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Alcohol Use and Disordered Eating in a US Sample of Heterosexual and Sexual Minority Adolescents

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Abstract

Objective: To expand knowledge of co-occurring alcohol use and disordered eating behaviors (DEB) among sexual minority (ie, nonheterosexual) youth.

Method: Using pooled 2009–2015 US Youth Risk Behavior Surveys (322,687 students; 7.3% lesbian, gay, bisexual), multivariable logistic regression models examined: (1) associations of age of onset of drinking and past month binge drinking with past year DEB (fasting, diet pill use, purging, steroid use); and (2) effect modification by sexual orientation.

Results: Alcohol use and sexual minority identity were independently associated with elevated odds for diet pill use and purging among females, and fasting and steroid use among males. Odds of fasting increased with greater frequency of monthly binge drinking among heterosexual adolescent females, and odds of diet pill use increased with greater frequency of monthly binge drinking among heterosexual adolescent males. DEB prevalence was particularly pronounced among adolescents who binge drank and who were not sure of their sexual orientation identity. Among males not sure of their sexual orientation identity, those who binge drank more than one day in the past month had 8.63–23.62 times the odds of using diet pills relative to those who did not binge drink, and 13.37–26.42 times the odds of purging relative to those who did not binge drink.

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Conclusion: More research is needed on psychosocial factors underlying alcohol use and DEB in youth of all sexual orientations.

Keywords

Adolescence; Sexual Minorities; Binge Drinking; Eating Disorders; Males and Females

INTRODUCTION

Alcohol use disorders and eating disorders are debilitating conditions that frequently co-occur.^{1–3} Genetic factors contribute to vulnerability for alcohol dependence and disordered eating,⁴ yet do not fully explain the association.^{5, 6} Alcohol use and disordered eating behaviors (DEB; e.g., purging) typically onset during adolescence.^{7–9} Although estimates vary, one recent large-scale survey of US college students indicated that approximately 17% of males and 19% of females engage in some form of co-occurring DEB and binge drinking.¹⁰ Identifying population subgroups in which co-occurrence is elevated can help inform prevention efforts. One diverse subpopulation within which elevated risk of co-occurrence is likely is sexual minority (i.e., nonheterosexual) adolescents. Prior research indicates that sexual minority adolescents are more likely than their heterosexual peers to engage in substance abuse behaviors^{11, 12} and to engage in a diverse range of DEB, including use of diet pills¹³ and steroids,¹⁴ purging,¹⁵ and binge eating.^{15, 16} Despite abundant research on sexual orientation disparities in adolescent alcohol use and DEB, few studies examine sexual orientation differences in co-occurring alcohol use and DEB.

Alcohol use and DEB may co-occur among sexual minority adolescents due to shared risk factors. In particular, sexual minority youth are at risk for experiencing and internalizing stress related to their stigmatized sexual orientation identities (i.e., minority stress¹⁷). Prior research has found that sexual minority youth may be targets of homophobic and heterosexist victimization and discrimination in schools and other settings.¹⁸ Sexual minority youth may engage in alcohol use and DEB as a means of coping with minority stress processes.^{19, 20}

Examining differences in alcohol use and DEB risk by gender and sexual orientation can differentiate priority subgroups of adolescents that require preventive interventions. In general, research on co-occurring alcohol use and DEB has focused on young women (ages 18–30), generally with no data on sexual orientation reported.^{3, 21} Prior studies indicate that gender stratified approaches are warranted, given that males generally report higher levels of alcohol use than females.^{22, 23} In addition, whereas females are more likely than males to engage in purging and diet pill use, males are more likely to engage in steroid use.²⁴ Sexual orientation modifies the association between gender and alcohol use^{22, 25} and gender and DEB.^{13, 15, 26} Thus, the association between alcohol use and DEB may differ by sexual orientation across males and females.

The current study examined associations between early alcohol use, binge drinking, and DEB among heterosexual and sexual minority adolescent males and females. It was expected that earlier age of alcohol use and more frequent binge drinking would be

associated with greater engagement in DEB. The association between alcohol use and DEB was hypothesized to be stronger in sexual minorities than among heterosexual youth.

METHOD

Data Source

The YRBS is a biennial national survey conducted by the Centers for Disease Control and Prevention (CDC) since 1991 to collect health data on students in grades 9–12.²⁷ This study utilized local YRBS surveys, which are administered on a state, large urban school district, or county level by departments of education or health; in this implementation, jurisdictions use a two-stage cluster sample design to identify a sample of students.²⁷ Schools are first selected with a probability proportional to their enrollment; then, classes are randomly selected, and all students within these classes are eligible to participate. A new sample is selected each year that the survey is administered; the same students are not followed over time.

