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Alcohol-induced blackouts as predictors of other drinking related harms among emerging young adults

Ralph Hingson, Sc.D., M.P.H.¹, Wenxing Zha, Ph.D.¹, Bruce Simons-Morton, Ed.D., M.P.H.², and Aaron White, Ph.D.³

¹Division of Epidemiology and Prevention Research, National Institute on Alcohol Abuse and Alcoholism

² Division of Intramural Population Health Research, *Eunice Kennedy Shriver* National Institute of Child Health & Human Development

³ Office of the Director, National Institute on Alcohol Abuse and Alcoholism

Abstract

Background—Alcohol-related blackouts are periods of amnesia that reflect the failure of the brain to record memories of what transpires while drinking. This paper examined the incidence, predictors, and behavioral correlates of blackouts among emerging adults and examined whether questions about blackouts could serve as better markers of risk for other alcohol related harms than questions about levels of consumption.

Methods—In 2012-2013, 1,463 (68%) of 2,140 respondents one-year past high school reported having consumed alcohol. They were asked whether, in the past six months because of drinking, they forgot where they were or what they did. The survey also explored demographics, substance use behaviors, and other alcohol-related problems in the past six months. Chi square and logistic regression analyses explored bivariate and multivariate predictors of blackouts and other alcohol-related problems.

Results—Twenty percent of respondents who ever drank alcohol reported a blackout in the past six months. Blackouts were more prevalent among females and those who, in the past 30 days, used multiple drugs, more frequently binged, were drunk, smoked, had lower body weight, and lived in college dorms. After controlling for drinking levels, having a blackout was the strongest independent predictor of most other alcohol problems examined, including in the past six months because of drinking, missing class or work, getting behind in work or school, doing something respondents later regretted, arguing with friends, experiencing an overdose, and total number of alcohol problems reported. It was also an independent predictor of hangovers, damaging property, getting hurt, and trouble with police.

Conclusion—Because blackouts indicate drinking at levels that result in significant cognitive and behavioral impairment, questions about blackouts could serve as important, simple screeners for the risk of experiencing other alcohol related harms. Additional work on this subject is warranted.

Address Correspondence: Ralph Hingson, Sc.D., M.P.H., National Institute on Alcohol Abuse and Alcoholism, 5635 Fishers Lane, Room 2074, Bethesda, MD 20892, Tel: 301-443-1274, rhingson@mail.nih.gov.

Introduction

Alcohol-induced memory blackouts represent periods of amnesia during which a person actively engages in behaviors (e.g., walking, talking) but the brain is unable to create memories for the events (Goodwin, 1995). Partial, or *fragmentary*, blackouts are characterized by spotty memories for events, while complete, or *en bloc*, blackouts involve an inability to recall large portions of an evening. Blackouts tend to occur following rapid increases in blood alcohol concentrations (BAC) (Ryback, 1970) and research suggests the odds of experiencing a partial or complete blackout are 50/50 at a blood alcohol concentration (BAC) of 0.22% (Perry et al., 2006).

Adolescents and emerging young adults often engage in a pattern of high intensity, or binge, drinking in which high peak BACs are reached quickly. According to the Monitoring the Future national surveys of high school seniors, between 2005 and 2011, 10.5% of high school seniors consumed 10 to 14 drinks on an occasion and 5.6% consumed 15 or more on an occasion in the past two weeks (Patrick et al., 2013). For most adolescents and young adults, 10+ drinks in a four hour period is sufficient to produce BACs associated with blackouts. The risk of a blackout is further increased by chugging drinks, such as during pre-gaming or when playing drinking games, and drinking on an empty stomach, both of which lead to steeper increases in BAC (Giles et al., 2009; Labrie et al., 2011; Ray et al., 2014).

Blackouts appear to be a common consequence of alcohol use among younger drinkers. For instance, while vomiting is a commonly endorsed consequence of excessive consumption among college freshmen, blackouts occur more frequently (Barnett et al., 2014). A 2012 survey of more than 28,000 college students by the American College Health Association suggests that roughly 30% of college students (32% male, 28% female) experience a blackout each year. Marino and Fromme (2015) reported that 66% of 1164 college students in a longitudinal study experienced an alcohol-related blackout during a three year period. In a study of roughly 800 college students, White and colleagues (2002) reported that 9% of those who drank in the two weeks prior to the survey experienced a blackout during that time period. Similarly, among 4,539 inbound college students during the summer between high-school graduation and the start of the freshmen year, 12% of males and females who drank in the previous two weeks experienced a blackout during that time (White and Swartzwelder, 2009).

