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Associations between binge drinking frequency and tobacco use among young adults

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Abstract

Tobacco use is greater among young adults who binge drink; yet there is limited research on tobacco use characteristics among different types of binge drinkers based on frequency. We aimed to characterize this relationship among young adults (18-25 years old) who used both substances in the past month (smoked ≥1 cigarette, and drank ≥1 alcoholic beverage) using an anonymous online survey. Participants (N=1405, 65.0% male) were grouped based on binge drinking frequency and compared for tobacco use characteristics and demographics using bivariate analyses and multinomial logistic regression. Binge drinking frequency groups were: non-binge drinkers who consumed alcohol (0 days; 27.5%); occasional (1-3 days; 37.9%); intermediate (4-8 days; 21.9%); and frequent (9+ days; 12.7%) binge drinkers. Comparing each binge drinking group to non-binge drinkers: Both occasional and frequent binge drinkers smoked more cigarettes per day ($p=0.001$; $p=0.002$); Frequent binge drinkers reported greater temptations to smoke in positive affective/ social situations ($p=0.02$); Intermediate binge drinkers were less likely to have a tobacco abstinence goal ($p=0.03$) but more likely to have made a serious tobacco quit attempt; all of the binge groups were more likely to be social smokers (all $p<0.01$). Overall, we also found a high rate of smoking on binge drinking days. Individuals smoked cigarettes on 85.7% ± 32.9% of days they binge drank. Extent of binge drinking (not just prevalence) is an important factor influencing smoking characteristics in young adults.

Keywords

Alcohol; binge drinking; heavy episodic drinking; tobacco; young adult

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1. Introduction

Tobacco use is the leading cause of premature death and has been linked to 6 million deaths per year worldwide (WHO, 2013). Binge drinking (defined as four or more drinks for women and five or more drinks for men on an occasion) is involved in half of all alcohol related deaths (Kerr et al., 2014). Young adults are an important target for public health efforts given that this age group has the highest rates of both cigarette smoking and binge drinking. In 2013, 37.0% of young adults reported smoking tobacco, and 37.9% reported binge drinking at least once in the past 30 days (SAMHSA, 2013). Of particular concern, binge drinking and cigarette smoking commonly co-occur in this population (53.1 % of heavy alcohol users aged 12 or over smoked cigarettes in the past month; SAMHSA, 2013). This co-use compounds health and social risks (Bobo & Husten 2000; Harrison et al., 2008; Harrison & McKee, 2008; 2011; Jiang & Ling, 2013; Jiang et al., 2014).

It has been well established that tobacco and alcohol use are associated (for review see McKee & Weinberger, 2013). This is clearly a complex relationship influenced by both social and pharmacological factors. Previous research indicates that the prevalence of cigarette smoking is highest among young adults who drink heavily or frequently binge drink (Harrison & McKee, 2011; Weitzman & Chen, 2005). Our study sought to further characterize this relationship by identifying tobacco use characteristics associated with different frequencies of binge drinking among young adults who use both substances.

Frequency of binge drinking may also be associated with unique profiles of social and situational factors that lead to temptations to smoke cigarettes. Self-identifying as a social smoker or using cigarettes in social situations is associated with smoking while drinking (Jiang et al., 2014; Nichter et al., 2010). Additionally, smoking temptations have previously been characterized into unique domains based on social situational factors where individuals are motivated to smoke. (Velicer et al., 1990). Given the extent to which binge drinking and smoking co-occur in social situations for young adults (e.g., bars; Jiang et al., 2014; Nichter et al., 2010), a goal of this work was to determine whether frequency of binge drinking was associated with differences in prevalence of social smoking or temptations to smoke in positive/affective situations.

Heavy alcohol consumption may be associated with both a decrease in desire to quit smoking and lower self-efficacy for quitting tobacco. Alcohol consumption has been negatively associated with quitting tobacco (Friend & Pagano, 2005; Hymowitz et al., 1997; Osler et al., 1999) and binge drinkers specifically were found be more likely to lapse during tobacco cessation attempts (Cook et al., 2012). Further, individuals who binge drink alcohol may be less ready to quit smoking cigarettes (Berg et al., 2012). However, little is known about whether readiness to quit smoking or having a goal of abstinence for tobacco are related to frequency of binge drinking among young adults who use both substances.