Local YRBS data were pooled across multiple jurisdictions and years (biennially from 2009–2015). The entire dataset consists of 47 jurisdictions across 6 time points, and 411,409 students. There were a total of 114 jurisdiction-years (distinct surveys administered by a particular jurisdiction in a specific year) that assessed sexual identity (366,550 students). The present analysis used data from 2009–2015. Students were excluded if they were missing any of the primary demographic/covariate variables of interest (sexual identity: 4.85%; race/ethnicity: 3.36%; sex: 0.76% and age 0.35%; BMI percentile: 8.41%; not mutually exclusive) resulting in a sample size 322,687 students (51% female).

Measures

Sexual orientation identity was assessed by an item, “Which of the following best describes you?”: “Heterosexual (straight);” “Gay or lesbian;” “Bisexual;” or “Not sure.”

Fasting.—Participants were asked, “During the past 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or keep from gaining weight?” (Yes/No).

Diet pills.—Participants were asked, “During the past 30 days, did you take any diet pills, powders, or liquids without a doctor’s advice to lose weight or to keep from gaining weight? (Do not include meal replacement products such as Slim Fast.)” (Yes/No).

Purging.—Participants were asked, “During the past 30 days, did you vomit or take laxatives to lose weight or to keep from gaining weight?” (Yes/No).

Steroid use.—Participants were asked, “During your life, how many times have you taken steroid pills or shots without a doctor’s prescription?” Response options ranged from 0 times to 40 or more times and were collapsed and dichotomized (Any use/No use).

Alcohol use was assessed with two items.—For *age at first drink*, participants were asked, “How old were you when you had your first drink of alcohol other than a few sips?”

Items were coded to reflect those who “Never Drank”, drank “Before age 13” and who drank “At age 13 or older,” per the CDC coding used in the 2015 YRBS Combined Data Users Guide.²⁸ For *binge drinking*, participants were asked, “During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?” Response options (ranging from 0 days to 20+ days) were coded into three categories: “0 days;” “1–2 days;” and “3+ days.”

Sex.—Participants identified their sex with the item “What is your sex?” (Female/Male).

Covariates.—The YRBS assessed *race/ethnicity* by self-report, with response options combined using CDC classification guidelines into the following racial/ethnic groups: “American Indian or Alaska Native;” “Asian;” “Black or African American;” “Native Hawaiian/Other Pacific Islander;” “White;” “Hispanic/Latino;” and “Multiple-Non-Hispanic.” *Age* was measured with the question, “How old are you?” coded into five categories: “14 or younger;” “15 y.o.,” “16 y.o.,” “17 y.o.,” and “18 and older.”

BMIpercentile was calculated based on percentile for body mass index (BMI) by age and sex, based on self-reported height and weight,²⁹ and entered as a continuous variable for multivariable analyses. *Survey year* was coded as the year of survey completion. Substance use was measured using a series of items about participants’ use of marijuana, cocaine, inhalants, heroin, methamphetamines, and ecstasy. Endorsement of any marijuana use was coded as *marijuana use*; any other drug was coded as non-marijuana *illicit drug use*.

Cigarette use was measured by asking participants “During the past 30 days, on how many days did you smoke cigarettes?” Response options ranged from 0 days to 29 days, and were dichotomized (Any use/No use). Models examining steroid abuse also considered potential steroid use related to the treatment of asthma, a common chronic health condition in childhood and adolescence. *Asthma* was measured using the item, “Has a doctor or nurse ever told you that you have asthma?” (Yes/No).

Analysis

Analyses were conducted in SAS Version 9.4 (SAS Institute, Cary, NC), using SAS-Callable SUDAAN Version 11.0.1 (RTI International, Research Triangle Park, NC) to weight estimates and account for the complex sampling design of the YRBS. YRBS data weights adjust for student non-response and distribution of students by grade, sex, and race/ethnicity in each jurisdiction.²⁷

First, descriptive statistics were calculated for all variables by sex and sexual orientation identity (Table 1). Next, DEB outcomes were regressed on the alcohol use indicators and sexual orientation in sex-stratified, multivariable logistic regression models (adjusting for all covariates). To test whether associations between alcohol use and DEB outcomes differed by sexual orientation subgroup, interaction terms (sexual orientation X alcohol use) were tested. If significant interaction effects were detected, sexual orientation-stratified models were estimated. Bar graphs plotting sexual orientation subgroup-specific raw prevalence of DEB by level of alcohol use aided in the interpretation of interactions.

