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Alcohol-Impaired Driving Behavior and Sensation-Seeking Disposition in a College Population Receiving Routine Care at Campus Health Services Centers

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Abstract

Accidents stemming from alcohol-impaired driving are the leading cause of injury and death among college students. Research has implicated certain driver personality characteristics in the majority of these motor vehicle crashes. Sensation seeking in particular has been linked to risky driving, alcohol consumption, and driving while intoxicated. This study investigated the effect of sensation-seeking on self-reported alcohol-impaired driving behavior in a college student population while adjusting for demographics, residence and drinking locations. A total of 1,587 college students over the age of 18 completed a health screening survey while presenting for routine, non-urgent care at campus heath services centers. Student demographics, living situation, most common drinking location, heavy episodic drinking, sensation-seeking disposition and alcohol-impaired driving behavior were assessed. Using a full-form logistic regression model to isolate sensation seeking after adjusting for covariates, sensation seeking remains a statistically significant independent predictor of alcohol-impaired driving behavior (OR=1.52;CI=1.19–1.94; $p<0.001$). Older, white, sensation-seeking college students who engage in heavy episodic drinking, live off-campus, and go to bars are at highest risk for alcohol-impaired driving behaviors. Interventions should target sensation seekers and environmental factors that mediate the link between sensation seeking and alcohol-impaired driving behaviors.

Keywords

Sensation seeking; College students; Alcohol; Impaired driving

1. Introduction

The detrimental consequences of alcohol-impaired driving are the leading cause of injury and death among college students. In 2001, there were more than 1,700 U.S. college alcohol-related injury deaths, of which 78% were alcohol-impaired traffic fatalities (Hingson et al., 2005). Research studies have consistently implicated drivers' personality characteristics as factors associated with vehicular accidents and have called for a closer examination of the role personality plays in traffic safety (Lewin, 1982a, 1982b; Schwebel et al., 2007). Personality

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characteristics such as aggressiveness, impaired risk perception, hostility, disinhibition, susceptibility to boredom, and sensation seeking are linked to negative driving outcomes (Burns & Wilde, 1995; Furnham & Saipe, 1993; Greene et al., 2000; Iversen & Rundmo, 2002; Jonah, 1997; McMillen et al., 1991; Wells-Parker et al., 2002).

Sensation-seeking disposition in particular, viewed as part of a global risk-taking behavior pattern (Jessor, 1987), has been implicated in risky driving (Dahlen et al., 2005; Patil et al., 2006; Iversen and Rundmo, 2002), alcohol drinking (Nagoshi et al., 1991; Yanovitzky, 2006; Hittner and Swickert, 2006; Trimpop and Kirkcaldy, 1997) and driving under the influence (DUI) of alcohol (Johnson and White, 1989; Jonah, 1997; Arnett, 1990). The sensation-seeking trait is defined by "the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience" (Zuckerman, 1994, p.27). Eight out of 13 studies in the general population and three studies of high school students that assessed the relationship between sensation seeking and drinking and driving found a positive association (see Jonah, 1997, for a review).

Information is relatively limited on the exact contribution of sensation seeking to alcohol-impaired driving among college students, who may differ in terms of predictors of risky driving (Fernandes et al., 2007). McMillen et al. (1992) studied 132 college students ages 18 to 24, enrolled in general psychology classes. Students who drank heavily and scored high on the Sensation Seeking Scale (Zuckerman, 1971) were more likely to be apprehended for driving while intoxicated. Another study by McMillen et al. (1991) assessed 188 college students age 18 to 21. Drivers from this sample apprehended for DUIs in a stakeout or roadblock had higher sensation-seeking scores than drivers who did not engage in drinking and driving. Jonah et al. (2001) studied 279 students who drove in the past 12 months. Participants who scored high on the sensation-seeking scale were more likely to engage in alcohol-impaired driving. Sensation seeking is reported to have a direct effect on DUI behavior among young males while controlling for drinking (Stacy et al., 1991).

A major limitation of some of the previous studies that assessed the relationship between sensation seeking and alcohol impaired driving in college populations is their reliance on DUI citations as a measure of alcohol impaired driving. Although DUI records are used to identify intoxicated drivers, this method does not include the drunk drivers who were not identified by law enforcement. In 2005, the Department of Justice reported arresting 1.4 million people for driving under the influence of alcohol (US Department of Justice, 2005); however that is less than one percent of the 159 million self-reported episodes of alcohol-impaired driving among US adults each year (Quinlan et al., 2005). An additional limitation is the small sample size employed by many of the earlier studies.

The relative contribution of demographic variables (e.g. gender) and environmental factors (e.g. residence, living arrangements, drinking location) to the relationship between sensation seekers and alcohol-impaired driving among college students has not been fully explored. While some studies argue that the relationship between sensation seeking, drinking and driving is stronger for men than for women (Stacy et al., 1991; Johnson & White, 1989), other researchers do not find gender to play a differential role in the link between driving under the influence and sensation seeking (Fernandes et al., 2007; Schwebel et al., 2007). Situational factors (e.g. rural residence, geographical location, family living structure) are reported to affect alcohol-involved driving and riding (O'Malley & Johnston, 1999; Poulin et al., 2006), but little is known about how environmental variables (e.g. living arrangement, residence and drinking location) affect sensation seeking and alcohol-impaired driving among college students. Clearly, more research is needed to define the link through which sensation seeking impacts alcohol-impaired driving.

