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Blackouts among Male and Female Youth seeking Emergency Department Care

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Abstract

Background: Alcohol-related blackouts are a common consequence of heavy drinking, which pose risk for injury and other adverse health outcomes.

Objective: To examine the prevalence and correlates of blackouts among underage drinkers.

Methods: Youth (ages 14–20) presenting to a suburban Emergency Department (ED) completed screening surveys. Among those reporting past-year alcohol consumption, we examined past 3-month blackouts in relation to: background characteristics (e.g., demographics, fraternity/sorority involvement), substance use, sexual risk behaviors and incapacitated sexual assault (unaware/unable to consent due to alcohol/drugs), forced sexual assault, positive depression screening, and reason for ED visit (injury vs. medical).

Results: In total, 2,300 past-year drinkers participated: 58% female, 75% Caucasian, and mean age = 18.4. Regarding past 3-month blackouts, 72.7% reported none, 19.3% reported monthly or less, and 8% reported monthly or more. Multivariate cumulative logit regression indicated that blackout frequency was positively associated with: college involvement in Greek life, alcohol use

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severity, prescription drug misuse, marijuana, screening positive for depression, incapacitated sexual assault, and a gender by alcohol use severity interaction.

Conclusion: With one-quarter of this clinical sample reporting recent blackouts, as well as the association between blackout frequency and health risk behaviors and other outcomes, findings underscore the need for programs focusing on substance use, depression, and preventing sexual assault. Interventions should also address poly-substance use and drinking motives. Although findings highlight how college students in Greek life may be at high risk for blackouts, many participants not in college also reported blackouts, suggesting that interventions in other settings are also needed.

Keywords

alcohol; alcohol-induced blackout; youth; substance use; sexual risk taking

Introduction

Alcohol-induced amnesia, more commonly referred to as a “blackout”, is a serious and relatively common consequence of heavy alcohol consumption. (1–4) Blackouts involve loss of memory for partial (i.e., fragmentary blackouts or “grayouts”) or entire (i.e., en bloc) events occurring during or subsequent to drinking. (5) From a neurobiological standpoint, these memory deficits are thought to be caused by alcohol’s acute impact on hippocampal function, although prefrontal and parietal brain regions have been implicated as well. (4) Variations in definitions of blackouts are found in the literature, including “forgot where you were or what you did,” (6) “periods of time that you could not remember,” (7) and “had difficulty remembering things you said or did or events that happened while you were drinking.” (8) A commonly used measure, the Young Adult Alcohol Consequences Questionnaire, (9) contains a “blackout” scale comprising seven different items, some of which directly ask about periods of memory loss (e.g., “I’ve not been able to remember large stretches of time while drinking”) or blackouts specifically (e.g., “I have had a blackout after drinking heavily”).

Although these differences in measurement likely impact estimates of the prevalence of blackouts, studies report that significant numbers of young people have experienced blackouts, with prevalence rates averaging around 50%. (4) For example, in one report of over 2,500 university students in New Zealand, 33% of drinkers reported having blackouts in the previous four weeks, (10) whereas the National College Health Assessment most recently reported that about 25% of student drinkers have had at least one blackout in the past 12 months. (11) In a longitudinal survey of college students initially recruited as incoming students, 69% of drinkers experienced blackouts from years 4 to 6 of the study. (12) Among alcohol-consuming incoming students surveyed in the summer prior to college, 11–12% reported blackouts within a two week period. (13) Among emerging adults initially recruited in the last year of high school and followed for the next year, approximately 14% reported a blackout in the past 6 months and, among past month drinkers, this rate was 20%. (14)

Our conceptual model of factors associated with blackouts during adolescence and emerging adulthood is rooted in social cognitive (e.g., health belief, social learning) and social ecological (15, 16) theories, emphasizing individual and social influences, (17–24) and is implicitly guided by resiliency framework. (25, 26) Across development, evolving interactions between individual and social risk and protective factors can decrease or accelerate alcohol use trajectories, (27–35) which increases the risk for blackouts. Consistent with this model, recent reviews suggest several domains of individual risk factors for blackouts, including environmental influences on consumption patterns, physiological factors (e.g., tolerance), psychological risks (e.g., childhood sexual abuse), heritability, genetics, and gender. (3, 4) For example, individual correlates of blackouts include female gender, low body weight, poly-drug use, more frequent intoxication, more frequent heavy episodic drinking, and smoking. (14)