RESULTS

Female Youth

Among females (Table 2), alcohol use and minority sexual orientation identity were independently associated with elevated odds of diet pill use and purging. Drinking in adolescence, regardless of age of onset (vs. never drinking) was associated with 1.69–2.11 times the odds of diet pill use and 1.73–1.80 times the odds of purging. In addition, binge drinking at least one day in the past month was associated with 1.33–1.99 times the odds of using diet pills and 1.24–1.54 times the odds of purging. Compared to heterosexual adolescent females, lesbian adolescents had 1.67 times the odds of using diet pills (95% CI=1.07, 2.60), and females who identified as lesbian, bisexual, or who were not sure of their sexual orientation identity had 1.77–2.75 times the odds of purging.

A significant interaction ($p=0.017$) indicated that the effect of binge drinking on fasting differed by sexual orientation. Stratified models (Table 2) and prevalence plots (Figure 1A) revealed that, among heterosexual females, those who binge drank 1–2 days in the past month had 1.48 times the odds of those who did not binge drink of engaging in fasting, and those who binge drank 3+ days in the past month had 1.61 times the odds of fasting. Among females who were not sure of their sexual orientation identity, those who binge drank 1–2 times in the past 30 days had 3.38 times the odds of fasting.

Male Youth

Among males (Table 3), alcohol use and sexual minority identity were independently associated with fasting and steroid use. Compared to those who did not drink, males who reported drinking prior to age 13 had 1.55 greater odds of fasting and 2.19 times the odds of steroid use. In addition, males who were gay, bisexual, or not sure of their identity had 2.43–3.07 times the odds of heterosexual males of reporting fasting. Males who identified as bisexual or not sure of their identity had 2.29–2.42 times the odds of using steroids compared to heterosexual males.

Significant interactions revealed that the associations between binge drinking and purging ($p=0.0005$), drinking age and diet pills ($p=0.0056$), and binge drinking and diet pills ($p<0.0001$) differed by sexual orientation. Stratified models (Figure 1B; Table 3) indicated that, among males not sure of their sexual orientation identity, those who binge drank 1–2 days in the past month had 13.37 times the odds of those who did not binge drink of purging (95% CI=1.63, 109.72), and those who binge drank 3+ days had 26.42 times the odds of purging (95% CI=3.73, 187.03). Among bisexual males, males who binge drank 1–2 days had 0.11 times the odds of purging; however, bisexual males who binge drank 3+ days had 4.5 times the odds of purging (95% CI=1.31, 15.41).

Among males who were not sure of their sexual orientation identity, those who drank at age 13 or later (vs. never drank) had 0.16 times the odds of using diet pills (Figure 1C; Table 3).

However, those who binge drank 1–2 days in the past month had 8.63 times the odds of those who did not binge drink of using diet pills (95% CI=1.56, 47.84), and those who binge drank 3+ days in the past month had 23.62 times the odds of using diet pills (95% CI=4.70,

118.64) (Figure 1D; Table 3). Among bisexual males, those who binge drank 3+ days in the past month had 4.93 times the odds of those who did not binge drink of using diet pills.

Although heterosexual males overall reported a low prevalence of diet pill use at all levels of binge drinking (Figure 1D), heterosexual males who binge drank 1–2 days had 1.56 times the odds of using diet pills relative to those who did not binge drink, and those who binge drank 3+ days had 1.73 times the odds of using diet pills.

DISCUSSION

The results of the current study align with previous research detecting elevated DEB among adolescents who consumed more alcohol,³⁰ and higher risk for DEB among sexual minorities.^{13, 31, 32} The findings support the clinical practice of screening for alcohol use among youth who engage in DEB, and being responsive to the potentially unique experiences of sexual minority youth. For females, ever drinking and more frequent binge drinking were associated with higher odds of diet pill use and purging. In addition, lesbian and bisexual females had higher odds of using diet pills and purging. Among males, earlier onset of drinking was associated with higher odds of fasting and steroid use, and more frequent binge drinking was associated with higher odds of steroid use. In addition, gay and bisexual males had higher odds of engaging in fasting, and bisexual males had higher odds of using steroids compared to heterosexual males.