The current study used data collected from an anonymous online survey of young adults who had self-reported both past month smoking and alcohol use to: (1) Characterize and validate binge drinking frequency groups; (2) Identify demographic and smoking characteristics associated with binge drinking frequency, including smoking frequency,

smoking history, social smoking, quit history, nicotine dependence, temptations to smoke in high risk situations, and thoughts about tobacco abstinence; and (3) Determine if the binge drinking frequency groups differed in cigarette smoking on binge and non-binge drinking days. Identifying sociodemographic and tobacco use characteristics that distinguish among specific frequencies of binge drinking is important to identify at risk populations and improve smoking cessation interventions among young adults who smoke and drink alcohol.

2. Methods

2.1 Participants and recruitment procedure

This study analyzed data from an anonymous, national cross-sectional survey study with online recruitment. Participants were young adults (18-25 years old) from the United States who were English literate and reported having smoked at least one cigarette in the past 30 days. Data were used for the present analysis if participants reported drinking alcohol at least once in the past month (n=1405). Participants were recruited between April 2009 and December 2010 using three Internet-based methods described previously (Ramo et al., 2010; Ramo & Prochaska, 2012b).

Participants who provided online University of California Institutional Review Board-approved consent and were eligible were invited to complete an online survey of tobacco and other substance use. Data were encrypted for added security protection. Participants were required to answer all questions before they could continue to the next page of the survey but could quit and return to the survey at any time. To prevent duplicate entries from the same person, computer Internet Protocol addresses were tracked; only one entry was allowed from a single computer. Eligibility checks excluded respondents who (a) had discrepant data on similar demographic questions or grossly discrepant data on substance use measures, (b) reported the same email address across multiple survey entries, or (c) had clearly invalid data (e.g., responding ‘9’ to all questions in the survey). Respondents found to be ineligible were excluded from analyses.

2.2 Measures

The measures used have been previously analyzed with anonymous online survey methods and demonstrated good reliability and validity with young adults (Ramo et al., 2011, 2012). Sociodemographics assessed were *g*ender, age, ethnicity, years of education, and annual household income.

2.3 Tobacco use measures

The Timeline Followback (TLFB) procedure was used to assess total cigarettes smoked each day in the past month (Brown et al., 1998) from which past month total cigarettes smoked, number of smoking days, average number of cigarettes smoked per day, and daily smoking status (yes/no; 30/30 days) were calculated. A smoking questionnaire (Hall et al., 2006) assessed participants' total years of smoking and number of past year 24-hr quit attempts (dichotomized due to skew; yes/no). Time to first cigarette upon waking (<30 min or > 30min) was used as a measure of dependence (Baker et al., 2007).

Participants were asked “Are you a social smoker” (yes/no), found to be an inclusive and widely endorsed definition of social smoking for young adults (Lisha et al., 2014; Song & Ling, 2011). Participants also completed a smoking temptation measure consisting of three domains: positive affective situations (e.g. “with friends at a party” or “when I am happy and celebrating”), negative affective situations (e.g. “when I am angry about something”); and Habitual/ Craving situations (e.g. “when I realize I have not smoked for a while”) based on Velicer et al., 1990.

Readiness to quit smoking cigarettes was measured using the Smoking Stages of Changes Questionnaire (Prochaska & DiClemente, 1983), categorizing participants into one of three pre-action stages of change: (a) Precontemplation - no intention to quit smoking within the next 6 months, (b) Contemplation – intention to quit smoking within the next sixth months but no 24-hr quit attempts in the past year, and (d) Preparation – intention to quit within the next month and a 24-hr quit attempt in the past year. Abstinence goal was assessed using a single-item with seven answer choices, categorized as complete abstinence or non-abstinence (e.g., no change, an intermediate or reduction goal; Hall et al., 2006).

2.4 Alcohol use measures

Past month alcohol use was assessed with the TLFB, with participants reporting the number of alcoholic drinks consumed on each day in the past 30 days (Sobell et al., 1996). TLFB data were used to generate the total number of drinks in the past 30 days, the number of days drinking any alcohol in the past 30 days, the average number of drinks per drinking day, the number of past month binge drinking days (5 or more drinks for men, 4 or more drinks for women), and the greatest number of drinks in a day. Age of first alcoholic drink was determined by asking participants: “How old were you the first time you had a drink of an alcoholic beverage”.