Next, although parents are important in childhood, peers are more robust social influences on alcohol consumption during the transition to adulthood, (35–41) likely due to reciprocal processes in which peers normalize risk behaviors and increase exposure to deviant social contexts with distancing from protective influences. (38, 42–50) Given the elevated rates of heavy episodic drinking among adolescents and young adults, (51) youth are at risk for blackouts from ingesting high quantities of alcohol in relatively short periods of time. For example, prior research has found that increased consumption characteristic of group-based drinking games is associated with blackout-related consequences (52) and blackouts are more common among post-high school students who reside in college dorms. (14)

Thus, blackouts are likely part of a larger constellation of risk behaviors, and absence of protective behaviors, among youth, and thus could be associated with other drug use, aggression, sexual risk behaviors, and injury/victimization. (53–55) For example, data collected from college students show that: blackouts are associated with increased risk for alcohol-related injury, even when controlling for heavy episodic drinking; (56) alcohol dependence symptoms predict blackouts, which are associated with later social/emotional consequences of alcohol use (e.g., negative impact on reputation, regret; 8); and blackouts increase healthcare expenditures due to increased utilization of emergency departments. (57) The potential role of alcohol combined with other drug use during blackouts is particularly concerning, given the increased risk for overdose following co-ingestion of alcohol with opioids or sedatives. (58–62) Thus, in addition to clustering of risk behaviors, blackouts are also likely related to acute, event-level sequelae, including physiological effects (e.g., amount of alcohol consumed, body mass, tolerance; 5, 63) and social/situational influences (64), such as speed of consumption (e.g., drinking games), motives (e.g., coping, enhancement at parties), and peer behaviors (e.g., others active or passive encouragement of drinking), which result in physical and mental health consequences.

In particular, blackouts also raise concerns about both unintentional injury (56) and victimization. One study found that, among heavy episodic drinking college women with a history of sexual victimization as adolescents, blackouts at baseline were associated with increased odds of sexual victimization while incapacitated due to alcohol/drugs during a 30-day prospective period. (65) Finally, to gain more information about the risks that occur during blackouts, White and colleagues (66) interviewed 50 undergraduate students, all of

whom had experienced at least one blackout. These students often reported engaging in a range of risky behaviors during blackouts, including sexual activity with both acquaintances and strangers, vandalism, getting into arguments and fights.

Given that the recent literature on blackouts has largely focused on college student samples (4), there is a lack of information on prevalence and correlates among younger youth and those from other settings, particularly healthcare settings, where prevention interventions may be delivered. To this end, we use data from a non-school-based sample of alcohol-consuming youth aged 14–20 who were attending an Emergency Department (ED) for medical or injury-related reasons. The ED represents a setting where riskier, substance-using youth tend to present (67–69) and where brief alcohol interventions for youth can be delivered with promising results, (68–72) while also including youth who may not be reached in school-based research and interventions. Therefore, the aim of the present cross-sectional study is to examine the prevalence of blackouts among these youth, and describe the relationships between demographics, substance use, and other risky behaviors with blackout history.

Method

Design

Data presented in the current study were collected as part of the screening phase of a randomized control trial (RCT; [project name], [Clinicaltrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01051141) #NCT01051141) that took place in a suburban emergency department (ED) in [city, state] (See 71). [University name]'s Institutional Review Board approved the study and a Certificate of Confidentiality was obtained from the National Institutes of Health.