The results present novel findings on youth who were not sure of their sexual orientation identity, who are sometimes excluded from research. Because sexual orientation identity is just one dimension of sexual orientation, which typically forms later in adolescence than other dimensions of sexual orientation, such as same-gender attraction,³³ some youth who identified as “not sure” could identify as gay, lesbian, bisexual, or a different sexual minority identity later in adolescence or young adulthood.³⁴ Irrespective of their future identity, results indicate that youth who are not sure of their sexual orientation identity are at elevated risk for DEB, particularly in the context of alcohol use. Compared to their heterosexual peers, females who were not sure of their sexual orientation identity had 1.85 times the odds of purging, and males who were not sure had more than a two-fold increase in the odds of fasting and using steroids. Stratified analyses among males revealed that if youth who are not sure about their sexual orientation also engage in more frequent monthly binge drinking, they may also have dramatically increased odds of also engaging in diet pill use and purging. Future research may include assessments of other dimensions of sexual orientation, such as attractions, or indicators of minority stress (e.g., victimization) in order to understand whether the experiences of youth who are not sure of their sexual orientation identity can be contextualized under minority stress paradigms.

Notably, among females who identified as heterosexual or not sure, the prevalence of fasting increased with greater frequency of binge drinking. The odds of diet pill use also increased with greater levels of binge drinking among heterosexual males, and markedly so among males not sure of their sexual orientation identity (over an eight-fold increase in odds). However, among lesbian and bisexual females, the prevalence of fasting was consistently high at all levels of binge drinking, and diet pill use and purging were consistently high at all

levels of binge drinking and age of onset of drinking among gay males. Although future research must replicate and explore patterns of association in greater depth, the results suggest that specific DEB and alcohol use behaviors may be less correlated among certain sexual orientation subgroups. Nevertheless, the findings indicate that potentially deleterious associations between alcohol use and specific DEB exist among all sexual orientation subgroups, including heterosexual adolescent females and males, even after adjusting for any illicit drug use, marijuana use, or past month cigarette use. Additional research is needed on psychological and contextual factors accounting for differential patterns. For example, emerging studies suggest that young adult females, in particular, may be at risk for engaging in dietary restriction behaviors, including fasting, in conjunction with binge drinking in an effort to adjust for overall daily calorie intake (i.e., the phenomenon of “drunkorexia”).³⁵ Whether this pattern holds more consistently for different sexual orientation groups across genders requires further study. In addition, studies should test for possible common underlying sources of causation, such as emotional dysregulation,^{2, 5, 6} and for mechanisms underlying potential sexual orientation differences in associations between DEB and alcohol use, such as comorbid depressive distress.²⁰

The current study represents one of the largest to examine co-occurring alcohol use and DEB among heterosexual and sexual minority adolescents. Nevertheless, there are limitations that merit consideration in interpreting results. Analyses were cross-sectional, preventing determination of directionality of effects. Despite the pooling of datasets, which permitted tests of interactions, point estimates in the stratified models are potentially inflated and should be interpreted with some caution, as noted by the wide confidence intervals. However, as displayed in the prevalence estimates and within-group raw prevalence plots, the high odds ratio estimates are likely tied to the high prevalence of the DEB outcomes within the sexual minority subgroups at each level of alcohol use (>10%) and the use of logit modeling.³⁶ The YRBS did not include binge eating, which is among the more common forms of DEB among adolescents, and which has been shown in research among women, in particular, to be one of the key eating disorder symptoms associated with alcohol use.^{3, 7} In addition, the YRBS only includes adolescents that were in school on the day of survey administration, which could introduce bias. Sexual minority youth may be more likely than their heterosexual peers to experience school absence due to victimization.¹³

In conclusion, future research should examine psychosocial factors underlying alcohol use and DEB among adolescents of all sexual orientation identities, including youth who are currently not sure of their sexual orientation identity. The findings yielded evidence of associations between alcohol use and sexual orientation with DEB that are of clinical relevance. Alcohol use and minority sexual orientation were generally uniquely associated with higher odds of disordered eating behaviors among adolescent females and males. However, evidence of effect modification indicated that clinicians and researchers should attend to and explore unique patterns of co-occurrence by sexual orientation subgroup.

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Ms. Turner served as the statistical expert for this research.

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Figure 1.

