations

Despite our study's strengths, it is not without limitations. Our results may not be generalizable to college campuses throughout the nation; however, the probability sampling method used in 14 college campuses was rigorous. We were also unable to explore effect modification by race/ethnicity due to small sample sizes. There may also be social desirability bias, but likely none more than is present in other studies of self-reported alcohol use. Finally, data for this study are cross-sectional in nature. Thus, longitudinal intra-individual changes in drinking patterns and settings cannot be assessed in this study.

4.5. Conclusions

Our study highlights the necessity of interventions to be tailored specifically for LGB college students, especially given that, to our knowledge, no effective drinking interventions have carefully considered these populations. Because some alcohol-related problems (e.g., sexual assault and considering suicide after drinking) are higher for LGB college drinkers than heterosexuals (Kerr et al., 2014), interventions that reduce alcohol consumption among LGB people may have robust effects that last beyond the college years. College health professionals, administrators, and researchers should carefully consider sexual-orientation differences in drinking patterns and settings while designing, implementing, and evaluating interventions.

Acknowledgments

Role of Funding Source

This research article was supported in part by the National Institute on Drug Abuse (awards F31DA037647 to R.W.S. Coulter) and the National Institute on Alcohol Abuse and Alcoholism (awards R01AA012516 to R. Saltz and R21AA021438 to C. Mair). The opinions expressed in this work are those of the authors and do not necessarily represent those of our funders or the post-secondary educational institutions included in this study.

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Highlights

- Drinking behaviors and use of drinking contexts differ by sexual orientation.
- Lesbian and bisexual females drank heavily more often than heterosexuals.
- Gay men engaged in heavy drinking less than heterosexuals.
- Lesbian/gays and bisexuals drank less often at Greek parties than heterosexuals.

Figure 1. Adjusted rate ratios for the estimated number of days by number of drinks consumed for lesbians/gays and bisexuals compared to heterosexuals, stratified by gender: Safer California Universities, 2003–2011

All models are adjusted for race/ethnicity, age, class, fraternity/sorority membership, employment status, vehicle on campus, campus, survey year, and intervention condition. Within each set of sexual-orientation comparisons, sample sizes are consistent and include: among females, 22,973 heterosexuals, 264 lesbians, and 860 bisexuals; among males, 16,291 heterosexuals, 518 gays, and 281 bisexuals.

Table 1
Sociodemographics for the total sample and by sexual orientation: Safer California Universities, 2003–2011

Characteristic	Total, %	Sexual orientation			Significance
		Heterosexual, %	Lesbian/gay, %	Bisexual, %	
Total observations, row % (n)	100.0 (58,903)	95.7 (56,364)	1.8 (1,037)	2.5 (1,502)	
Gender					
Female	54.3	54.4	28.9	69.7	<i>a, b, c</i>
Male	45.7	45.6	71.2	30.4	
Race/ethnicity					
Non-Hispanic White	39.1	39.2	36.7	34.8	<i>a, b, c</i>
Non-Hispanic Asian/Pacific Islander	29.2	29.5	24.3	22.1	
Hispanic	13.7	13.5	19.4	15.9	
Non-Hispanic Black	2.7	2.7	3.3	3.7	
Other race	5.1	5.1	4.3	7.9	
Multiple races/ethnicities	10.2	10.0	12.1	15.8	
Age					
Younger than 21 years	52.3	52.4	44.1	52.4	<i>a, c</i>
21 years and older	47.7	47.6	55.9	47.6	
Class					
Freshman	19.2	19.3	16.5	17.7	<i>a, c</i>
Sophomore	17.9	17.9	15.0	18.6	
Junior	28.8	28.8	28.8	28.9	
Senior	33.5	33.4	38.0	34.0	
Not seeking a degree or "other"	0.7	0.7	1.8	0.8	
Fraternity/sorority membership					
No	90.8	90.7	94.3	94.0	<i>a, b</i>
Yes	9.2	9.3	5.7	6.0	
Employment status					
Part-time or full-time	50.1	49.9	57.4	52.0	<i>a, c</i>
None	49.9	50.1	42.7	48.0	

Characteristic	Sexual orientation			Significance
	Total, %	Heterosexual, %	Lesbian/gay, %	
Vehicle on campus				
No	34.2	33.9	36.6	b, c
Yes	65.8	66.1	63.4	

Note.

^a p<0.05 comparing heterosexual to lesbian/gay;

^b p<0.05 comparing heterosexual to bisexual;

^c p<0.05 comparing lesbian/gay to bisexual.