Participants and Recruitment

From 9/2010 – 3/2013, research assistants identified patients (age 14–20) in the ED via the electronic medical record system and approached them to participate in screening for the RCT. Participants were mostly recruited on afternoon and evening shifts (2:00pm-12:00am) because lower numbers of youth attend the ED during the day and overnight (these shifts were sampled in a limited manner). If a youth patient was too ill to be screened in the ED and admitted to the hospital, they were approached during their inpatient stay if they stabilized within 72 hours. Exclusion criteria for screening are detailed in previous articles, (71, 72) but briefly included: presenting with suicidal ideation, sexual assault, or child abuse; diminished mental status precluding consent; non-English speaking; and absence of a parent/guardian to provide consent (if under age 18). After providing written assent (ages 14–17) and consent (ages 18 and older; parents of 14–17-year-olds), participants self-administered screening surveys (approximately 20 minutes) on a touchscreen tablet computer and received a \$1.00 gift (e.g., cards, lotion).

Measures

Background Characteristics.—Items from prior research were used to assess the following demographic characteristics: age, gender, race (dichotomized into Caucasian vs. Other), receipt of public assistance, current school enrollment, typical grades in school (or

when in school; dichotomized as Mostly Cs and above vs. Cs and Ds and lower), current involvement in a Greek Fraternity or Sorority (i.e., Greek Life), and lifetime sexual activity. (11, 73–77) We combined the school and Fraternity/Sorority variables into one variable with response options of: not in college, in college and not involved in Greek Life, and in college and involved in Greek Life. Participants' chief complaint for ED presentation on the day of screening was abstracted from the medical record as: medical illness (e.g., abdominal pain, back pain) or injury. (78)

Alcohol Use.—The Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) is a three-item measure used to assess past 12-month: frequency of alcohol use, typical number of drinks consumed on a drinking day, and frequency of heavy episodic drinking (5+ drinks). (79). Eligibility for inclusion in the analytic sample was based on the first item, “In the past 12 months, how often did you have a drink containing alcohol?” Participants who responded they drank alcohol were included in the present analyses.

For those with past 12-month alcohol consumption, the full 10-item AUDIT (80, 81) was administered, adjusted to assess the past 3 months. We included responses on the item measuring blackouts from a 3-month version of the AUDIT for use as our dependent measure. This item asked, “During the past 3 months, how often have you had blackouts, i.e., been unable to remember what happened the night before, because you had been drinking?” Because of the overlap with the dependent measure, we used the 3-month AUDIT-C score and suggested hazardous drinking cut-points (3 for 14–17 year-olds, 4 for 18–20 year-olds) in analyses instead of the 10-item AUDIT. Age of first alcohol consumption was queried using an item modified from previous research. (82) Frequency of five drinking and driving related behaviors over the past 12-months were assessed with items modified from the Young Adult Driving Questionnaire. (83)

Drug use.—Past 12-month drug use, tobacco use, and nonprescription cough/cold medicine (e.g. DXM) misuse were assessed with dichotomous items from the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST; 84). Because it was the most commonly used substance other than alcohol, we present marijuana use (yes/no) separate from other illicit drugs, which were combined due to lower frequency of use (yes/no: cocaine, methamphetamines, inhalants, hallucinogens, and/or street opioids). Prescription drug misuse (yes/no) was based on combined responses to items assessing misuse of prescription stimulants, sedatives, or opioids. We also calculated ASSIST severity scores for marijuana (possible range=0–39) and prescription drug misuse (possible range = 0–117 summing across 3 subscales). Frequency of energy drink consumption in the past year was assessed using a modified item from the 2006 Athletic Involvement Study (responses range from 1=0 days to 7=40 or more days; 85).

Clinical risk factors.—Two types of sexual assault victimization were measured with questions from the Youth Risk Behavior Surveillance System. (86) Victimization when under the influence of substances was assessed with the item: “In the past 12 months, did someone ever have sexual intercourse with you when you were unaware, or unable to give consent from drinking alcohol or using drugs?” Forced sex was measured as a “yes” to the question: “In the past 12 months, have you ever been physically forced to have sexual

intercourse when you did not want to?” A single item also assessed frequency of sex after using substances in the past year (from 0 = None of the time to 4 =All of the time; 87). The 2-item Patient Health Questionnaire (PHQ-2) was used to screen for depression-related symptoms over the previous two weeks. Total scores greater than or equal to 3 are indicative of a possible major depression diagnosis. (88)