Raw Prevalence Plots of Fasting (Female Participants) and Diet Pill Use and Purging (Males Participants) by Sexual Orientation and Alcohol Use *Note:* (Figure 1A) Female Participants: Fasting by binge drinking behavior and sexual orientation. (Figure 1B) Male Participants: Purging by binge drinking behavior and sexual orientation. (Figure 1C) Male Participants: Diet pill use by age of first drink and sexual orientation. (Figure 1D) Male Participants: Diet pill use by binge drinking behavior and sexual orientation.

Table 1

Weighted Prevalence Estimates of Key Variables from the 2009–2015 Pooled Youth Risk Behavior Surveys

FEMALE PARTICIPANTS (N=163,153)								
	Heterosexual n= 139,714		Lesbian n= 3,286		Bisexual n= 14,431		Not Sure n= 6,132	
	n	%	n	%	n	%	n	%
Alcohol Use								
Age of First Drink								
Never Drank	55400	41.2	829	28.6	3076	21.8	2531	45.7
13 or older	59394	45.8	1446	44.1	6565	51.3	1977	34.5
Before age 13	18548	13.0	851	27.4	4050	26.9	1256	19.8
Binge Drinking (past 30 days)								
0 days	113249	84.9	2242	80.8	10262	76.8	4906	85.6
1–2 days	13551	10.2	494	13.1	2121	15.2	556	9.8
3+ days	5882	4.9	204	6.0	1071	7.9	281	4.6
Disordered Eating Behaviors								
Fasting	6213	14.1	217	27.5	1074	28.0	371	24.4
Diet Pills	2427	5.4	114	15.3	422	10.8	172	9.8
Purging (vomiting or laxatives)	3187	5.4	153	16.7	642	13.3	236	11.8
Steroid Use	1085	1.5	190	9.3	395	4.7	181	2.8
Covariates								
Substance use								
Illicit Drugs	11531	8.4	794	24.2	3421	22.8	1096	16.2
Marijuana	32229	34.2	1321	54.2	5684	60.6	1508	32.0
Cigarette Use (past 30 days)	10878	7.3	660	21.0	3222	24.0	700	8.9
Demographics								
Age								
14 or younger	21556	12.4	336	6.8	2085	13.1	1194	21.3
15	36193	25.5	722	26.2	3922	25.4	1744	31.9
16	36091	25.3	909	24.7	3900	24.0	1483	22.7
17	32612	24.0	858	25.6	3171	22.2	1169	16.4
18 or older	13262	12.8	461	16.7	1353	15.4	542	7.7
Race								
American Indian/Alaskan Native	2075	1.0	70	0.9	329	1.2	122	0.9
Asian	9545	5.7	87	2.0	485	4.5	593	8.2
Black	22274	14.7	892	25.8	2814	18.5	1050	13.7
Hispanic/Latino	32569	26.4	970	25.3	4455	30.6	1701	25.1
Hawaiian/Pacific Islander	2205	0.7	52	0.3	231	0.5	112	2.9
White	64533	48.3	1004	42.1	5129	40.4	2159	43.2
Multiple-Races (non-Hispanic)	6513	3.2	211	3.5	988	4.4	395	6.1
Health								

FEMALE PARTICIPANTS (N=163,153)								
	Heterosexual n= 139,714		Lesbian n= 3,286		Bisexual n= 14,431		Not Sure n= 6,132	
	n	%	n	%	n	%	n	%
<i>Asthma</i>	24052	22.4	848	36.8	3275	30.1	1152	23.4
<i>Weight Status^a</i>								
Underweight	3421	2.4	92	1.9	333	2.1	175	3.0
Healthy Weight	104086	74.2	2018	58.7	8959	63.4	3986	67.9
Overweight/Obese	32207	23.4	1176	39.4	5139	34.5	1971	29.1
MALE PARTICIPANTS (N=155,263)								
	Heterosexual n= 143,869		Gay n= 143,869		Bisexual n= 3,836		Not Sure n= 4,125	
	n	%	n	%	n	%	n	%
<u>Alcohol Use</u>								
Age of First Drink								
Never Drank	59293	43.5	1152	38.5	1157	36.4	1888	55.4
13 or older	51221	39.1	1101	36.7	1301	37.4	975	20.4
Before age 13	25873	17.4	955	24.9	1161	26.3	1020	24.3
Binge Drinking (past 30 days)								
0 days	112033	83.0	2237	82.5	2606	76.1	2860	83.6
1–2 days	13900	10.5	414	10.5	477	16.5	376	9.0
3+ days	8460	6.5	255	7.0	337	7.3	384	7.5
<u>Disordered Eating Behaviors</u>								
Fasting	3347	7.2	233	24.8	204	20.6	200	17.7
Diet Pills	2030	4.5	169	15.4	106	13.3	124	11.9
Purging (vomiting or laxatives)	1998	3.1	231	17.3	160	12.5	182	14.3
Steroid Use	2235	2.3	394	13.1	356	12.4	368	10.7
<u>Covariates</u>								
Substance use								
Illicit Drugs	15280	10.3	1136	26.5	1227	26.9	1133	25.7
Marijuana	38910	39.3	950	42.8	1217	45.5	1040	36.1
Cigarette Use (past 30 days)	15720	11.2	653	16.8	819	25.7	695	14.6
<u>Demographics</u>								
Age								
14 or younger	19332	11.2	359	9.5	495	11.0	606	14.0
15	36343	25.2	803	26.3	940	21.3	986	27.4
16	37339	25.3	854	23.1	984	23.8	1022	23.4
17	33857	23.7	886	24.4	946	28.5	954	19.4
18 or older	16998	14.6	531	16.7	471	15.4	557	16.0
Race								
American Indian/Alaskan Native	2685	1.3	85	1.3	111	2.3	121	2.3