2.5 Tobacco and alcohol co-use

TLFB data were used to generate the percent of binge drinking days that participants smoked cigarettes, and the percent of total past month cigarettes that were smoked on days participants binge drank alcohol.

2.6 Data Analysis

Individuals were divided into 4 groups based on binge drinking frequency: (a) non-binge drinkers; (b) occasional binge drinkers (1-3 binge drinking days/ month); (c) intermediate binge drinkers (4-8 binge drinking days/ month); and (d) frequent binge drinkers (9 or more binge drinking days/ month). Groups were chosen to characterize frequencies of binge drinking that would correspond with typical patterns of alcohol use among young adults (e.g., less than, equal, or greater than weekend binge drinking, ∼4-8 days per month; Jackson et al., 2010; Kuntsche & Labhart, 2012; Livingston et al., 2010). However, day of the week on which binge drinking occurred was not directly assessed. Binge drinking frequency groups were validated by examining alcohol variables on which they were expected to differ (e.g. total alcoholic drinks consumed, number of drinking days in the past month, average drinks per drinking day, greatest number of drinks in a day, and age first tried alcohol) using bivariate analyses.

Bivariate analyses were used to identify characteristics that differed between the binge drinking groups to include in the regression model. Factorial ANOVA for continuous variables, Kruskal-Wallis test for continuous variables with skewed distributions, and Pearson's chi-square tests for categorical variables.

A multinomial logistic regression model was used to compare each of the three binge drinking groups to the non-binge drinkers (i.e., those who drank alcohol in the past month but did not binge drink). Initial factorial ANOVA analyses found years of education (p=0.6), and stage of change (p=0.7) to be non-significant and they were excluded from the model. All other variables from bivariate analyses were included in the multivariate logistic regression model. An ordinal logistic regression model was considered for these analyses; however initial examination of the binge drinking groups found that the data did not meet the assumption of proportional odds, suggesting that there was not a linear relationship between binge drinking and the tobacco use characteristics.

The extent to which smoking occurred on binge drinking was examined between the binge drinking frequency groups. ANOVAs were used to compare binge drinking groups on (1) the proportion of binge and non-binge drinking days that cigarette smoking occurred, and (2) the percent of total past month cigarettes that were smoked on binge drinking days. Tukey's post-hoc tests were used for individual group comparisons when appropriate. All statistical analyses were performed using SPSS 22 (IBM Corporation, Armonk, NY, USA). Effects were considered significant at an alpha level of 0.05 or less.

3. Results

3.1 Sample characteristics

Of those who reached the study's introductory page, 7,260 people gave online consent to determine eligibility to complete the survey. Of those, 4,242 (58%) met criteria and 494 (7%) were deemed invalid, leaving 3,748 (52%) eligible and valid cases. Of those 1,987 (53%) completed the entire survey, consistent with other cross-sectional online smoking studies (Cobb et al., 2005; McKay et al., 2008; Swartz et al., 2006). Seventy percent (n=1405) reported past month drinking and were used for the present analysis.

The sample was a majority male (65.0%) and Caucasian (71.0 %), with 45.7 % being over 21 years old (Table 1). Almost three quarters (72.5 %) reported binge drinking at least once in the past month. Median cigarettes smoked per day was 5.4 (interquartile range: 1.2, 11.3) with 55.0 % reporting daily smoking. Other tobacco and alcohol use characteristics are reported in Table 1.

3.2 Binge drinking groups

The four binge drinking frequency groups were defined by number of binge drinking episodes in the past month (non-binge, occasional, intermediate, and frequent; Table 1). As expected, more frequent binge drinking was associated with significantly more drinks consumed in the past month ($F_{(3, 1401)} = 908.7$, $p < 0.001$); greater number of days drinking any alcohol in the past month ($F_{(3, 1401)} = 326.7$, $p < 0.001$), greater drinks per drinking day $F_{(3, 1401)} = 240.6$, $p < 0.001$), and a higher number of drinks on the heaviest drinking day

($F_{(3, 1401)}$ = 509.1, p < 0.001). In addition, more frequent binge drinking was associated with trying alcohol for the first time at a slightly younger age ($F_{(3, 1401)}$ = 5.7, p = 0.01).