Data Analysis

Data analyses were conducted using SAS Version 9.2. (89) For the purposes of this study, only participants who reported any alcohol consumption on the AUDIT in the past 12 months were included in analyses and, due to the skewness in the frequency of blackouts, we divided participants into three groups for further analysis based on their responses (i.e., never, less than monthly, monthly or more) for use as our dependent measure. First, we calculated means, standard deviations, and proportions for variables of interest. Next, we used analysis of variance (ANOVA) and chi-square analyses to evaluate bivariate differences on demographic and clinical characteristics based on self-reported blackout frequency; post-hoc comparisons were conducted with Bonferroni corrections. Finally, we selected significant variables for inclusion in a cumulative logit model to examine relationships with blackouts at the multivariate level. For this model, the score test evaluating the proportional odds assumption was not significant, supporting the use of the cumulative logit model.

Results

Description of Sample and Blackout Frequency

A total of 4,389 patients completed screening in the ED (13.9% refused participation). Males were more likely to refuse than females (15.1% vs. 13.0%, respectively; $\chi^2(1)= 4.76$ $p<.05$) and individuals from other races were more likely to refuse than Caucasians and African-Americans (35.0% versus 9.6% and 7.7%, respectively; $\chi^2(2)= 393.20$, $p<0.001$).

For this paper, 2,300 participants comprised the analytic sample because they reported past 12-month alcohol consumption and responded to the item assessing frequency of recent blackouts. Among those 2,300 patients, 72.8% ($n = 1,678$) reported no blackouts in the past 3 months and 27.2% ($n = 627$) indicated that they experienced blackouts: less than monthly = 19.3% ($n=444$), monthly = 6.0% ($n=137$), weekly = 1.9% ($n=43$), and daily/almost daily = 0.1% ($n=3$). The mean age of the sample was 18.4 years ($SD = 1.5$); 58.3% were female, and most (75.0%) were White (12.6% African American, 12.4% of other backgrounds). A total of 82.4% were currently enrolled in school (56.4% were currently in college). Table 1 displays demographic characteristics of the full sample of drinkers and is further broken down based on blackout frequency.

Bivariate Analyses: Characteristics Associated with Blackout Frequency

Background Factors.—When examining relationships between participants’ demographic factors and blackout frequency (Table 1), bivariate analyses revealed a positive association between age and frequency of blackouts. Males were more likely to have monthly blackouts, and Caucasian individuals also had higher frequency of blackouts. Those receiving public assistance were more likely to report monthly or more frequent blackouts

than those without blackouts. Participants presenting to the ED for an injury (vs. medical condition) were more likely to report blackouts (monthly or less) as opposed to no blackouts. Finally, those in college and involved with Greek life were more likely to report any blackouts than other groups (not in college, or in college but not involved with Greek life).

Substance Use.—As shown in Table 1, participants with no history of blackouts differed significantly from those with monthly or less frequent blackouts, as well as those with monthly or more frequent blackouts on all substance use variables examined. Further, those with monthly or more frequent blackouts differed significantly from those reporting monthly or less frequent blackouts on all substance use variables (except for non-medical use of non-prescription cough/cold medicine). As blackout frequency increased, age of first alcohol consumption decreased. AUDIT-C score, frequency of heavy episodic drinking, and frequency of drinking and driving behaviors were all positively associated with increasing frequency of blackouts. Regarding other substances, increasing frequency of blackouts was associated with increased likelihood of reporting past-year use of tobacco, marijuana, other illicit drugs, and misuse of prescription drugs. Similarly, severity scores for past 3-month marijuana use, misuse of prescription drugs, and frequency of energy drink use were highest among those with more frequent blackouts. Finally, monthly or more frequent blackouts were associated with more frequent non-medical use of non-prescription cough/cold medicine.

Other Clinical Risk Factors.—Screening positive for possible depression was positively associated with blackout frequency; individuals screening positive were more likely to report monthly or more frequent blackouts, compared to those not reporting blackouts or those reporting monthly or less frequent blackouts. Similarly, those with monthly or more frequent blackouts were more likely to report lifetime sexual activity than other groups. Further, those with monthly or more frequent blackouts were significantly more likely to report using substances prior to sex in the past year and being sexually victimized while intoxicated or high during the past year, followed by those with monthly or less frequent blackouts, and those without blackouts. Finally, those with monthly or more frequent blackouts were more likely to report being a victim of forced sexual assault than those without blackouts, or with less frequent blackouts.