FEMALE PARTICIPANTS (N=163,153)								
	Heterosexual n= 139,714		Lesbian n= 3,286		Bisexual n= 14,431		Not Sure n= 6,132	
	n	%	n	%	n	%	n	%
Asian	9800	6.0	189	4.1	203	3.3	426	9.2
Black	22461	14.1	661	17.8	578	15.2	611	13.0
Hispanic/Latino	33727	26.2	991	33.1	1083	28.8	1077	31.6
Hawaiian/Pacific Islander	2470	0.9	88	2.9	84	0.6	116	0.7
White	66467	48.7	1243	36.5	1513	45.9	1555	39.5
Multiple-Races (non-Hispanic)	6259	2.9	176	4.4	264	3.8	219	3.7
Health								
<i>Asthma</i>	26332	24.1	770	25.3	796	25.7	812	28.7
<i>Weight Status</i>								
Underweight	5237	3.6	197	6.3	225	6.9	247	5.2
Healthy Weight	95100	65.2	2127	59.0	2213	54.9	2469	59.4
Overweight/Obese	43532	31.2	1109	34.7	1398	38.2	1409	35.4

Note: Multivariable models included body mass index (BMI) percentile (continuous variable) based on participant's age and sex.

^aFor descriptive purposes, weight status was calculated from body mass index z-scores.

Multivariable Logistic Regression Models Estimating Odds of Disordered Eating Behaviors by Adolescent Alcohol Use Among Heterosexual and Sexual Minority Females in the 2009–2015 Pooled Youth Risk Behavior Surveys

Table 2

	Overall Sample		Heterosexual		Lesbian		Bisexual		Not Sure	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Fasting ^a										
Age of First Drink										
Never Drank (Referent)										
13 or older	1.40***	(1.24, 1.59)	1.46***	(1.27, 1.67)	0.51	(0.23, 1.15)	1.00	(0.67, 1.51)	1.45	(0.81, 2.60)
Before age 13	1.77***	(1.53, 2.06)	1.79***	(1.52, 2.09)	0.94	(0.38, 2.34)	1.46	(0.91, 2.34)	2.61**	(1.33, 5.13)
Binge Drinking (30 days)										
0 days (Referent)										
1–2 days	1.47***	(1.30, 1.65)	1.48***	(1.29, 1.70)	1.23	(0.50, 3.01)	1.17	(0.80, 1.70)	3.38**	(1.39, 8.24)
3+ days	1.39 ^c	(1.14, 1.69)	1.61***	(1.30, 1.99)	0.73	(0.23, 2.28)	0.68	(0.39, 1.17)	1.51	(0.62, 3.73)
Any illicit drug use	1.95***	(1.67, 2.27)	2.09***	(1.74, 2.51)	1.56	(0.68, 3.55)	1.52**	(1.10, 2.11)	2.21**	(1.24, 3.97)
Any marijuana use	1.12	(0.99, 1.27)	1.10	(0.96, 1.26)	1.10	(0.50, 2.42)	1.25	(0.89, 1.75)	0.89	(0.51, 1.53)
Any cigarettes (30 days)	1.50***	(1.31, 1.73)	1.47***	(1.23, 1.75)	1.65	(0.73, 3.74)	1.76**	(1.26, 2.46)	1.18	(0.56, 2.47)
Sexual Orientation										
Heterosexual (Referent)										
Lesbian										
Bisexual										
Not Sure										
Diet Pills										
Overall Sample										
OR		95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age of First Drink										
Never Drank (Referent)										