3.3 Demographics and tobacco use characteristics associated with binge drinking frequency

Bivariate analyses identified demographic and tobacco use characteristics that differed between the binge drinking groups to include in the logistic regression model. This included age ($\chi^2_{(3, N=1405)}$= 8.1, p = 0.04), sex ($\chi^2_{(3, N=1405)}$ = 10.2, p = 0.02), daily smoking ($\chi^2_{(3, N=1405)}$=25.8, p < 0.001), average cigarettes per day ($H_{(3)}$ = 47.4, p < 0.001), years smoking ($F_{(3, 1401)}$ = 3.0, p = 0.03), social smoking ($\chi^2_{(3, N=1405)}$=22.2, p < 0.001), temptation to smoke in positive affective/ social situations ($F_{(3, 1401)}$ = 6.1, p < 0.001); and a trend for past year 24-hr cigarette quit attempts ($\chi^2_{(3, N=1405)}$=7.6, p = 0.05).

Logistic regression models with tobacco use and demographic characteristics, were used to compare each binge drinking group (occasional; intermediate, and frequent) to non-binge drinkers (reference group) as described below and in Table 2.

3.3.1 Occasional binge vs non-binge drinkers—Compared to non-binge-drinkers, occasional binge drinkers were significantly more likely to be social smokers (adjusted odds ratio; AOR = 1.8, p < 0.001).

3.3.2 Intermediate binge vs non-binge drinkers—Members of the intermediate binge drinking group were more likely to be social smokers (AOR = 1.6, p = 0.006), smoke more cigarettes/day (AOR = 1.1, p = 0.001), have had a 24-hr cigarette quit attempt during the past year (AOR = 1.5, p = 0.01) but were less likely to have a tobacco abstinence goal (AOR = 0.6, p = 0.04) than non-binge drinkers.

3.3.3 Frequent binge vs non-binge drinkers—Members of the frequent binge drinking group were more likely to be male (AOR = 1.6, p = 0.04), had higher household income (less likely to have a household income of either <$20,000 (AOR = 0.5, p = 0.03) or $20,000 - $60,000 (AOR = 0.5, p = 0.008) compared to >$100,000), smoked more cigarettes/day (AOR=1.1, p=0.04), were more likely to be social smokers (AOR = 2.3, p < 0.001), and had greater temptations to smoke in positive affective/ social situations (AOR = 1.1, p = 0.01) than non-binge drinkers. Daily smoking approached significance (AOR=1.6, p=0.06).

3.4 Combined smoking and binge drinking

3.4.1 Smoking on binge drinking days—Cigarette smoking occurred on the majority of days that individuals binge drank alcohol (85.7% ± 32.9% overall). Comparing across binge drinking groups, the model was significant (occasional binge drinkers: 85.7% ± 32.9%; intermediate binge drinkers: 84.3% ± 28.8%; and frequent binge drinkers: 91.6% ± 20.7%; $F_{(2, 1018)}$ = 3.6, p = 0.03), with significant group differences between frequent and intermediate binge drinker groups (p <0.05). There was a similar trend when comparing the frequent to the occasional binge groups, though this did not reach statistical significance (p = 0.06).

Frequent and intermediate binge drinkers also smoked more of their total past month cigarettes on binge drinking days than occasional binge drinkers (occasional binge: 16.0% ± 23.2%; intermediate binge: 30.2% ± 24.3%; frequent binge: 54.3% ± 22.7%; $F_{(2, 1018)} = 182.7$, $p < 0.001$).

3.4.1 Smoking on non-binge days—Smoking also occurred on a majority of non-drinking days (71.7% ± 37.9% overall). There were significant differences between the binge drinking groups for smoking on the non-binge days: (occasional binge: 67.2% ± 39.3%; intermediate binge: 73.0% ± 36.5%; frequent binge: 82.8% ± 33.3%; $F_{(2, 1018)} = 11.8$, $p < 0.001$). The frequent binge group was more likely to smoke on non-binge days compared to both the occasional binge group ($p<0.001$), and the intermediate binge group ($p<0.05$).