Multivariate Analyses Characteristics Associated with Blackout Frequency

Table 2 displays the results of a cumulative logit regression model evaluating relationships between the following variables and blackout frequency: age, gender (Female/Male), race (Caucasian/Other), receipt of public assistance (yes/no), college and Greek life involvement, reason for ED visit (injury/medical), prescription drug misuse (yes/no), marijuana use (yes/no), alcohol use severity (AUDIT-C score), depression screening (positive/negative), past-year sexual victimization while under the influence of alcohol or drugs (yes/no) and past-year forced sexual assault (yes/no). In examining the statistically significant variables, the most robust correlates associated with blackout frequency in this model were: prescription drug misuse, being in college and a member of a Greek fraternity/sorority, and being sexually victimized while under the influence of alcohol or drugs in the past year. Additional

significant correlates included marijuana use, alcohol use severity, screening positive for depression, and gender X alcohol use severity interaction. Although both males and females showed increasing AUDIT-C scores as blackout frequency increased, the slope of this increase was steeper for males than females [Males: Never (M=3.0, SD=2.6); Less than monthly (M=6.1, SD=2.3); Monthly or more (M=8.0, SD=2.3); Females: Never (M=2.1, SD=2.0); Less than monthly (M=4.5, SD=2.0); Monthly or more (M=6.8, SD=2.1)].

Discussion

Our findings demonstrate that, in this healthcare sample, more than 1 in 4 underage drinkers report experiencing alcohol-related blackouts in the past 3 months; among those experiencing blackouts, about 70% indicated blackouts happened less than monthly and 30% reported monthly or more frequent blackouts. This finding is consistent with previous research among college students, (11) although to date, blackouts have been relatively unexamined among more educationally diverse groups and younger individuals. Not surprisingly, severity of alcohol use increased the likelihood of reporting blackouts, including younger age of first drink, which is consistent with prior research. (12) In addition, 80–90% of youth reporting blackouts screened positive on the AUDIT-C. Future studies examining the trajectories of risk before and after initial blackouts would provide interesting data on the relationship between differing patterns of alcohol use and blackouts. Such data could have large public health impact given the association between blackouts and driving under the influence of alcohol, ED visit for injury, and alcohol/drug-related ED visits. (56, 57)

Underage drinkers reporting blackouts were more likely to report other risk behaviors, including risky alcohol consumption, smoking, illicit and non-medical prescription drug use, and energy drink consumption, with greater substance use observed among those reporting more frequent blackouts. These findings underscore potential risk for overdose, particularly due to co-ingestion. For example, in 2008, hospitalization rates for combined alcohol and drug overdoses among emerging adults increased 76%, at a cost of \$198 million. (62) Given recent data demonstrating the efficacy of single-session interventions in reducing overdose risk behaviors among adults in the ED (90) and risky drinking, including prescription drug use, among underage drinkers in the ED, (71) studies adapting these interventions to prevent blackouts may be beneficial. Findings that underage drinkers reporting more frequent blackouts (monthly or more) were also more likely to screen positive for depression may reflect greater likelihood of drinking, and potentially using other substances, to cope with negative affect; however, replication is required using clinical diagnostic indicators of major depression to more fully understand the clinical significance of this finding. Nonetheless, the current finding is consistent with previous research that identified relationships between blackouts and suicidal ideation. (91)