	Overall Sample			Heterosexual			Lesbian			Bisexual			Not Sure		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
13 or older	1.69***	(1.32, 2.14)													
Before age 13	2.11***	(1.60, 2.78)													
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.33**	(1.09, 1.63)													
3+ days	1.99***	(1.49, 2.66)													
Any illicit drug use	1.75***	(1.42, 2.15)													
Any marijuana use	1.14	(0.92, 1.41)													
Any cigarettes (30 days)	1.66***	(1.31, 2.10)													
Sexual Orientation															
Heterosexual (Referent)															
Lesbian	1.67*	(1.07, 2.60)													
Bisexual	1.16	(0.91, 1.49)													
Not Sure	1.43	(0.98, 2.08)													
	Overall Sample			Heterosexual			Lesbian			Bisexual			Not Sure		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Purging															
Age of First Drink															
Never Drank (Referent)															
13 or older	1.80***	(1.45, 2.24)													
Before age 13	1.73***	(1.34, 2.23)													
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.24 ^c	(1.02, 1.49)													
3+ days	1.54**	(1.17, 2.03)													
Any illicit drug use	2.17***	(1.80, 2.61)													

	Overall Sample			Heterosexual			Lesbian			Bisexual			Not Sure		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Any marijuana use	1.13	(0.96, 1.33)													
Any cigarettes (30 days)	1.55***	(1.29, 1.87)													
Sexual Orientation															
Heterosexual (Referent)															
Lesbian	2.75***	(1.85, 4.08)													
Bisexual	1.77***	(1.40, 2.23)													
Not Sure	1.85**	(1.33, 2.58)													
Steroids															
Age of First Drink															
Never Drank (Referent)															
13 or older	0.69	(0.27, 1.74)													
Before age 13	0.93	(0.38, 2.29)													
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.14	(0.68, 1.90)													
3+ days	1.00	(0.61, 1.64)													
Any illicit drug use	4.47***	(2.76, 7.23)													
Any marijuana use	2.98***	(1.76, 5.06)													
Any cigarettes (30 days)	2.37***	(1.49, 3.76)													
Sexual Orientation															
Heterosexual (Referent)															
Lesbian	1.31	(0.52, 3.31)													
Bisexual	1.40	(0.84, 2.33)													
Not Sure	0.79	(0.29, 2.12)													

Note: Models adjust for age, race/ethnicity, body mass index (BMI) percentile, asthma (steroid use model only), and survey wave. Sexual orientation-stratified results are reported when significant sexual orientation X alcohol use interaction effects are identified. OR = odds ratio.

^aSexual orientation estimates in the Overall Sample model for fasting are not reported due to the significant interaction effect.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

Table 3

Multivariable Logistic Regression Models Estimating Odds of Disordered Eating Behaviors by Adolescent Alcohol Use Among Heterosexual and Sexual Minority Males in the 2009–2015 Pooled Youth Risk Behavior Surveys

	Overall Sample			Heterosexual			Gay			Bisexual			Not Sure		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Fasting															
Age of First Drink															
Never Drank (Referent)															
13 or older	1.11	(0.93, 1.33)													
Before age 13	1.55***	(1.29, 1.86)													
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.11	(0.87, 1.42)													
3+ days	1.22	(0.94, 1.60)													
Any illicit drug use	1.49***	(1.20, 1.85)													
Any marijuana use	0.93	(0.79, 1.11)													
Any cigarettes (30 days)	1.55***	(1.27, 1.88)													
Sexual Orientation															
Heterosexual (Referent)															
Gay	3.07***	(2.07, 4.58)													
Bisexual	2.54***	(1.84, 3.50)													
Not Sure	2.43***	(1.75, 3.37)													
Diet Pills^a															
Overall Sample															
OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		
Age of First Drink															
Never Drank (Referent)															

