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Sex differences in psychosocial correlates of concurrent substance use among heterosexual, homosexual and bisexual college students

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Abstract

Background—College students identifying as Lesbian, Gay or Bisexual (LGB) are at increased risk for substance use. Few studies have assessed correlates of concurrent substance use, which increases the risk for substance use disorders.

Objectives—The current study aimed to (1) examine differences in substance use among male and female sexual minorities and (2) explore the impact of psychosocial factors on the relationship between sexual identity and concurrent substance use.

Methods—A web-based survey assessing health behavior, psychosocial characteristics, attitudes and demographics was administered to students from six colleges in the southeastern US. A total of 4840 students responded to the survey; 2.9% reported a homosexual identity ($n = 111$) and 3.5% reported a bisexual identity ($n = 135$). Multivariable modeling was used to assess the relationship between sexual identity and the number of substances used, adjusting for demographic and psychosocial factors.

Results—Bisexual females were significantly more likely than their homosexual or heterosexual counterparts to report tobacco use ($p < 0.0001$), binge drinking ($p < 0.05$) and marijuana use ($p < 0.0001$) in the past 30 days. No differences in substances used existed among males. Adjusted for age and ethnicity, homosexually- and bisexually-identified females were more likely to have concurrent substance use than those who identified as heterosexual ($p < 0.0001$ and $p < 0.0001$, respectively). Adjusting for psychosocial factors decreased the magnitude and significance of the association ($p < 0.01$ and $p < 0.001$, respectively). Conclusion: Female sexual minorities are at high risk for substance use. Targeting specific psychosocial factors might be useful in efforts to address use of tobacco, alcohol and marijuana among LGB young adults.

Keywords

Concurrent substance use; LGBT health; young adults

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Introduction

Globally, abuse and dependence of alcohol, tobacco and other drugs causes a combined 12.4% of all deaths. In 2010, nearly 9% of the US population aged 12 and older was classified with substance use dependence or abuse (1); lifetime prevalence of substance use dependence or abuse was estimated at nearly 15% (2). Substance abuse and dependence are characterized by a pattern of continued and pathological use of alcohol, tobacco or other prescription or illicit drugs, impacting an individual's mental and physical health, and the health and wellbeing of those around them.

Substance use initiation typically occurs during adolescence and young adulthood, with peak prevalence occurring in late adolescence and young adulthood (3). A recent national study found the prevalence rate by age 17 was more than 40% for cigarettes, more than 60% for alcohol and more than 30% for marijuana (4). The concurrent use of more than one substance is common among adolescents and young adults, with those engaging in heavy and episodic marijuana use being at greater risk for subsequent illicit drug use (5), and with heavy alcohol and tobacco use being associated with the use of illicit substances (6). Concurrent substance users are also more likely to have or develop substance use disorders (7). Given that lifetime prevalence of substance use increases as age increases (4), young adulthood is a critical period for intervention.

In particular, young adults identifying as lesbian, gay and bisexual (LGB) have been shown to be more prone to substance use and abuse compared to their heterosexual counterparts (8–12). The higher prevalence of substance use among sexual-minority youth and young adults is typically explained through the conceptualization of the minority stress model (13). The minority stress model extends social stress theory, suggesting that the stigma and prejudice associated with a minority status causes psychosocial stressors, which can lead to compromised psychological health, including substance use and substance use disorders. Individuals who identify as LGB report experiencing greater discrimination and are more likely to report psychosocial disorders (e.g. anxiety disorders, mood disorders) compared to their heterosexual counterparts (13–15). Thus, understanding how psychosocial factors (e.g. perceived stress, satisfaction with life, emotional stability) are associated with concurrent substance use may be important to the development of LGB-specific interventions.

While earlier research assessing the association between sexual orientation and substance use often failed to look at within group differences (16), recent research suggests that the prevalence and type of substance use varies between LGB young adults, with sex (male versus female) being an important moderating factor. Among female undergraduate students, bisexual women have been found to be more likely to use or abuse marijuana, illicit drugs, cigarettes and medically prescribed substances when compared with their heterosexual and homosexual counterparts (17,18). Some research suggests that drinking behaviors are similar among LGB female undergraduates (18,19), while other research suggest higher rates of binge drinking among LB women, versus heterosexual women (12,20). Homosexual and bisexual male college students have been found to be significantly less likely than their heterosexual counterparts to drink heavily, but may be more likely to use some illicit drugs (19,20).

A growing body of research exists associating the use of particular substances to sexual orientation; however, few studies have assessed the prevalence and correlates of concurrent substance use and sexual orientation. Furthermore, few studies have controlled for social or psychological variables. To date, no studies that we are aware of have assessed individual-level psychosocial correlates of substance use among LGB college students. Given the aforementioned literature, the purpose of this study was: (1) to examine differences in substance use among male and female sexual minorities, and (2) to explore the impact of psychosocial factors on the relationship between sexual identity and concurrent substance use.