In bivariate analyses, youth reporting monthly or more frequent blackouts had an increased likelihood of lifetime sexual activity, use of alcohol or drugs before having sex, and forced sexual victimization. Also alarming, youth reporting blackouts were more likely to report being the victim of a sexual assault when they were unaware and unable to give consent due to the effects of alcohol or other substances; specifically, those reporting monthly or less

frequent blackouts were almost 3 times as likely, and those reporting monthly or more frequent blackouts were over 7 times more likely than those without blackouts to report being victimized in this manner. These findings have important intervention implications for sexual assault prevention, with few evidence-based programs available. (92, 93) For example, two programs designed to prevent dating violence among middle and high school students (i.e., Safe Dates and Shifting Boundaries; 94, 95–97) showed secondary effects on preventing sexual violence. Although sexual assault programs currently exist on many college campuses, (98) data demonstrating efficacy is generally lacking and such programs are not typically delivered outside of school settings. (92) In addition, such programs only address alcohol use in a limited manner, and future interventions for both sexual assault and alcohol misuse may be enhanced by focusing, at least in part, on prevention of blackouts. Addressing alcohol use in sexual assault prevention programs requires careful attention to avoid blaming victims and excusing violent behavior when under the influence of substances, or during a blackout. Nevertheless, given the strong association between blackouts and being sexually victimized while unaware and unable to provide consent due to substances, these programs may be improved if they attempt to reset norms regarding consent and intoxication, in addition to increasing bystander interventions to prevent assault.

Finally, underage drinkers reporting blackouts were more likely to be in college and involved in the college Greek system, with higher socio-economic status. The present study also found that the males were at greater risk than females for experiencing blackouts, reflecting increased alcohol consumption among males as compared to females. Although involvement in college and Greek life increased risk for blackouts, it is unclear the extent to which college-based alcohol intervention programs like BASICS (99) and E-CHUG (100) focus specifically on prevention of blackouts, although they do include psychoeducation and protective behavioral strategies for reducing consumption. These programs, however, do not focus on sexual assault prevention, which is urgently needed, particularly given that sexual assault during adolescence may increase the likelihood of future blackouts and subsequent assault while under the influence of substances. (65)

Several limitations require acknowledgement. First, the cross-sectional design precludes causal determinations. Second, the study was conducted at a single ED site, with replication necessary prior to generalization of study findings to other samples and settings. Third, data were based on self-report; although self-administration on the computer and assurance of confidentiality partially alleviate this concern, recall bias remains a possibility. Nonetheless, data presented in this paper, from a non-college student setting, is novel. Further, due to the sample size, some significant effects require further investigation to determine clinical significance in terms of mental health disorders (e.g., depression).

In summary, one-quarter of underage drinkers in this clinical setting reported blackouts in the past three months, with one-third of these youth reporting that blackouts occurred monthly or more frequently. The association between blackouts and other negative health risk behaviors and outcomes, such as other drug use and sexual assault, underscore the public health significance of this issue. Findings suggest that alcohol-focused prevention and interventions programs should incorporate poly-substance use and drinking motives, with content on sexual assault prevention also included. Although findings highlight how high-

risk college students, such as those in the Greek system, may be at risk for blackouts, the fact that about one-third of youth with a recent blackout were not in college suggests that interventions are needed to reduce blackouts among youth in other settings as well.

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Table 1.