5. Discussion

The goal of the current study was to determine which demographic and tobacco use characteristics differentiate frequencies of binge drinking among young adults who smoke and drink alcohol. Some tobacco use characteristics were found to be associated with binge drinking regardless of frequency (e.g. self-identifying as a social smoker), while others (e.g., cigarettes per day, and temptations to smoke in positive affective/ social situations) were greater among those who reported more frequent binge drinking.

Given that heavier smoking was associated with intermediate or frequent binge drinking, smoking cessation intervention with heavy binge drinkers should advocate use of evidenced-based strategies to reduce nicotine cravings (e.g., nicotine replacement therapy, varenicline, bupropion). Frequent binge drinkers may be particularly vulnerable to smoking relapse at parties and other social events when binge drinking commonly occurs. Interventions with this group should provide coping mechanisms for dealing with temptations to smoke in social situations and when drinking alcohol. Given absence of significant effects for temptations in negative situations, coping strategies targeting positive affective/social situations versus negative affect situations may be more effective with frequent binge drinkers. Further research examining the specific context of binge drinking and smoking may help to further elucidate this relationship.

Individuals in the intermediate binge group were more likely to report making a past year tobacco quit attempt but less likely to report having a tobacco abstinence goal compared to non-binge drinkers. Notably, there were no other significant differences for these variables among either the frequent or the occasional binge drinking groups. Binge drinkers have been found be more likely to lapse during tobacco cessation attempts (Cook et al., 2012). Individuals in the intermediate binge group (a frequency that is characteristic of regular weekend binge drinking) may be less confident that they can make a successful tobacco cessation attempt despite previous attempts, and less likely to want to make a quit attempt in the future. Incorporating self-efficacy into research on binge drinking frequency and into smoking cessation with binge drinkers is warranted.

Individuals in the most frequent binge drinking group were more likely to smoke cigarettes on both binge and the non-binge drinking days compared to non-binge drinkers. Frequent binge drinking may perpetuate cigarette smoking overall and suggests that individuals were not only smoking cigarettes for their combined pharmacological effects with alcohol. We did not find an association between binge drinking frequency and tobacco dependence using the time to first cigarette. Data with other population, suggests that individuals who are alcohol dependent may have higher nicotine dependence (Hurt et al., 1995; McKee et al., 2007; Marks et al., 1997). Changes in tobacco dependence may occur with a chronic pattern of alcohol abuse and dependence; and this may be less apparent in young adults who binge drink alcohol.

Of note, overall prevalence of binge drinking was higher than reported in national epidemiological data from the year this study was conducted. The 2010 National Household Survey on Drug Use and Health reported 40.6% of young adult current smokers had at least one past month binge drinking episode (SAMHSA, 2011). This is consistent with results reported for marijuana use in this sample of young adult smokers (Ramo & Prochaska, 2012a), and could be related to the anonymous data collection allowing for reduced bias in reporting of illegal or potentially stigmatizing behavior (binge drinking).

Limitations of the current study include that the data relied on anonymous self-report, however, reliability of tobacco and alcohol self-report has been demonstrated (Sobell et al., 1996; Brown et al., 1998). In addition, this methodology allowed for data collection from a population that may have been difficult to reach otherwise. Because the goal of this study was to examine the relationship between tobacco and alcohol use the sample included only young adults who smoke cigarettes and drink alcohol, sample characteristics and results may not be nationally representative.

Researchers and clinicians working with young people who co-use tobacco and alcohol should consider frequency of binge drinking to better understand correlates of tobacco use and for intervention targeting. Future research should consider longitudinal patterns to understand the relationship between binge drinking frequency and smoking across the developmental trajectory of late adolescence and emerging adulthood.