Methods

Sample

Data for these analyses come from a larger cross-sectional study on the health behaviors of college students. In 2010, a random sample of students from six colleges in the southeastern US (5000 students at each school, and a census of all students a two schools with enrollment less than 5000) were invited to complete an online survey (n = 24 055). Of the students who received the invitation to participate, 4840 students returned a completed survey (20.1%). Only participants who had complete data on sexual orientation, smoking, binge drinking, marijuana use and psychosocial questions were included in these analyses (n = 3892). Additional details about the study recruitment and study design procedures can be found elsewhere (21). The Emory University Institutional Review Board approved this study, IRB# 00030631.

Measures

The online survey contained 230 questions and assessed a variety of health behaviors, psychosocial characteristics, attitudes and demographics. Sexual orientation was defined by self-reported sexual identity, asking participants, “What best describes your sexual orientation?” with response options: “heterosexual”, “homosexual” and “bisexual”. For these analyses, the primary outcome of interest was substance use. Participants were asked about cigarette smoking (“In the past 30 days, on how many of those days did you smoke a cigarette, even one puff?”), marijuana use (“In the past 30 days, on how many of those days did you smoke marijuana?”) and alcohol use (“In the past 30 days, on how many of those days did you drink alcohol?”). Responses to each of these questions were dichotomized (yes, no). Binge drinking was assessed by asking those who reported drinking at least once in the past 30 days, “In the past 30 days, on how many of those days did you drink more than 5 alcoholic drinks on one occasion?” Responses were dichotomized with those reporting drinking more than five alcoholic drinks on a single occasion in the past 30 days being considered binge drinkers.

Concurrent substance use was assessed by computing a substance use score, aggregating the dichotomized responses to cigarette smoking, marijuana use and binge drinking to form an index, with reported use of each substance being scored as a 1, such that use of no substances scored a 0 and use of all three substances scored a 3.

Depressive symptoms were assessed through the Patient Health Questionnaire (PHQ-2) (22), which is a two-item depression screening tool, based on DSM-4 diagnostic criteria, assessing frequency of depressed mood ("feeling down, depressed or hopeless") and anhedonia ("little interest or pleasure in doing things") over the past two weeks. Responses were rated on a 4-point Likert scale (0 = *not at all* to 3 = *nearly every day*). A total score ≥3 has been used to screen for clinical depression (22).

Perceived stress was assessed through the four-item Perceived Stress Scale (PSS-4) (23) to assess the amount of stress they experienced in the past month using a 5-point Likert scale (0 = *never* to 4 = *very often*). Higher total scores indicate greater levels of perceived stress. Psychometric analyses revealed appropriate internal consistency, convergent validity and test-retest reliability (23).

Satisfaction with life was assessed through the Satisfaction With Life Scale (SWLS), a short 5-item scale, scored on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*) and designed to measure global cognitive judgments about one's satisfaction with life (e.g. "In most ways, my life is close to my ideal") (24,25).

Sensation seeking was assess through the Brief Sensation Seeking Scale (BSSS-4) (26), using the following four items: *I would like to explore strange places; I like to do frightening things; I like new and exciting experiences, even if I have to break the rules; and I prefer friends who are exciting and unpredictable*. Psychometric analyses revealed appropriate internal consistency, convergent validity and test–retest reliability (26).

Five-Factor Personality Traits were assessed through the Ten-Item Personality Inventory (TIPI) (27), which organizes personality theories into five primary non-cognitive personality factors, called the "Big Five" (Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness to Experience). Items are rated on a 7-point scale (1 = *disagree strongly* to 7 = *agree strongly*). The TIPI has demonstrated appropriate internal consistency, adequate convergent validity, test–retest reliability and appropriate patterns of predicted external correlates (27).

Social and demographic information was also collected, including age (in years), sex (male or female), ethnicity (categorized as non-Hispanic white, black or other) and attendance at a two-year versus a four-year college. Questions that asked about sexual risk taking, specific smoking and quitting attitudes and behaviors, and exposure to secondhand smoke were not included in these analyses.

Data analyses

Univariate statistics (means and standard deviations) and frequencies were used to compute descriptive statistics for the total sample and for the subsamples of heterosexual, homosexual and bisexual students. Because previous research on substance use among sexual minority samples has identified sex as an effect modifier (18), differences were assessed after stratifying the samples by male and female. Differences between the three subsamples for males and for females were computed using ANOVA tests (continuous data) and chi-square tests (categorical data). When the inequality of variance assumption was not

met, Welch's ANOVA was used instead of the Tukey *post-hoc* test. Simple linear regression was performed to assess the relationship between sexual orientation and the substance use index, before adjusting for other factors. Multicollinearity was assessed between all predictors. Two multivariable linear regression models were constructed for each sex (males and females). The first model assessed the relationship between sexual orientation and the substance use index after controlling for the demographic factors of age and race/ethnicity. The second model adjusted for demographic factors and for psychosocial factors (depressive symptoms, perceived stress, satisfaction with life, sensation seeking and the Big 5 personality traits). Data cleaning, univariate, bivariate and multivariable analyses were conducted in SAS (SAS Institute, Inc., Version 9.3, Cary, NC).