While blackouts are more likely to occur at higher BACs, research suggests there are several important factors, beyond level of alcohol consumption alone, that predict blackouts. Blackouts are more likely to occur when subjects drink in ways that cause the BAC to rise quickly, such as during pre-gaming or pre-partying (Labrie et al, 2011; Raye et al., 2014). At moderate BAC levels (~ 0.08%), young adults who report experiencing blackouts exhibit larger memory impairments (Weatherill and Fromme, 2011) and greater changes in memory-related brain function (Weatherill et al, 2012) than those without histories of blackouts, suggesting inherent differences in memory circuits that predispose some drinkers to memory impairments or reflect damage to the memory circuits following repeated heavy drinking. Several studies suggest that females are at greater risk than males for blackouts. Despite the fact that young females drink less heavily and less often than males, similar percentages of

male and female drinkers report experiencing blackouts (e.g., White et al., 2002; Mundt and Zakletskaia, 2012; Mundt et al., 2012; Barnett et al., 2014). There also appears to be a genetic component to vulnerability to blackouts. Among monozygotic twins, if one experiences blackouts the other is more likely to experience them, as well (Nelson et al., 2004). Marino and Fromme (2015) observed that, overall, women were more likely to report blackouts than men but that men with a maternal family history of alcoholism were more than twice as likely to report blackouts as women with a maternal family history of alcoholism. Exposure to alcohol in the womb also appears to increase the risk of blackouts. Baer and colleagues (2003) examined the drinking habits of pregnant women in 1974 and 1975, and then studied alcohol use and related problems in their offspring over a 21-year period. Prenatal alcohol exposure was associated with increased rates of experiencing alcohol-related consequences, including blackouts, even after controlling for drinking habits of the offspring.

As detailed above, the occurrence of a blackout is only partially explained by drinking levels per se. Regardless of the number of drinks required to produce a blackout for a particular individual, the presence of a blackout indicates the drinker reached a level of intoxication consistent with significant impairments in a variety of brain regions beyond the temporal lobe memory areas, including frontal lobe regions involved in attention, impulse control and decision making (Weatherill et al., 2012; Bjork and Gilman, 2014; Magrys and Olmstead, 2014). Thus, it is possible that blackouts might be a better predictor of other alcohol-related outcomes, such as injuries, than traditional quantity/frequency measures of consumption. Mundt and colleagues (2012) reported that a history of blackouts at baseline predicted alcohol-related injuries over the next two years even after controlling for baseline levels of drinking. In a direct comparison, the effect size for predicting alcohol-related injuries over the two-year period was larger for baseline frequency of blackouts than for measures of heavy drinking. Such findings suggest that a single question about blackouts could serve as an important screener for level of risk for other alcohol related harms.

Most studies of blackouts in the last few decades have focused on college students. Alcohol use tends to increase after graduation from high school and peaks during emerging young adulthood (White et al., 2006). While young adults attending college drink more heavily and more often than their non-college peers, such gaps have narrowed considerably over the years. It is important to understand how the transition into college versus other career paths influences both drinking levels and the occurrence of blackouts. The first year past high school is a period of particular vulnerability to alcohol and its consequences, as many young people leave home and enter college or the workplace and often identify with new peers and new perceived pressures to drink (Simons-Morton et al., in press).

The present study utilized data from a longitudinal study of emerging young adults, currently one year past high school, to assess the association between blackouts and a variety of alcohol-related harms after controlling for measures of consumption. Further, the study design allows for an examination of the trajectories of alcohol use, alcohol-related blackouts and other negative outcomes as students transition into college or non-college career paths. The findings will yield useful insight into the predictors of blackouts and

potential utility of questions about blackouts as screeners for risk of other alcohol related harms.