Sample characteristics among drinkers by past 3-month blackout frequency

Characteristic	Blackout Frequency			
	Total (N=2300)	Never (N=1673)	Less than Monthly (N=444)	Monthly or More (N=183)
Demographics				
Age, M(SD) ^{*** a,b}	18.4 (1.5)	18.3 (1.6)	18.6 (1.5)	18.8 (1.3)
Female Gender, % ^{**b}	58.3	60.3	54.3	49.7
Caucasian Race, % ^{***a,b}	75.0	73.2	78.6	82.5
Current School Enrollment, % [*]	82.4	81.9	86.3	78.1
College and Greek Life Involvement ^{***a,b}				
Not in college	38.7	42.4	30.0	26.8
In college, not in Greek Life	46.3	47.8	43.7	39.3
In college, involved in Greek Life	15.0	9.9	26.4	33.9
Low Grades, %	9.4	8.7	10.4	13.1
Receives Public Assistance, % ^{**b}	23.8	25.6	20.3	16.9
Alcohol Use				
AUDIT-C, M(SD) ^{***a,b,c}	3.4 (2.6)	2.4 (2.3)	5.2 (2.3)	7.4 (2.3)
AUDIT-C positive, % ^{***a,b,c}	44.7	29.8	80.2	94.5
HED Frequency, M(SD) ^{***a,b,c}	1.1 (1.0)	0.6 (0.9)	1.6 (1.0)	2.4 (0.9)
DUI Frequency, M(SD) ^{***a,b,c}	0.9 (2.4)	0.5 (1.6)	1.3 (2.9)	3.0 (4.8)
Age first drink, M(SD) ^{***a,b,c}	15.8 (2.2)	16.0 (2.3)	15.7 (1.9)	15.0 (2.1)
Past Year Drug Use				
Tobacco Use, % ^{***a,b,c}	50.8	47.3	55.0	73.2
Energy Drink Frequency, M(SD) ^{***a,b,c}	2.7 (1.9)	2.5 (1.8)	2.9 (1.9)	3.4 (2.1)
Marijuana Use, % ^{*** a,b,c}	56.7	49.4	72.1	86.3
Marijuana Use Severity, M(SD) ^{***a,b,c}	5.4 (8.2)	4.3 (7.2)	7.0 (8.8)	12.1 (10.9)
Other Illicit Drug Use, % ^{***a,b,c}	13.7	8.8	18.2	47.0
Prescription Drug Use, % ^{***a,b,c}	20.8	15.3	27.7	54.1
Prescription Drug Use Severity, M(SD) ^{***a,b,c}	2.2 (8.6)	1.2 (5.5)	3.0 (8.7)	9.9 (20.1)
Non-Prescription Cough/Cold Medicine Use % ^{*b}	19.2	17.9	21.2	25.7
Clinical Risk Factors				
Positive Screen for Depression, % ^{**b,c}	17.3	16.6	16.1	26.1
Ever Had Sexual Intercourse, % ^{***b,c}	77.6	75.3	80.0	92.4
Condom Use All the time (%)	26.7	27.5	26.8	19.7
Sub. Use Before Sex Frequency, M(SD) ^{***a,b,c}	0.7 (1.0)	0.5 (0.8)	1.1 (1.0)	1.8 (1.2)

Characteristic	Total (N=2300)	Blackout Frequency		
		Never (N=1673)	Less than Monthly (N=444)	Monthly or More (N=183)
Incapacitated Sexual Assault, % ^{***a,b,c}	4.7	2.5	7.0	19.1
Forced Sex, % ^{**b}	6.4	5.9	6.1	11.5
ED Visit for Injury (vs. Medical) % ^{***a}	33.2	30.8	41.4	35.5

*
 $p < 0.05$

**
 $p < 0.01$

 $p < 0.0001$

Note. Ns for each variable range from 2,288 to 2,300, with the exception of the depression screening where $N = 2,168$ because these items were added later in study screening. Post-hoc comparisons (with Bonferroni correction):

^a Less than monthly vs Never

^b Monthly or more vs Never

^c Monthly or more vs Less than monthly. HED= Heavy Episodic Drinking.

Table 2.

Adjusted correlates of past 3-month blackout frequency

Characteristic	Adjusted Odds Ratio	95% CI
Demographics		
Age	1.00	0.91–1.11
Female	1.07	0.64–1.78
Caucasian Race	0.92	0.69–1.21
In College, Not in Greek Life (ref = not in college)	0.96	0.69–1.33
In College, Involved in Greek Life (ref = not in college)**	1.85	1.26–2.72
Receives Public Assistance	0.90	0.67–1.22
Substance Use		
AUDIT-C score***	1.50	1.60–1.72
Prescription drug use***	1.96	1.48–2.60
Marijuana use***	1.55	1.21–1.98
Clinical Risk Factors		
Positive Screen for Depression*	1.44	1.07–1.95
Incapacitated Sexual Assault***	3.82	2.39–6.09
Forced Sexual Assault	0.82	0.51–1.32
ED Visit for Injury	1.15	0.91–1.47
Gender X Alcohol Consumption Interaction*	1.10	1.01–1.21

**
 $p < 0.01$ ***
 $p < 0.001$

Note. N for this analysis = 2,134 due to missing data. Results of the χ^2 for proportional odds assumption: $\chi^2(14) = 19.8988$, $p = .1335$. Blackouts coded as: none, less than monthly, or monthly or more among drinkers.