Results

The majority of the sample was female (71.2%), white or black (46.7% and 37.7%, respectively), and attended a 4-year school (63.0%). Among the total sample, 2.9% of students reported a homosexual identity (n =111) and 3.5% reported a bisexual identity (n = 135). More specifically, among males, 4.5% reported being homosexual and 2.3% reported being bisexual, while among females, 3.9% reported being bisexual and 2.2% reported being homosexual (Table 1). Compared to homosexual or heterosexual students, bisexual students reported more depressive symptoms ($p < 0.0001$), higher levels of stress ($p < 0.001$), lower satisfaction with life ($p < 0.0001$), higher levels of sensation seeking ($p < 0.0001$), lower levels of conscientiousness ($p<0.001$), and lower levels of emotional stability ($p < 0.0001$).

In addition, compared to homosexually or heterosexually-identified males, bisexual males reported more depressive symptoms ($p < 0.0001$) and higher perceived stress ($p < 0.001$) (Table 2). In looking at the Big-Five personality traits, homosexually-identified males reported higher levels or conscientiousness ($p < 0.05$) and openness ($p < 0.01$) compared to either heterosexual or bisexually identified males. However, no significant bivariate differences were identified between heterosexual, homosexual and bisexual males for any substance use, including alcohol use, binge drinking, marijuana use or tobacco use.

Compared to heterosexually or homosexually-identified females, bisexually-identified females exhibited more depressive symptoms ($p < 0.0001$), higher levels of perceived stress ($p < 0.01$), lower satisfaction with life ($p < 0.0001$) and higher levels of sensation seeking ($p < 0.0001$). Compared to heterosexually-identified females, both homosexually and bisexually-identified females reported lower levels of agreeableness ($p < 0.001$) and contentiousness ($p < 0.001$). Furthermore, bisexually-identified females reported significantly lower levels of emotional stability than either homosexually or heterosexually-identified females ($p < 0.0001$). Bisexually-identified females were also significantly more likely than their heterosexually or homosexually-identified counterparts to report any alcohol use (p50.001), binge drinking ($p < 0.05$), marijuana use ($p < 0.0001$) or tobacco use ($p < 0.0001$) in the past 30 days.

Among males, multivariable linear regression models indicated no significant association between sexual orientation and substance use score after adjusting for age and ethnicity (Table 3). The relationship between sexual orientation and substance use score remained insignificant after adjusting for psychosocial factors. Significant correlates of substance use

included ethnicity, with non-Hispanic black individuals being less likely to use substances than white individuals ($p < 0.0001$), and other racial/ethnic groups being less likely to use substances than white individuals ($p < 0.001$); satisfaction with life, with higher satisfaction being associated with lower substance use scores ($p < 0.0001$); sensation seeking, with higher levels of sensation seeking being associated with higher substance use scores ($p < 0.0001$); and contentiousness, with higher levels of contentiousness being associated with lower substance use scores ($p < 0.001$).

Among females, multivariable linear regression models indicated a significant association between sexual orientation and substance use score, after adjusting for age and ethnicity, with homosexually and bisexually-identified females being more likely to use substances than heterosexually-identified females ($p < 0.0001$ and $p < 0.0001$, respectively) (Table 3). Adjusting for psychosocial factors decreased the magnitude of association between sexual orientation and substance use score by greater than 10% for both homosexual and bisexual females. While sexual orientation remained significant in the model, these findings suggest that psychosocial factors confound the relationship. In addition to sexual orientation, significant correlates of substance use score among females included ethnicity, with non-Hispanic black individuals being less likely to use substances than white individuals ($p < 0.0001$), and other racial/ethnic groups being less likely to use substances than white individuals ($p < 0.0001$); depressive symptoms, with a higher number of symptoms being associated with higher substance use scores ($p < 0.01$); satisfaction with life, with higher satisfaction being associated with lower substance use scores ($p < 0.001$); sensation seeking, with higher sensation seeking scores being associated with higher substance use scores ($p < 0.0001$); extraversion, with higher levels of extraversion being associated with higher substance use scores ($p < 0.0001$); and conscientiousness, with higher levels of conscientiousness being associated with lower levels of substance use ($p < 0.0001$).