Methods

This study used wave 4 data from the NEXT Generation Health Study, an ongoing 7-year longitudinal study using a 3-stage stratified design to select a sample representative of 10th graders enrolled in public, private, and parochial US high schools in 2009-10 school year. School districts and groups of districts stratified across 9 US Census divisions were randomly sampled. Within each district, individual schools were randomly sampled, and within each school, one 10th-grade class was randomly sampled. To provide adequate population estimates, African American students were oversampled. Among those provided with information about the study, only students with signed parental consent and student (18 years or older) assent forms were enrolled. Participation was voluntary, and responses were confidential. Of recruited schools, 81 (58%) participated (Conway et al., 2013). Researcher-administered, in-school surveys were completed by 2524 (96.4%) of the 2619 qualified recruited students. The sample was followed annually using web-based surveys and, in wave 4, a total of 2,140 participants (84% of those interviewed in wave 1) were re-interviewed in 2012-13 school year, one year after high school. The study protocol was reviewed and approved by the Institutional Review Board of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

Measures

The survey included measures of alcohol consumption, blackouts, other alcohol-related consequences, drinking patterns, drug use, smoking, and drinking and driving behavior. All respondents were asked, “[a]t present, how often do you drink anything alcoholic, such as beer, wine, or hard liquor like vodka or rum?” Response categories were every day, every week, every month, rarely, and never. Drinkers were those who reported ever drinking alcohol (N=1,463). Binge drinking was defined as having consumed 4+ (females) or 5+ (males) drinks on an occasion at least once in the previous 30 days. The survey administered in wave 4, but not in previous waves, asked drinkers about the frequency in the past six months of experiencing blackouts. Blackouts were defined as “forgetting where you were or what you did while drinking.” Drinkers also were asked about the frequency, during the preceding six months, of the following alcohol-related consequences: have a hangover, miss work or a class, get behind in school or at work, do something you later regretted, argue with friends, damage property, get into trouble with campus or local police, get hurt or injured, require medical treatment for an alcohol overdose.

Questions about blackouts and other alcohol related problems were drawn from the Harvard School of Public Health College Alcohol Survey Questionnaire (Wechsler et al., 2002). Response categories for blackouts and other alcohol problem questions were: Not at all, Once, Twice, 3 times, 4+ times.

Respondents were also asked about the ages they first drank alcohol, binged, were drunk, and whether in the past 30 days they used marijuana and each of ten other drugs, using the same drug categories asked by the Monitoring the Future Surveys (Johnston et al., 2013).

A comparison of drinkers and non-drinkers in the sample revealed no significant differences in age, sex, race/ethnicity, sexual orientation, or body weight. Not surprisingly, drinkers were significantly more likely than non-drinkers to live away from home and to smoke or use marijuana and other drugs.

Analyses

Statistical analyses were performed using SUDDAN (Research Triangle Institute) to take into account complex survey design to ensure accurate estimation and allow testing for significance of demographic and behavioral associations with measures of blackouts. Chi square analyses assessed what demographic and substance use measures were significantly associated with having experienced a blackout in the past six months. The following variables were then entered into logistic regression to determine which demographic and substance use measures were independently and significantly associated with experiencing blackouts in the last 6 months: sex (male/female), college (4 years, 2 years, or not in college), sexual orientation (attracted to opposite sex, same sex, or both sexes), place of residence (home, dorm, or other), age started to drink (13, 14-15, 16-17, 18-21, or never drank), frequency of bingeing in past 30 days in waves 1, 2, 3, and 4 (never, 1-5, or 6 or more times), frequency of being drunk in the past 30 days in waves 1, 2, 3, and 4 (never, 1-5, or 6 or more times), frequency of smoking in the past 30 days in waves 1, 2, 3, and 4 (never, 1-5, or 6 or more times), frequency of using marijuana in the past 30 days in wave 4 (never, 1-5, or 6 or more times), number of drugs used in the past 30 days in wave 4 (0, 1, or 2 or more), body weight in wave 4 (100, 101-130, 131--160, 161-190, 191-220, or 221 or more pounds)

The same variables were then entered into logistic regressions that examined whether experiencing blackouts in the past six months were independently associated with having experienced each of the other alcohol-related problems and the total number of other alcohol problems experienced by each respondent. In this analysis, we examined whether or not they had experienced a blackout in the last six months as a dichotomous variable. Odds ratios and 95% confidence intervals were calculated to assess significant predictors of each alcohol-related problem and the total number of alcohol-related problems respondents experienced.