Table 2

Prevalence, frequency, and quantity of alcohol consumption by sexual orientation, stratified by gender: Safer California Universities, 2003–2011

TOTAL SAMPLE	Females (<i>n</i> = 34,440)				Males (<i>n</i> = 24,463)					
	Prevalence	RR	(95% CI)	<i>P</i>	Prevalence	RR	(95% CI)	<i>P</i>		
Any current drinking (in current semester)										
Sexual orientation										
Heterosexual	69.1%	1.00			69.5%	1.00				
Lesbian/gay	77.8%	1.09	(1.03, 1.16)	0.003	73.8%	1.07	(1.03, 1.12)	0.002		
Bisexual	77.5%	1.10	(1.06, 1.14)	<0.001	70.6%	1.05	(0.98, 1.12)	0.185		
AMONG CURRENT DRINKERS	Females (<i>n</i> = 24,097)				Males (<i>n</i> = 17,090)					
	Mean	(sd)	IRR	(95% CI)	<i>P</i>	Mean	(sd)	IRR	(95% CI)	<i>P</i>
	Frequency of alcohol consumption (days per 28 days)									
Sexual orientation										
Heterosexual	5.09	(5.04)	1.00			7.00	(6.38)	1.00		
Lesbian/gay	5.42	(5.36)	1.09	(0.91, 1.31)	0.339	6.03	(5.67)	0.91	(0.83, 1.01)	0.065
Bisexual	6.15	(5.82)	1.29	(1.16, 1.43)	<0.001	6.53	(6.79)	1.02	(0.90, 1.16)	0.793
Quantity of alcohol consumption (drinks per occasion)										
Sexual orientation										
Heterosexual	2.82	(1.78)	1.00			3.73	(2.31)	1.00		
Lesbian/gay	2.48	(1.64)	0.92	(0.82, 1.02)	0.118	3.31	(2.06)	0.91	(0.86, 0.97)	0.005
Bisexual	2.85	(1.80)	1.02	(0.97, 1.08)	0.435	3.49	(2.21)	0.95	(0.88, 1.04)	0.259

Note. Risk ratios (RR), incidence rate ratios (IRR), and 95% confidence intervals (CI) are adjusted for race/ethnicity, age, class, fraternity/sorority membership, employment status, vehicle on campus, campus, survey year, and intervention condition; sd = standard deviation.

Table 3

Sexual-orientation differences in the estimated number of days per 28 on which alcohol was consumed in different drinking settings, stratified by gender:
Safer California Universities, 2003–2011

		Unadjusted mean days			Adjusted models		
		Heterosexual	Lesbian/gay	Bisexual	Heterosexual	Lesbian/gay	Bisexual
Gender and setting	n	mean (sd)	mean (sd)	mean (sd)	IRR	IRR (95% CI)	IRR (95% CI)
Females							
Setting							
Fraternity/sorority (Greek) house	23,745	0.45 (1.42)	0.12 (0.70)	0.26 (1.33)	1.00 (ref)	0.52 (0.34, 0.80)	0.73 (0.61, 0.88)
Residence hall (dorm)	23,656	0.21 (0.98)	0.09 (0.34)	0.27 (1.11)	1.00 (ref)	0.81 (0.48, 1.37)	1.17 (0.94, 1.44)
On-campus event	23,624	0.06 (0.33)	0.07 (0.37)	0.07 (0.39)	1.00 (ref)	1.21 (0.72, 2.02)	1.00 (0.75, 1.33)
Off-campus	23,386	1.44 (2.38)	1.02 (1.94)	1.53 (2.74)	1.00 (ref)	0.84 (0.71, 0.99)	0.93 (0.86, 1.01)
Bar/restaurant	23,399	0.75 (1.89)	0.75 (1.98)	0.65 (1.65)	1.00 (ref)	0.80 (0.64, 1.00)	0.79 (0.69, 0.91)
Outdoor settings	20,917	0.13 (0.57)	0.18 (0.51)	0.19 (0.77)	1.00 (ref)	1.36 (0.94, 1.99)	1.13 (0.92, 1.39)
Males							
Setting							
Fraternity/sorority (Greek) house	16,811	0.52 (1.71)	0.23 (0.86)	0.25 (0.87)	1.00 (ref)	0.66 (0.52, 0.84)	0.57 (0.40, 0.79)
Residence hall (dorm)	16,677	0.34 (1.36)	0.26 (0.73)	0.45 (1.68)	1.00 (ref)	0.85 (0.66, 1.09)	0.92 (0.66, 1.09)
On-campus event	16,647	0.11 (0.57)	0.08 (0.54)	0.30 (1.41)	1.00 (ref)	0.87 (0.62, 1.21)	1.87 (1.37, 2.57)
Off-campus	16,338	1.72 (2.75)	1.33 (2.47)	1.33 (2.19)	1.00 (ref)	0.95 (0.86, 1.06)	0.82 (0.71, 0.95)
Bar/restaurant	16,386	0.89 (2.17)	0.80 (2.03)	0.73 (2.59)	1.00 (ref)	1.21 (1.04, 1.41)	1.00 (0.81, 1.24)
Outdoor settings	14,604	0.21 (0.84)	0.29 (1.58)	0.19 (0.95)	1.00 (ref)	1.63 (1.32, 2.02)	0.89 (0.63, 1.26)

Note. *sd* = standard deviation; *ref* = referent. For adjusted models, boldface indicates statistically significant findings ($p < 0.05$). Incidence rate ratios (IRR) and 95% confidence intervals (CI) are adjusted for race/ethnicity, age, class, fraternity/sorority membership, employment status, vehicle on campus, survey year, and intervention condition. Adjusted models also adjust for the number of days each participant consumed alcohol (i.e., the exposure period). There were no key differences by sexual orientation between those missing and not missing data on drinking in each setting.