Discussion

The current study provides novel and important information regarding concurrent substance use among LGB-identifying college students. Findings from this study suggest a significant association between sexual identity and the number of substances used among female college students, with those identifying as homosexual or bisexual having a higher odds of increased substance use than their heterosexual counterparts. Consistent with existing research (17–19), after controlling for demographic factors, the relationship between the number of substances used and sexual identity was strongest among women who were bisexually identified. However, the magnitude of association between bisexual identity and concurrent substance use decreased significantly after adding psychosocial factors to the model. Interestingly, the magnitude of association did not change substantially for homosexually-identified females, suggesting that psychosocial factors confound the relationship between sexual orientation and substance use in bisexual women. Indeed, in bivariate analyses, data suggest that bisexual females have a unique psychosocial identity, with more depressive symptoms, higher perceived stress, lower satisfaction with life, higher levels of sensation seeking, lower levels of agreeableness, lower levels of contentiousness and lower emotional stability. More research is needed to better understand why this unique psychosocial profile might exist and how it might lead to increased substance use.

Males in this sample did not differ in substance use by sexual identity, and multivariable regressions did not find significant association between sexual identity and concurrent substance use among males. While a number of studies have found a significant association between sexual identity and illicit drug use among college males (17,19,28), findings have been inconsistent with regard to the association of sexual identity and binge drinking or cigarette smoking (19,29). It is possible that no association existed in the current study because we opted to combine substances with differing associations into one substance use score. Additionally, the relatively small sample size of males in this study likely limited our ability to detect significant differences. Furthermore, the only illicit substance included in this study was marijuana; we did not inquire about other illicit substances such as ecstasy or opiates. Previous research has identified differences between homosexually or bisexually-identified males and heterosexual males in the use of other illicit substances (9,17).

Interestingly, at 40.4% for all males and 26.2% for all females, the prevalence of cigarette smoking among this sample was substantially higher than national estimates for individuals ages 18–24 (21.3% and 16.4%, respectively) (30). This may be based on the fact that the geographic region from which the sample for the current study was drawn has higher tobacco prevalence than the national average (31).

The current findings have implications for research and practice. These results suggest that sexual identity is an important correlate of increased and concurrent substance use, but that psychosocial factors also play an important role. In particular, efforts to reduce substance use should focus on bisexually identified female college students. Targeting specific psychosocial factors might be a useful addition to substance use interventions. However, more research is needed to better understand how psychosocial factors may lead to different patterns of substance use among sexual minorities, and whether or not those factors are a result of or a response to minority stresses. In addition, more research is needed to assess whether or not race/ethnicity interacts with gender to yield different levels of substance use. The current study was unable to evaluate this potential interaction due to limitations in sample size. Finally, researchers may also aim to test and evaluate interventions to decrease substance use by targeting the psychosocial factors identified in this study (e.g. emotion regulation, sensation seeking).

This study has a number of limitations. First, the survey sample was a convenience sample, was largely female, and was drawn from colleges in the Southeast. This limits the generalizability of these findings to other populations or geographic areas. However, this sample reflects the characteristics of these school populations and has strong representation from individuals of both White and Black racial backgrounds. Second, the survey response rate was 20.1%, which might suggest sampling bias. However, previous online research has yielded similar response rates (29–32%) among the general population (32) and a wide range of response rates (17–52%) among college students (33). We are also unable to ascertain how many participants did not open the e-mail or had inactive email accounts, which impacts what the true “denominator” for this response rate may have been. In addition, prior work has demonstrated that, despite lower response rates, internet surveys yield similar statistics regarding health behaviors compared to mail and phone surveys (34). Another limitation is that all survey items were self-reported. Due to the sensitive nature of

disclosing one's sexual orientation and substance use behaviors, response bias may be a concern. Additionally, these findings relate only to self-reported sexual identity, the cognitive aspect of sexual orientation. Research suggests that including measures sexual attraction and sexual behavior could yield differences in the association between sexual orientation and substance use (29). This study used secondary data, collected for other purposes, and adding these additional dimensions of sexual orientation was not possible. Finally, the cross-sectional nature of this study limits the extent to which we can make causal attributions. Despite these limitations, this study focuses on an understudied population (LGB young adults) with important health disparities that should be considered in public health research and programming.

In conclusion, these findings suggest that, among females, significant disparities exist in substance use by sexual orientation. However, these disparities may be confounded by psychosocial factors like satisfaction with life, sensation seeking, extraversion and contentiousness. These findings suggest that psychosocial factors should be considered in future research among LGB young adults.