Results

Sixty-eight percent of respondents reported consuming alcohol at some point in their lives and 53% of respondents drank alcoholic beverages in the previous 30 days during wave 4. Fourteen percent of all respondents and 20% of past-month drinkers reported experiencing at least one blackout in the previous 6 months. Forty-one percent of the entire sample binged at least once in the past month (45% of males and 37% of females). Of those who drank alcohol in the previous month, 75% binged during that time period. Table 1 provides the

percentages of respondents who experienced other problems in the past six months because of their drinking.

In unadjusted analyses of drinkers shown in Table 2, four-year college students, Caucasians, persons living in college dormitories, and people who smoked, binged, were drunk, and used marijuana and other drugs in the past 30 days were all significantly more likely to have experienced a blackout in the past 6 months. Earlier ages of first drinking, binging, being drunk, and lower body weight were also associated with experiencing blackouts in the past six months. Before adjusting for co-variables, there was no overall difference in the percentage of males (22%) and females (17%) who reported blackouts.

Table 3 reports alcohol problems respondents experienced in the past 6-months according to the frequency with which they experienced a blackout during that time period. Logistic regression analyses, adjusted for the other variables in the table, revealed that having used multiple drugs, having been drunk 6 or more times in the past month, frequent smoking, low body weight, and being female were the strongest independent predictors of blackouts in the past 6 months followed by binging 6 or more times in the past month and residing in a college dormitory (See Table 4). Of note, entering body weight into the regression as a predictor of blackouts partially but not completely accounted for the increased risk of blackouts among women relative to men.

Blackouts in the past six months was the strongest independent predictor of the following outcomes in Table 5 because of drinking in the past six months: missing class or work, getting behind in work or school, doing something they later regretted, arguing with friends, seeing a doctor because of an overdose.

Logistic regression analyses also indicated that having a blackout in the past six months was a significant independent predictor of experiencing every other alcohol problem in the past six months asked about in the survey, including having a hangover, missing work or class, falling behind in work or school, doing something after drinking that the respondent later regretted, arguing with friend after drinking, damaging property, getting in trouble with the police, getting hurt after drinking and seeing a doctor because of an overdose after drinking.

Other independent predictors of alcohol-related problems were frequency of binge drinking, frequency of being drunk, use of multiple drugs, and being a college student. . Specifically, other significant independent predictors of missing class or work were frequency of binging in the past 30 days (wave 4) 6 or more times [4.2 (1.3, 13.8)] and use of two or more drugs [4.4(1.9, 10.4)]. Other significant independent predictors of getting behind in school were age first drunk being 13 [17.5(3.0, 102)], used 2 or more drugs [6.9(2.1, 22.0)], 4-year college student [4.0(1.6, 10.2)], and 2-year college student [4.0(1.2, 13.1)]. Other predictors of doing something respondents later regretted were wave 3 frequency of binging, age first drunk being 16-17 [2.8(1.1, 6.9)] and 18-21 [2.6(1.1, 6.3)]. Other significant independent predictors of arguing with friends after drinking in the last 6 months were frequency of being drunk in the past 30 days being 6 or more times (wave 4) [6.2(3.2, 11.8)] and 1-5 times [2.4(1.1, 5.2)], 4-year college student [0.4(0.2, 0.7)], and 2-year college student

[0.6(0.3, 0.9)]. The only other predictor of alcohol overdose in the past six months was number of other drugs used [2 or more drugs: 22.4 (4.1, 122.8) and 1 drug: 8.2 (1.4, 26.2)].

For the alcohol-related problems where experiencing a blackout was not the strongest independent predictor, blackouts were still a strong independent predictor. The strongest predictors of hangover were bingeing 6 or more times in the past month [12.38 (6.40-23.96)], followed by blackouts in the past six months [7.43 (4.55-12.14)]. The strongest predictor of damaging property was using three or more [40.89 (11.01-151.83)] or two drugs [11.59 (2.17-62.00)], followed by blackouts in the past six months [11.15 (5.03-24.74)].

The strongest predictor of getting into trouble with police was use of three or more drugs [11.42 (2.32-56.27)], followed by blackouts in the past six months [8.36 (3.69-18.98)]. Using three or more drugs was also the strongest predictor of getting hurt or injured [11.89 (3.86-36.63)], followed by blackouts in the past six months [4.13 (1.57-10.86)].