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Highlights

- We examined smoking characteristics across binge drinking groups in young adults.
- Self-identifying as a social smoker was associated with any binge drinking
- Other tobacco use characteristics differed by frequency of binge drinking
- High rate of smoking while binge drinking regardless of frequency (85.7% ± 32.9%)

Table 1

Descriptive statistics and tobacco use characteristics of the binge drinking frequency groups

Variable	Total (N=1405)	Non-binge (N=386)	Occasional (N=533)	Intermediate (N=307)	Frequent (N=179)	χ^2/F/K -W	p
			----------*Binge drinking groups* ----------				
			Demographics				
Over 21 years old, % yes	45.7 %	48.4 %	43.5 %	41.7 %	53.1 %	8.1	**0.04**
Sex, % male	65.0 %	63.2 %	62.9 %	64.8 %	75.4 %	*10.2*	***0.02***
Ethnicity, % Caucasian	71.0 %	69.2 %	69.0 %	74.6 %	74.3 %	4.5	0.2
Years of education, M±SD	13.3 ± 2.1	13.2 ± 2.0	13.3 ± 2.2	13.4 ± 2.2	13.3 ± 2.0	0.7	0.6
Household income, %	---	---	---	---	---	13.0	0.2
<$20,000	24.7 %	27.5 %	24.4 %	23.1 %	22.3 %	---	---
$20,000-$60,000	36.2%	38.3 %	37.1 %	34.9 %	31.3 %	---	---
$60,000-$100,000	20.5 %	17.9 %	22.0 %	19.9 %	22.9 %	---	---
>$100,000	18.6 %	16.3 %	16.5 %	22.1 %	23.5 %	---	---
			Tobacco use characteristics				
Daily smoker, % yes	55.0%	53.6%	50.5%	54.7%	72.1%	25.8	**<0.001**
Cigarettes per day, Mdn (IR)	5.4 (1.2, 11.3)	4.7 (0.6, 11.0)	4.3 (1.0, 10.0)	6.3 (2.0, 12.1)	9.1 (4.4, 13.9)	47.4	**<0.001**
First cigarette within 30 min of waking, % yes	33.5 %	34.2 %	31.7 %	31.9 %	40.2 %	4.8	0.2
Years smoking cigarettes, M±SD	4.0 ± 3.0	4.1 ± 3.3	3.8 ± 2.9	3.8 ± 2.9	4.5 ± 3.0	3.0	**0.03**
Social smoker, % yes	73.2%	64.2 %	77.3 %	74.9 %	77.1 %	22.2	**<0.001**
Past year 24-hr cigarette quit attempt, % yes	63.3%	59.6 %	64.2 %	68.7 %	59.2 %	7.6	**0.05**
Stage of change, %	---	---	---	---	---	4.2	0.7
Pre-contemplation	47.1%	50.0%	45.8%	44.0%	50.3%	---	---
Contemplation	30.0%	27.7%	31.1%	32.6%	26.8%	---	---
Preparation	22.9%	22.3%	23.1%	23.5%	22.9%	---	---
Tobacco abstinence goal, % yes	10.1%	13.0%	9.8%	7.8%	8.9%	5.6	0.1
Temptations to smoke, M±SD	---	---	---	---	---	---	---
Positive affect/ social situations	11.4 ± 2.7	11.1 ± 2.9	11.2 ± 2.5	11.6 ± 2.5	12.0 ± 2.8	6.1	**<0.001**
Negative affect situations	11.4 ± 3.5	11.3 ± 3.7	11.2 ± 3.5	11.4 ± 3.4	11.8 ± 3.1	1.1	0.4
Habitual/craving situations	8.7 ± 3.5	8.7 ± 3.5	8.4 ± 3.5	8.7 ± 3.4	9.2 ± 3.6	2.3	0.08

Variable	Total (N=1405)	Non-binge (N=386)	Occasional (N=533)	Intermediate (N=307)	Frequent (N=179)	$\chi^2/F/K\text{-}W$	*p*
			----------*Binge drinking groups* ----------				
			Alcohol use characteristics				
Days binge drinking, past month, M±SD	---	---	1.8 ± 0.8	5.6 ± 1.4	14.0 ± 5.9	---	---
Alcoholic drinks in the past month, M±SD	39.2 ± 50.9	8.0 ± 12.4	19.8 ± 12.8	54.1 ± 21.2	138.3 ± 73.1	908.7	**<0.001**
Days drinking any alcohol (past month), M±SD	7.6 ± 7.5	4.2 ± 5.8	5.0 ± 5.1	9.9 ± 5.8	18.9 ± 7.4	326.7	**<0.001**
Drinks per drinking day, M±SD	4.9 ± 3.4	1.9 ± 0.8	5.5 ± 3.5	6.3 ± 2.7	7.6 ± 3.2	240.6	**<0.001**
Drinks on heaviest drinking day, M±SD	7.7 ± 5.2	2.3 ± 1.0	8.0 ± 3.8	10.7 ± 4.3	13.2 ± 4.9	509.1	**<0.001**
Age first tried alcohol, M±SD	14.7 ± 2.9	15.0 ± 3.2	15.0 ± 2.7	14.4 ± 2.8	14.1 ± 2.6	5.7	**0.001**