References

1. SAMSHA. NSDUH Series H-41, HHS Publication No (SMA) 11-4658. Rockville (MD): Substance Abuse and Mental Health Services Administration; 2011. Results from the 2010 National Survey on Drug Use and Health: summary of national findings.
2. Kessler RC, Berglund P, Demler O, et al. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62:593–602. [PubMed: 15939837]
3. Merikangas KR, McClair VL. Epidemiology of substance use disorders. Hum Genet. 2012; 131:779–89. [PubMed: 22543841]
4. Kroutil, LA.; Colliver, JD.; Gfroerer, J. Age and cohort patterns of substance use among adolescents: OAS data review. Rockville (MD): Office of Applied Studies, Substance Abuse and Mental Health Services Administration; 2010.
5. Patton GC, Coffey C, Lynskey MT, et al. Trajectories of adolescent alcohol and cannabis use into young adulthood. Addiction. 2007; 102:607–15. [PubMed: 17286642]
6. Bailey SL. Adolescents multisubstance use patterns – the role of heavy alcohol and cigarette use. Am J Public Health. 1992; 82:1220–4. [PubMed: 1503161]
7. Merikangas KR, Herrell R, Swendsen J, et al. Specificity of bipolar spectrum conditions in the comorbidity of mood and substance use disorders. Arch Gen Psychiatry. 2008; 65:47–52. [PubMed: 18180428]
8. Garofalo R, Wolf RC, Kessel S, et al. The association between health risk behaviors and sexual orientation among a school-based sample of adolescents. Pediatrics. 1998; 101:895–902. [PubMed: 9565422]
9. Boyd CJ, McCabe SE, d'Arcy H. Ecstasy use among college undergraduates: gender, race and sexual identity. J Subst Abuse Treat. 2003; 24:209–15. [PubMed: 12810141]
10. Russell ST, Driscoll AK, Truong N. Adolescent same-sex romantic attractions and relationships: implications for substance use and abuse. Am J Public Health. 2002; 92:198–202. [PubMed: 11818291]
11. Pope HG, Ionescu-Pioggia M, Pope KW. Drug use and life style among college undergraduates: a 30-year longitudinal study. Am J Psychiat. 2001; 158:1519–21. [PubMed: 11532744]
12. Eisenberg M, Wechsler H. Substance use behaviors among college students with same-sex and opposite-sex experience: results from a national study. Addict Behav. 2003; 28:899–913. [PubMed: 12788264]

13. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. Psychol Bull. 2003; 129:674–97. [PubMed: 12956539]
14. Bostwick WB, Boyd CJ, Hughes TL, McCabe SE. Dimensions of sexual orientation and the prevalence of mood and anxiety disorders in the United States. Am J Public Health. 2010; 100:468–75. [PubMed: 19696380]
15. McCabe SE, Bostwick WB, Hughes TL, et al. The relationship between discrimination and substance use disorders among lesbian, gay, and bisexual adults in the United States. Am J Public Health. 2010; 100:1946–52. Research Support, N.I.H., Extramural. [PubMed: 20075317]
16. Bux DA. The epidemiology of problem drinking in gay men and lesbians: a critical review. Clin Psychol Rev. 1996; 16:277–98.
17. Ford JA, Jasinski JL. Sexual orientation and substance use among college students. Addict Behav. 2006; 31:404–13. [PubMed: 15970397]
18. McCabe SE, Hughes TL, Boyd CJ. Substance use and misuse: are bisexual women at greater risk? J Psychoactive Drugs. 2004; 36:217–25. [PubMed: 15369203]
19. McCabe SE, Boyd C, Hughes TL, d'Arcy H. Sexual identity and substance use among undergraduate students. Substance Abuse. 2003; 24:77–91. [PubMed: 12766375]
20. Brewster KL, Tillman KH. Sexual orientation and substance use among adolescents and young adults. Am J Public Health. 2012; 102:1168–76. [PubMed: 22021322]
21. Berg CJ, Nehl E, Sterling K, et al. The development and validation of a scale assessing individual schemas used in classifying a smoker: implications for research and practice. Nicotine Tob. 2011; 13:1257–65.
22. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. Med Care. 2003; 41:1284–92. [PubMed: 14583691]
23. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983; 24:385–96. [PubMed: 6668417]
24. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Pers Assess. 1985; 49:71–5. [PubMed: 16367493]
25. Pavot W, Diener E, Colvin CR, Sandvik E. Further validation of the Satisfaction with Life Scale: evidence for the cross-method convergence of well-being measures. J Pers Assess. 1991; 57:149–61. [PubMed: 1920028]
26. Stephenson MT, Hoyle RH, Palmgreen P, Slater MD. Brief measures of sensation seeking for screening and large-scale surveys. Drug Alcohol Depend. 2003; 72:279–86. [PubMed: 14643945]
27. Gosling SD, Rentfrow PJ, Swann WB. A very brief measure of the Big-Five personality domains. J Res Pers. 2003; 37:504–28.
28. McCabe SE, Hughes TL, Bostwick WB, et al. Sexual orientation, substance use behaviors and substance dependence in the United States. Addiction. 2009; 104:1333–45. [PubMed: 19438839]
29. McCabe SE, Hughes TL, Bostwick W, Boyd CJ. Assessment of difference in dimensions of sexual orientation: implications for substance use research in a college-age population. J Stud Alcohol. 2005; 66:620–9. [PubMed: 16331847]
30. CDC. Vital signs: current cigarette smoking among adults aged >18 years – United States, 2005-2010. MMWR Morbidity and Mortality Weekly Report. 2011; 60:1207–12. [PubMed: 21900875]
31. CDC. State-specific prevalence of cigarette smoking and smokeless tobacco use among adults – United States, 2009. MMWR Morbidity and Mortality Weekly Report. 2010; 59:1400–6. [PubMed: 21048561]
32. Kaplowitz MD, Hadlock TD, Levine R. A comparison of web and mail survey response rates. Public Opin Quart. 2004; 68:94–101.
33. Crawford, S.; McCabe, S.; Kurotsuchi Inkelas, K. Using the web to survey college students: institutional characteristics that influence survey quality. Boston (MA): American Association for Public Opinion Association; 2008.
34. An LC, Hennrikus DJ, Perry CL, et al. Feasibility of Internet health screening to recruit college students to an online smoking cessation intervention. Nicotine Tob Res. 2007; 9:S11–18. [PubMed: 17365722]