Table 6 provides independent predictors of the total number of various alcohol-related problems respondents experienced in the last six months. Blackouts because of drinking was the strongest independent predictor of the total number of alcohol-related problems in the past six months.

Discussion

This national survey of respondents one year past high school found 14% of all respondents and 20% of those who ever drank alcohol experienced a blackout because of drinking in the previous 6 months. In logistic regression analyses, frequency of binge drinking and drunkenness, being female, smoking, and use of multiple drugs predicted blackouts. Persons with lower body weights, females and those living in a college dorm were significantly more likely to experience blackouts. Prevalence of blackouts and other alcohol-related problems were higher among those attending 4-year colleges and residing in dormitories relative to non-students and those in two-year colleges. Earlier age of first drinking, bingeing, and drunkenness predicted experiencing blackouts in bivariate but not logistic regression analyses, probably because those variables are associated with frequency of binge drinking and drunkenness, which in turn were independently related to experiencing blackouts. Blackouts were an independent predictor of every other alcohol-related problem explored in this survey and was the strongest predictor of the largest number of other problems.

The present study advances our understanding of the nature of blackouts by suggesting that blackouts are an independent predictor of a wide range of alcohol-related consequences, including hangovers, missing work or class, falling behind in work or school, doing something after drinking that the respondent later regretted, arguing with friend after drinking, damaging property, getting in trouble with the police, getting hurt after drinking and requiring medical treatment because of an overdose after drinking. Such findings are in line with those of previous reports. Mundt and colleagues (2012) examined past-year blackouts in a sample of more than 900 college students and found that, after controlling for drinking levels, blackouts predicted alcohol-related injuries over a subsequent 2-year period. Compared with students who had no history of blackouts, those who reported one to two

blackouts at baseline were 1.5 times more likely to experience an alcohol-related injury, whereas those with six or more blackouts were 2.5 times more likely. Indeed, 50% of subjects who reported six or more blackouts at baseline sustained an alcohol-related injury requiring medical attention during the subsequent two years. In a follow-up report based on the same sample, Mundt and Zakletskaia (2012) estimated that among study participants, one in eight emergency-department (ED) visits for alcohol-related injuries involved a blackout. On a campus of 40,000 students, this would translate into roughly \$500,000 in annual costs related to blackout-associated ED visits.

Mundt et al, based on their finding that blackouts independently predict future alcohol related harms, assert that blackout screening questions could be useful for identifying young adults who drink at risky levels and are therefore at risk for other consequences. Findings from the present study support this assertion. Subjects who reported blackouts were more likely than those who did not to report all other alcohol related problems. While the risk of alcohol-related harms clearly increases with increasing levels of consumption, the threshold for consequences, such as blackouts, varies from person to person. In contrast, the occurrence of a blackout indicates that a given individual has, for certain, consumed sufficient alcohol to produce a level of neurocognitive dysfunction that could contribute to a wide range of negative outcomes.

At present, questions about blackouts are not included in most national surveys of alcohol and other drug use. A question about blackouts is included in the full version of the AUDIT. However, responses to the question are weighted the same as responses to other questions about consequences of drinking. It is possible that a positive response to a question about blackouts is sufficient to predict other alcohol related harms. Additional research on the utility of blackout questions as screeners for alcohol use disorders and other alcohol related harms is certainly warranted.

Current evidence that existing screening instruments used in primary care and other settings are useful for identifying young people at risk for harm is mixed. The U.S. Preventive Services Task Force (2004) has identified strong evidence of the effectiveness of alcohol screening in primary care for adults but insufficient evidence for adolescents. However, recent meta-analyses found evidence for effectiveness among adolescents and college students (Tanner-Smith et al., 2015; Scott-Sheldon et al., 2014). Unfortunately, according to national surveys, most adolescents and young adults are not both asked about drinking and counseled about alcohol-related harms. In one survey of 18-39 year olds, most young adults who saw a physician in the past year were not both asked about drinking and given advice about what levels of alcohol use pose health risk (Hingson et al., 2012). Those aged 18-24 were least likely to be asked about drinking, even though a higher percent in that age group exceed low-risk limits and meet alcohol dependence criteria (U.S. Department of Health and Human Services, 2006).