M= mean; mdn= median; SD= standard deviation, IR= interquartile rage; K-W= Kruskal-Wallis test.

Table 2

Multivariate associations (binge drinking frequency groups vs. non-binge drinkers)

	Occasional vs. Non-binge drinkers (ref)			Intermediate vs. Non-binge drinkers (ref)			Frequent vs. Non-binge drinkers (ref)		
Variable	**AOR**	**95% CI**	**P**	**AOR**	**95% CI**	**P**	**AOR**	**95% CI**	**P**
Over 21 years old	0.9	(0.6, 1.2)	0.3	0.8	(0.6, 1.2)	0.3	1.3	(0.8, 1.9)	0.3
Male	0.9	(0.7, 1.2)	0.5	0.9	(0.7, 1.3)	0.6	1.6	(1.0, 2.4)	**0.04**
Caucasian	1.0	(0.7, 1.3)	0.8	1.2	(0.8, 1.6)	0.4	1.0	(0.7, 1.5)	1.0
Household income (ref: >$100,000)	--	--	--	--	--	--	--	--	--
<$20,000	0.9	(0.6, 1.4)	0.7	0.7	(0.4, 1.1)	0.1	0.5	(0.3, 0.9)	**0.03**
$20,000-$60,000	1.0	(0.7, 1.5)	1.0	0.7	(0.5, 1.1)	0.1	0.5	(0.3, 0.8)	**0.008**
$60,000-$ 100,000	1.2	(0.8, 1.9)	0.4	0.8	(0.5, 1.3)	0.4	0.7	(0.4, 1.3)	0.3
Daily smoker	0.9	(0.7, 1.3)	0.7	0.8	(0.5, 1.2)	0.3	1.6	(1.0, 2.7)	**0.06**
Cigarettes/ day	1.0	(1.0, 1.1)	0.4	1.1	(1.0, 1.1)	**<0.001**	1.1	(1.0, 1.1)	**0.002**
First cigarette within 30 min of waking	1.0	(0.7, 1.5)	0.8	0.8	(0.6, 1.3)	0.4	0.9	(0.6, 1.4)	0.6
Years smoking cigarettes	1.0	(1.0, 1.0)	1.0	1.0	(0.9, 1.1)	0.6	1.0	(1.0, 1.1)	0.6
Social smoker	1.8	(1.3, 2.5)	**<0.001**	1.6	(1.2, 2.3)	**0.006**	2.3	(1.5, 3.5)	**<0.001**
Made past year 24-hr quit attempt	1.2	(0.9, 1.6)	0.2	1.5	(1.1, 2.1)	**0.01**	1.1	(0.7, 1.6)	0.8
Has a tobacco abstinence goal	0.7	(0.5, 1.1)	0.2	0.6	(0.3, 1.0)	**0.04**	0.7	(0.4, 1.4)	0.3
Temptations to smoke	--	--	--	--	--	--	--	--	--
Positive Affect/ Social Situations	1.0	(1.0, 1.1)	0.4	1.1	(1.0, 1.2)	0.07	1.1	(1.0, 1.2)	**0.01**
Negative Affect Situations	1.0	(1.0, 1.1)	0.9	1.0	(0.9, 1.1)	1.0	1.0	(1.0, 1.1)	0.7
Habitual/Craving Situations	1.0	(0.9, 1.0)	0.3	1.0	(0.9, 1.0)	0.2	0.9	(0.9, 1.0)	0.07

Multinomial logistic regression model with non-binge drinkers as the reference group. AOR= adjusted odds ratio, CI= confidence interval.