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Table 1

Socio-demographic, psychosocial and substance use characteristics among college students of differing sexual orientations.

Variable	All participants *n* = 3892 M(SD) or *n* (%)	Heterosexual *n* = 3646 M(SD) or *n* (%)	Homosexual *n* = 111 M(SD) or *n* (%)	Bisexual *n* = 135 M(SD) or *n* (%)	*p* Value
Sociodemographics					
Age (SD)	23.52 (7.09)	22.83 (5.07)	23.57 (7.18)	22.81 (5.98)	0.2806
Male (%)	1123 (28.85)	1046 (28.69)	51 (45.95)	26 (19.26)	<0.0001
Ethnicity (%)					
White	1816 (46.66)	1713 (46.98)	36 (32.43)	67 (49.63)	<0.001
Black	1467 (37.69)	1379 (37.82)	51 (45.95)	37 (27.41)	
Other	609 (15.65)	554 (15.19)	24 (21.62)	31 (22.96)	
Type of school (%)					
Four-year	2451 (62.98)	2298 (63.03)	78 (70.27)	75 (55.56)	0.0571
Two-year	1441 (37.02)	1348 (36.97)	33 (29.73)	60 (44.44)	
Psychosocial factors					
Depressive symptoms (SD)[a]	1.24 (1.32)	1.20 (1.29)	1.43 (1.45)	1.93 (1.66)	<0.0001
Perceived Stress Scale (SD)[a]	6.16 (3.40)	6.09 (3.40)	6.75 (3.22)	7.43 (3.25)	<0.001
Satisfaction With Life Scale (SD)[a]	22.26 (7.50)	22.42 (7.47)	20.89 (7.41)	19.25 (7.85)	<0.0001
Sensation seeking (SD)	3.32 (0.90)	3.30 (0.90)	3.44 (0.84)	3.68 (0.89)	<0.0001
Big 5 Personality Traits (SD)					
Extraversion	8.75 (2.86)	8.75 (2.86)	8.59 (2.97)	8.87 (2.86)	0.7483
Agreeableness	9.97 (2.31)	10.01 (2.31)	9.57 (2.13)	9.46 (2.34)	<0.05
Conscientiousness	11.06 (2.43)	11.09 (2.42)	11.01 (2.29)	10.23 (2.64)	<0.001
Emotional stability	9.53 (2.75)	9.57 (2.73)	9.65 (2.77)	8.40 (3.02)	<0.0001
Openness	10.79 (2.31)	10.77 (2.30)	11.28 (2.31)	11.20 (2.40)	<0.01
Substance use, past 30 days					
Any alcohol use (%)[a]					
No	1696 (43.58)	1622 (44.49)	35 (31.53)	39 (28.89)	<0.0001
Yes	2196 (56.42)	2024 (55.51)	76 (68.47)	96 (71.11)	
Any binge drinking (%)[a]					
No	3029 (77.83)	2850 (77.91)	84 (74.63)	95 (70.24)	0.0866

Variable	All participants *n* = 3892 M(SD) or *n* (%)	Heterosexual *n* = 3646 M(SD) or *n* (%)	Homosexual *n* = 111 M(SD) or *n* (%)	Bisexual *n* = 135 M(SD) or *n* (%)	*p* Value
Yes	863 (22.17)	796 (21.83)	27 (24.32)	40 (29.63)	
Marijuana (%)[a]					
No	3387 (87.02)	3202 (87.82)	85 (76.58)	100 (74.07)	<0.0001
Yes	505 (12.98)	444 (12.18)	26 (23.42)	35 (25.93)	
Tobacco use (%)					
No	2712 (69.68)	2565 (70.35)	75 (67.57)	72 (53.33)	<0.0001
Yes	1180 (30.32)	1081 (29.65)	36 (32.43)	63 (46.67)	
Any substance use (%)					
No	2268 (58.27)	2150 (58.97)	56 (50.45)	62 (45.93)	<0.01
Yes	1624 (41.73)	1496 (41.03)	55 (49.55)	73 (54.07)	
Substance use index (SD)[a]	0.65 (0.90)	0.64 (0.88)	0.80 (.98)	1.02 (1.11)	<0.0001

[a]Welch's ANOVA used instead of Tukey due to inequality of variances.