The risks posed by consumption of such large amounts of alcohol that one experiences memory lapses can be compounded by use of other drugs. In the present study, respondents who used marijuana and other drugs in the past 30-days were significantly more likely to have experienced a blackout in the past 6 months. It is unclear if those substances were used

in conjunction with alcohol or during separate events. However, research by Hartzler and Fromme (2003) suggests that en bloc blackouts, memory lapses for entire portions of a drinking occasion, tend to occur following combined use of alcohol and other substances. Much more research is needed in this area.

A limitation of this analysis is that it relied on self-report where social desirability bias and especially memory might lead to underreporting and potential underestimation or even overestimation of risks associated with blackouts. Under reporting of other alcohol-related problems may also be possible. One limitation of the present study is that the time frames for assessing drinking (lifetime), frequency of bingeing and intoxication (30 days) and blackouts (6 months) are different. It is possible that a subject might report a blackout in the past 6-months yet no alcohol use in the previous 30-days. Future studies would benefit from assessing drinking and blackouts within a similar time frame. Future research also should assess blackouts in settings where actual blood alcohol levels can be determined (e.g., emergency departments, trauma centers, police encounters, etc., and where objective other alcohol problem data, e.g. injury severity, harm to drinkers, and others can be ascertained). Another limitation is that this study did not explore blackouts and other problems in earlier waves when respondents were younger. Consequently, it may not generalize to other developmental stages than emerging adulthood. These questions will be repeated in waves 5 through 7, when respondents will be of the legal drinking age. It is notable that so many experienced blackouts in wave 4 were when they had not yet reached the legal drinking age. Previous studies suggest that family history of alcoholism is a strong predictor of alcohol-related blackouts in emerging adults (White et al., 2002; Marino and Fromme, 2015). The role of this variable in the prevalence of blackouts was not examined in current study. It is possible that inclusion of family history in the analyses might have altered the outcomes.

While data were collected regarding the frequency of blackouts, there was insufficient power to examine the predictors of higher frequencies of blackouts or the value of examining frequency of blackouts as predictors of other alcohol related harms. It is clear from the existing literature that frequency of blackouts is more valuable than a simple yes/no question about blackouts when examining risk of other alcohol-related consequences. Mundt and colleagues (2012) reported that the risk of sustaining an alcohol-related injury over a two year period increased significantly with the number of blackouts reported at baseline. White et al (2002) observed that, as the number of blackouts reported by subjects increased, grade point average and age of first drink decreased and the likelihood of a family history of alcoholism and having others voice concern about one's drinking increased. As such, it is important for future studies assessing the utility of using questions about blackouts in screening instruments to examine the relationship between frequency of blackouts and other alcohol related harms.

Finally, none of the other alcohol problem questions in this survey explored harms to others posed by persons experiencing blackouts. It is quite possible that experiencing blackouts may be related to traffic crashes, violence, and sexual assault. This needs to be explored along with the effects of potential educational, clinical, and legal interventions to reduce such associations.

Conclusion

The findings suggest that an affirmative answer to a single question about blackouts predicts, above and beyond other alcohol consumption measures, the likelihood that subjects will report a wide range of alcohol-related harms. Such outcomes could have important implications for screening and prevention efforts. In addition to asking adolescents and young adults to recall exactly how many drinks they consumed over a particular period of time or with a particular frequency, it might be possible to also ask a simple and direct question about experiencing alcohol-related amnesia. An affirmative response would warrant additional questions about harms and perhaps brief counseling.

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Table 1

Problems Experienced in the Past 6 Months Because of Drinking: NEXT Generation Health Study, Wave 4

	Of Drinkers (N=1,463)	Of Total Sample (N=2,140)
Hangover	37%	27%
Miss work/class	12	9
Got behind school/work	11	8
Did something you later regret	22	15
Argued with friends	18	13
Damaged property	6	4
Got into trouble with police	4	3
Got hurt	9	6
Required medical treatment for an overdose	1	<1

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Table 2

Characteristics of Drinkers Who Had Blackouts: NEXT Generation Health Study, Wave 4 (N=1,463, Drinkers)