	Overall Sample			Heterosexual			Gay			Bisexual			Not Sure		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Fasting															
13 or older	1.15	(0.89, 1.48)		1.18	(0.91, 1.54)		0.78	(0.25, 2.38)		3.26	(0.57, 18.61)		0.16 [*]	(0.03, 0.72)	
Before age 13	1.18	(0.87, 1.61)		1.22	(0.86, 1.74)		1.19	(0.37, 3.83)		0.95	(0.17, 5.45)		0.21	(0.02, 2.02)	
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.44 ^c	(1.07, 1.92)		1.56 ^{**}	(1.15, 2.12)		0.21	(0.05, 0.87)		0.05	(0.01, 0.20)		8.63 ^{***}	(1.56, 47.84)	
3+ days	1.84 ^{***}	(1.39, 2.43)		1.73 ^{***}	(1.27, 2.36)		0.68	(0.18, 2.60)		4.93 [*]	(1.06, 23.02)		23.62 ^{***}	(4.70, 118.64)	
Any illicit drug use	1.44 ^{**}	(1.12, 1.84)		1.35 [*]	(1.02, 1.79)		4.15 [*]	(1.28, 13.46)		1.48	(0.36, 6.06)		4.41 [*]	(1.29, 15.12)	
Any marijuana use	1.08	(0.86, 1.35)		1.07	(0.84, 1.35)		2.02	(0.65, 6.30)		1.14	(0.25, 5.28)		0.66	(0.15, 2.94)	
Any cigarettes (30 days)	1.31	(0.98, 1.74)		1.33	(0.97, 1.84)		0.96	(0.28, 3.32)		2.14	(0.67, 6.91)		0.63	(0.21, 1.91)	
Sexual Orientation															
Heterosexual (Referent)															
Gay															
Bisexual															
Not Sure															
Purging^b															
Age of First Drink															
Never Drank (Referent)															
13 or older	0.83	(0.60, 1.14)		0.81	(0.57, 1.15)		0.82	(0.17, 3.84)		0.69	(0.21, 2.26)		0.61	(0.20, 1.90)	
Before age 13	0.99	(0.69, 1.41)		1.00	(0.67, 1.51)		1.69	(0.44, 6.51)		0.32	(0.10, 1.02)		0.36	(0.10, 1.28)	
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.34	(0.92, 1.93)		1.30	(0.88, 1.91)		2.67	(0.49, 14.62)		0.11 ^{**}	(0.03, 0.45)		13.37 [*]	(1.63, 109.72)	
3+ days	1.36	(0.95, 1.96)		1.17	(0.80, 1.72)		1.98	(0.38, 10.21)		4.50 [*]	(1.31, 15.41)		26.42 ^{***}	(3.73, 187.03)	

	Overall Sample			Heterosexual			Gay			Bisexual			Not Sure		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Fasting															
Any illicit drug use	1.85 ^{***}	(1.40, 2.45)		1.76 ^{***}	(1.29, 2.41)		2.17	(0.72, 6.54)		1.50	(0.56, 4.05)		6.07 ^{***}	(2.23, 16.49)	
Any marijuana use	0.89	(0.65, 1.22)		0.96	(0.69, 1.34)		0.50	(0.14, 1.82)		1.34	(0.29, 6.12)		0.06	(0.01, 0.36)	
Any cigarettes (30 days)	1.56 [*]	(1.09, 2.24)		1.68 [*]	(1.13, 2.51)		0.94	(0.22, 4.02)		0.79	(0.25, 2.53)		2.60	(0.73, 9.27)	
Sexual Orientation															
Heterosexual (Referent)															
Gay															
Bisexual															
Not Sure															
Steroids															
Age of First Drink															
Never Drank (Referent)															
13 or older	1.43	(0.91, 2.24)													
Before age 13	2.19 ^{***}	(1.38, 3.47)													
Binge Drinking (30 days)															
0 days (Referent)															
1–2 days	1.80 [*]	(1.13, 2.86)													
3+ days	3.47	(2.12, 5.69)													
Any illicit drug use	6.00 ^{***}	(4.34, 8.31)													
Any marijuana use	1.66 ^c	(1.10, 2.49)													
Any cigarettes (30 days)	1.25	(0.89, 1.76)													
Sexual Orientation															
Heterosexual (Referent)															
Gay															
Bisexual	2.29 [*]	(1.19, 4.41)													

Overall Sample		Heterosexual		Gay		Bisexual		Not Sure	
OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Fasting									
Not Sure	2.42 ***	(1.57, 3.73)							

Note: Models adjust for age, race/ethnicity, body mass index (BMI) percentile, asthma (steroid use model only), and survey wave. Sexual orientation-stratified results are reported when significant sexual orientation X alcohol use interaction effects are identified. OR = Odds ratio.

a, b Sexual orientation estimates in the Overall Sample model for diet pills and purging are not reported due to significant interaction effects.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$