Table 2

Socio-demographic, psychosocial and substance use characteristics among male and female college students of differing sexual orientations.

	Male subsample					Female subsample				
Variable	**All males *n* = 1123 M(SD) or *n* (%)**	**Heterosexual *n* = 1046 M(SD) or *n* (%)**	**Homosexual *n* = 51 M(SD) or *n* (%)**	**Bisexual *n* = 26 M(SD) or *n* (%)**	***p* Value**	**All females *n* = 2769 M(SD) or *n* (%)**	**Heterosexual *n* = 2600 M(SD) or *n* (%)**	**Homosexual *n* = 60 M(SD) or *n* (%)**	**Bisexual *n* = 109 M(SD) or *n* (%)**	***p* Value**
Sociodemographics										
Age (SD)	24.00 (7.80)	24.07 (7.87)	22.43 (3.92)	24.50 (10.3)	0.3261	23.33 (6.77)	23.37 (6.87)	23.18 (5.88)	22.41 (4.36)	0.3467
Ethnicity (%)										
White	575 (51.20)	546 (52.20)	19 (37.25)	10 (38.46)	<0.05	1241 (44.82)	1167 (44.88)	17 (28.33)	57 (52.29)	<0.01
Black	348 (30.99)	321 (30.69)	20 (39.22)	7 (26.92)		1119 (40.41)	1058 (40.69)	31 (51.67)	30 (27.52)	
Other	200 (17.81)	179 (17.11)	12 (23.53)	9 (34.62)		409 (14.77)	375 (14.43)	12 (20.00)	22 (20.18)	
Type of school (%)										
Four-year	687 (61.18)	633 (60.52)	39 (76.47)	15 (57.69)	0.0690	1764 (63.71)	1665 (64.04)	39 (65.00)	60 (55.05)	0.1570
Two-year	436 (38.82)	413 (39.48)	12 (23.53)	11 (42.31)		1005 (36.29)	935 (35.96)	21 (35.00)	49 (44.95)	
Psychosocial factors										
Depressive symptoms (SD)[a]	1.14(1.33)	1.10 (1.30)	1.45 (1.54)	2.21 (1.86)	<0.0001	1.28 (1.31)	1.25 (1.29)	1.42 (1.38)	1.86 (1.61)	<0.0001
Perceived Stress Scale (SD)[a]	5.84 (3.42)	5.74 (3.40)	6.71 (3.49)	7.96 (3.59)	<0.001	6.28 (3.38)	6.23 (3.40)	6.79 (3.01)	7.31 (3.16)	<0.01
Satisfaction With Life Scale (SD)*	21.62 (7.50)	21.71 (7.46)	21.18 (7.92)	18.96 (8.14)	0.1659	22.52 (7.49)	22.70 (7.45)	20.64 (6.99)	19.32 (7.81)	<0.0001
Sensation seeking (SD)	3.46 (0.88)	3.44 (0.88)	3.72 (0.80)	3.56 (1.04)	0.0735	3.26 (0.91)	3.24 (0.91)	3.21 (0.81)	3.71 (0.86)	<0.0001
Big 5 Personality Traits (SD)										
Extraversion	8.42 (2.79)	8.40 (2.78)	8.88 (3.33)	8.35 (2.19)	0.4803	8.88 (2.88)	8.88 (2.88)	8.35 (2.63)	9.00 (2.99)	0.3302
Agreeableness	9.52 (2.32)	9.51 (2.33)	9.60 (2.12)	9.50 (2.16)	0.9712	10.16 (2.28)	10.20 (2.27)	9.55 (2.15)	9.45 (2.39)	<0.001
Conscientiousness	10.67 (2.42)	10.68 (2.41)	11.09 (2.32)	9.58 (2.84)	<0.05	11.21 (2.42)	11.25 (2.41)	10.94 (2.28)	10.39 (2.59)	<0.001
Emotional Stability	10.04 (2.65)	10.08 (2.63)	9.63 (2.72)	9.19(3.11)	0.1242	9.33 (2.76)	9.37 (2.74)	9.67 (2.82)	8.21 (2.98)	<0.0001
Openness	10.59 (2.40)	10.54 (2.40)	11.63 (2.10)	10.54 (2.50)	<0.01	10.88 (2.27)	10.86 (2.26)	10.98 (2.45)	11.36(2.36)	0.0735
Substance use, past 30 days										
Any alcohol use (%)*										
No	447 (39.80)	424 (40.54)	15 (29.41)	8 (30.77)	0.1810	1249 (45.11)	1198 (46.08)	20 (33.33)	31 (28.44)	<0.001
Yes	676 (60.20)	622 (59.46)	36 (70.59)	18 (69.23)		1520 (54.89)	1402 (53.92)	40 (66.67)	78 (71.56)	
Any binge drinking (%)[a]										