Characteristics	Blacked Out		
	Number	Percentage	P-value
Sex			
<i>Male</i>	114/618	17	NS
<i>Female</i>	160/845	22	
College			
<i>4-year</i>	155/659	29	0.02
<i>2-year</i>	48/340	13	
<i>No</i>	71/464	14	
Race			
<i>Hispanic</i>	57/413	11	NS
<i>Black</i>	58/346	16	
<i>White</i>	146/629	23	
<i>Other</i>	13/71	19	
Residence			
<i>Home</i>	145/990	14	0.00
<i>Dormitory</i>	116/374	37	
<i>Other</i>	13/99	18	
Sexual orientation			
<i>Attracted to opposite sex</i>	243/1321	20	NS
<i>Attracted to same sex</i>	11/47	26	
<i>Attracted to both sex</i>	13/75	18	
<i>Questioning</i>	6/16	15	
Past 30 days (wave 4)			
<i>Frequency of smoking cigarettes</i>			
<i>Never</i>	175/1086	16	0.01
<i>1-5 times</i>	59/185	44	
<i>6+ times</i>	40/191	16	
<i>Frequency of Binge drinking</i>			0.00
<i>Never</i>	58/757	6	
<i>1-5 times</i>	153/594	24	
<i>6+ times</i>	63/110	61	
<i>Frequency of being drunk</i>			0.00
<i>Never</i>	47/791	5	
<i>1-5 times</i>	147/525	29	
<i>6+ times</i>	80/146	51	
<i>Frequency of using Marijuana</i>			0.00
<i>Never</i>	128/1019	12	

Characteristics	Blacked Out		
	Number	Percentage	P-value
1-5 times	68/228	35	
6+ times	78/214	41	
Number of other drugs used past year			
0	204/1304	16	0.01
1	34/85	47	
2+	36/74	52	
Age first drank			0.01
13	59/260	30	
14-15	82/408	20	
16-17	95/490	20	
18-21	27/228	8	
Age first binge			0.00
13	15/51	28	
14-15	55/211	32	
16-17	108/439	23	
18-21	69/365	20	
Age first drunk			0.00
13	20/54	37	
14-15	52/216	29	
16-17	110/441	23	
18-21	75/387	17	
Body Weight			0.01
<100 pounds	23/112	16	
101-130 pounds	64/333	23	
131-160 pounds	98/511	26	
161-190 pounds	57/272	20	
191-220 pounds	16/112	8	
221 or more pounds	16/123	7	
Past 30 days (wave 1)			
<i>Frequency of Binge drinking</i>			
Never	156/949	18	NS
1-5 times	76/292	23	
6+ times	11/511	33	
<i>Frequency of being drunk</i>			
Never	174/1044	16	NS
1-5 times	49/201	27	
6+ times	22/59	45	
Past 30 days (wave 2)			

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Characteristics	Blacked Out		
	Number	Percentage	P-value
<i>Frequency of Binge drinking</i>			
Never	167/1009	16	0.02
1-5 times	76/306	29	
6+ times	17/38	39	
<i>Frequency of being drunk</i>			
Never	167/1030	15	NS
1-5 times	63/247	32	
6+ times	30/81	37	
Past 30 days (wave 3)			
<i>Frequency of Binge drinking</i>			
Never	142/981	14	0.02
1-5 times	86/313	28	
6+ times	27/60	53	
<i>Frequency of being drunk</i>			
Never	146/1020	14	0.03
1-5 times	78/262	28	
6+ times	32/78	48	

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Table 3

Experienced Other Alcohol Problems According to Frequency of Blackouts in Past 6 Months: NEXT Generation Health Study, Wave 4 (N=1,463, Drinkers)

Past 6 Months	Frequency of Blackouts in Past 6 Months [*]		
	None (N=1,189)	1-2 (N= 218)	3 or More (N=56)
Had a hangover	26%	78%	94%
Missed work/class	4	35	65
Got behind school/work	3	37	61
Did something they later regretted	11	58	76
Argued with friends	10	49	60
Damaged property	2	14	48
Trouble with police	1	11	28
Injured	4	16	55
Alcohol overdose	<1	6	8
Number of Other Alcohol Problems Experienced			
0	64	6	1
1	24	16	12
2	5	30	4
3	5	18	18
4+	2	34	67