Variable	Male subsample					Female subsample				
	All males *n* = 1123 M(SD) or *n* (%)	**Heterosexual *n* = 1046 M(SD) or *n* (%)**	**Homosexual *n* = 51 M(SD) or *n* (%)**	**Bisexual *n* = 26 M(SD) or *n* (%)**	***p* Value**	**All females *n* = 2769 M(SD) or *n* (%)**	**Heterosexual *n* = 2600 M(SD) or *n* (%)**	**Homosexual *n* = 60 M(SD) or *n* (%)**	**Bisexual *n* = 109 M(SD) or *n* (%)**	***p* Value**
No	766 (68.21)	711 (67.97)	39 (76.47)	16 (61.54)	0.3386	2263 (81.73)	2139 (82.27)	45 (75.00)	79 (72.48)	<0.05
Yes	357 (31.79)	335 (32.03)	12 (23.53)	10 (38.46)		506 (18.27)	461 (17.73)	15 (25.00)	30 (27.52)	
Marijuana (%)*										
No	899 (80.05)	841 (80.40)	39 (76.47)	19 (73.08)	0.5268	2488 (89.85)	2361 (90.81)	46 (76.67)	81 (74.31)	<0.0001
Yes	224 (19.95)	205 (16.60)	12 (23.53)	7 (26.92)		281 (10.15)	239 (9.19)	14 (23.33)	28 (25.69)	
Cigarette smoking (%)										
No	669 (59.57)	620 (59.27)	35 (68.63)	14 (53.85)	0.3449	2043 (73.78)	1945 (74.81)	40 (66.67)	58 (53.21)	<0.0001
Yes	454 (40.43)	426 (40.73)	16 (31.37)	12 (46.15)		726 (26.22)	655 (25.19)	20 (33.33)	51 (46.79)	
Any substance use (%)										
No	521 (46.39)	481 (45.98)	27 (52.94)	13 (50.00)	0.5812	1747 (63.09)	1669 (64.19)	29 (48.33)	49 (44.95)	<0.0001
Yes	602 (53.61)	565 (54.02)	24 (47.06)	13 (50.00)		1022 (36.91)	931 (35.81)	31 (51.67)	60 (55.05)	
Substance Use Index (SD)[a]	0.92 (1.02)	0.92 (1.02)	0.78 (1.04)	1.15 (1.24)	0.3968	0.55 (0.81)	0.52 (0.79)	0.82 (.93)	1.00 (1.08)	<0.0001

[a] Welch's ANOVA used instead of Tukey due to inequality of variances.

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Table 3

Gender-specific multiple linear regression models identifying correlates of substance use score.

	Males						Females					
	Model 1[a]			Model 1[b]			Model 1[c]			Model 2[d]		
Variable	**β**	**SE**	***p***	**β**	**SE**	***p***	**β**	**SE**	***p***	**β**	**SE**	***p***
Sexual orientation												
Heterosexual	Ref	–	–	Ref	–	–	Ref	–	–	Ref	–	–
Homosexual	−0.04	0.14	0.788	−0.15	0.14	0.286	0.39	0.09	<0.000	0.32	0.10	<0.01
Bisexual	0.35	0.18	0.058	0.09	0.19	0.655	0.43	0.07	1 50.0001	0.27	0.07	<0.001
Age	−0.01	0.004	<0.05	−0.005	0.004	0.228	−0.01	0.002	<0.001	−0.001	0.002	0.657
Ethnicity												
White	Ref	–	–	Ref	–	–	Ref	–	–	Ref	–	–
Black	−0.47	0.06	<0.0001	−0.42	0.07	<0.0001	−0.34	0.03	<0.0001	−0.32	0.03	<0.0001
Other	−0.28	0.08	<0.001	−0.29	0.08	<0.001	−0.29	0.04	<0.0001	−0.31	0.04	<0.0001
Depressive symptoms				0.03	0.03	0.273				0.04	0.01	<0.01
Perceived stress				0.003	0.01	0.807				0.005	0.01	0.444
Satisfaction with life				−0.02	0.005	<0.0001				−0.01	0.002	<0.001
Sensation seeking				0.19	0.04	<0.0001				0.14	0.02	<0.0001
Big 5: Extraversion				0.02	0.01	<0.05				0.03	0.01	50.0001
Big 5: Agreeableness				−0.02	0.01	0.090				−0.01	0.01	0.263
Big 5: Conscientiousness				−0.05	0.01	<0.001				−0.04	0.01	<0.0001
Big 5: Emotional Stability				0.03	0.01	<0.05				−0.001	0.01	0.943
Big 5: Openness				0.01	0.01	0.625				0.01	0.01	0.053

[a] $R^2 = 0.046$.

[b] $R^2 = 0.1186$.

[c] $R^2 = 0.056$.

[d] $R^2 = 0.1472$.