* All relations $p < 0.01$

Table 4

Independent* Predictors of a Blackout in the Past 6 Months: NEXT Generation Health Study, Wave 4
(N=1,463, Drinkers)

	Adjusted Odds Ratios	95% Confidence Intervals
<i>Wave 4 number of Drugs Used</i>		
2+	7.2	(1.8, 28.7)
1	2.3	(1.0, 5.9)
0	1.0	(1.0-1.0)
<i>Wave 4 frequency of being drunk in the past 30 days</i>		
6+ times	7.2	(3.2-16.5)
1-5 times	4.5	(2.3, 8.8)
Never	1.0	(1.0-1.0)
<i>Wave 4 frequency of bingeing in the past 30 days</i>		
6+ times	3.5	(1.6, 7.4)
1-5 times	1.5	(0.9, 2.5)
Never	1.0	(1.0, 1.0)
<i>Smoked in the past 30 days</i>		
6+ times	0.6	(0.2, 2.1)
1-5 times	2.7	(1.3, 5.7)
Never	1.0	(1.0, 1.0)
<i>Body Weight</i>		
<=100 pounds	4.5	(0.9, 21.3)
101-130 pounds	3.7	(1.1, 12.9)
131-160 pounds	4.1	(1.0, 16.0)
161-190 pounds	3.1	(0.9, 10.9)
191-220 pounds	1.0	(0.3, 3.3)
221+ pounds	1.0	(1.0, 1.0)
<i>Living situation</i>		
In dorm	2.2	(1.4, 3.8)
other	0.7	(0.2, 7.4)
At home	1.0	(1.0, 1.0)
<i>Sex</i>		
Female	1.6	(1.1, 2.5)
Male	1.0	(1.0, 1.0)

*Logistic regressions adjusted for other variables in Table 2

Table 5

Other Alcohol-Related Problems Whose Strongest Independent* Predictor was Having a Blackout in the Past 6 Months: NEXT Generation Health Study, Wave 4 (N=1,463, Drinkers)

Past 6 months	Adjusted Odds Ratios	95% Confidence Intervals	Unadjusted Odds Ratios	95% Confidence Intervals
Having an hangover	7.9	(4.9, 12.5)	13.6	(8.9, 20.6)
Missing class or work	11.5	(4.9, 26.6)	18.1	(8.2, 40.3)
Getting behind in work or school	17.0	(7.5, 38.7)	25.1	(10.7, 59.1)
Doing something respondents later regretted	10.3	(6.0, 17.9)	14.1	(8.1, 24.4)
Arguing with friends	8.1	(4.4, 14.9)	10.6	(5.1, 22.3)
Seeing a doctor because of an overdose after drinking	143.5	(15.9, 1293.3) [†]	274.3	(28.8, 2610.0) [†]
The total number of alcohol-related problems reported	13.1	(7.2, 23.9)	25.5	(13.7, 47.5)

Note: See Table 6 for other adjusted odds for other significant predictors of the total number of alcohol-related problems reported.

* Logistic regressions adjusted for other variables in Table 2

[†] Low reliability due to small number of overdoses

Table 6

Independent* Predictors: Experiencing 1, 2, 3, 4, or More Alcohol-Related Problems in the Last 6 Months:
NEXT Generation Health Study, Wave 4 (N=1,463, Drinkers)

Past 6 months	Adjusted Odds Ratios	95% Confidence Intervals
<i>Experienced a blackout</i>	13.1	(7.2, 23.9)
<i>Wave 4 frequency of being drunk</i>		
6+ times	6.9	(2.8, 17.3)
1-5 times	2.4	(1.6, 3.5)
0 times	1.0	(1.0-1.0)
<i>Sex</i>		
Female	1.5	(1.0-2.3)
Male	1.0	(1.0-1.0)
<i>Age first drunk</i>		
13	4.0	(1.3, 12.4)
14-15	2.7	(1.0, 7.8)
16-17	4.6	(2.3, 9.5)
18-21	4.3	(1.8, 10.2)
Never	1.0	(1.0-1.0)
<i>Wave 3 frequency of binge drinking</i>		
6+ times	3.6	(1.7, 7.7)
1-5 times	1.4	(1.0, 1.9)
0 times	1.0	(1.0-1.0)

* Logistic regressions adjusted for other variables in Table 2