Furthermore, being a drunk driver is not the only way to be injured in an alcohol-related motor vehicle accident. Riding with an alcohol-impaired driver is recognized as a high-risk driving behavior (Poulin et al., 2006; Dellinger et al., 1999). The National Highway Traffic Safety Administration defines a motor vehicle crash to be alcohol related if at least one driver, passenger, or non-occupant (pedestrian or cyclist) involved in the crash is found to have had a positive blood alcohol concentration (BAC) value (U.S. Department of Transportation, 2002). Eighty percent of passengers in alcohol-related traffic fatalities have BACs greater than zero (Isaac et al., 1995). Pairs of drivers and passengers admitted to a trauma center after a motor vehicle crash have been found to be alcohol-impaired at similar rates, with 43% drivers and 41% passengers having positive BACs (Soderstrom et al.,1996). Dellinger et al. (1999) argues that asking passengers about riding with an alcohol-impaired driver may be an alternative way to measure impaired driving, because the respondents may be more forthcoming about this behavior which is not against the law. Therefore, it may be important to evaluate sensation-seeking in relation to students' driving behavior either as drivers or as passengers.

The purpose of this paper is to fill the gap in the literature on the effect of sensation seeking on alcohol-impaired driving behavior in college students using data from the College Health Intervention Projects (CHIPs), a randomized controlled trial of brief physician alcohol intervention delivered at campus health services centers. The objective of this cross-sectional research is to examine the significance of sensation-seeking dispositions with respect to alcohol-impaired driving behavior (i.e. drunk driver or passenger of drunk driver) with and without adjusting for alcohol use and various subject characteristics in a college student population. Our findings will serve injury prevention efforts by offering a better understanding of the role alcohol and sensation seeking play in alcohol-impaired driving and will inform alcohol safety programs aimed at reducing deaths and injuries from vehicle crashes among college students.

2. Methods

2.1. Study Sample

The data analyzed in this paper come from screening participants of the College Health Intervention Projects (CHIPs), a randomized control trial (RCT) to test the efficacy of brief intervention on reducing alcohol use and alcohol related harm among college students. Students provided data at one of three participating university sites: (1) a medium-size university in the US Midwest (12,000 students enrolled), (2) a large university in the US Midwest (40,000 students enrolled), (3) a large university on the US West Coast (42,000 students enrolled). The University of Wisconsin Health Sciences Institutional Review Board, and the IRB of record at each of the other sites, approved the study.

Between October 30, 2004 and February 15, 2007, all enrolled students 18 years and older with non-urgent and primary care appointments at their university’s student health services were asked to complete one of two health screening surveys for the CHIPs RCT (HSS-A and HSS-B) (Fleming et al., 1999). Both the HSS-A and HSS-B were presented to subjects with an informed consent form. Subjects had 3 options for completing the HSS-A and HSS-B: 1) Mark the circle at the bottom of the survey cover stating, “I do not want to complete this questionnaire” ending their participation; 2) Complete the survey and decline to provide name and contact information, bowing out of any further participation in the study; 3) Complete the survey and provide name and contact information, in which case those who screened eligible would be invited to participate in the RCT. The fact that subjects could complete the surveys without a link to their name on either the consent form or the survey (if they so chose), may have allowed for increased participation and forthcoming responses from those who otherwise may have been uncomfortable doing so. Students filled the screening tool while waiting for

their appointment and returned the completed questionnaire to a locked box. Students were volunteers and were not compensated for their participation. The data from the HSS-B, an extended screening instrument given to every fifth student, are analyzed in this report.

2.2. Heavy Episodic Drinking Measure

The frequency of heavy episodic drinking was measured with the question: "In the last 30 days, how many times have you had five or more regular drinks (average-size glass of beer, a small glass of wine, a shot of gin, vodka, rum, brandy, whiskey or other hard liquor) on one occasion?" Possible answers were "Zero," "1 time," "2 times," "3 times," "4 times," or "5 or more times."

2.3. Sensation Seeking Measure

Sensation-seeking disposition was evaluated with a Brief Sensation Seeking Scale (BSSS) that has a proven reliability and validity record (Hoyle et al., 2001). BSSS is a brief self-report measure suitable for evaluating sensation seeking among young adults. It has the same basic content as the SSS-V (Zuckerman et al., 1978; Zuckerman, 1994) and utilizes a Likert-type response format. Subjects are asked how strongly they agree or disagree with the following 8 items: (1) "I would like to explore strange places"; (2) "I get restless when I spend too much time at home"; (3) "I like to do frightening things"; (4) "I like wild parties"; (5) "I would like to take off on a trip with no pre-planned routes or timetables"; (6) "I prefer friends who are excitingly unpredictable"; (7) "I would like to try bungee jumping"; and (8) "I would love to have new and exciting experiences, even if they are illegal."

Following the convention in other studies of sensation seeking (Henderson et al, 2005; Stephenson et al., 1999; Jonah et al., 2001; Evans et al., 2006; D'Silva et al., 2001; Zuckerman, 1979), subjects who scored above the median on the BSSS (median=3) were categorized as high sensation seekers, and those below, low sensation seekers.

2.4. Alcohol-Impaired Driving Behavior Outcome Measure

For the current study, alcohol-impaired driving behavior was defined as a *Yes* response to either or both of the following questions: (1) "In the last six months, did you ever ride in a car or other vehicle with a driver who had been drinking alcohol?"; and (2) "In the last six months, did you ever drive in a car or other vehicle after drinking any alcohol?" A *No* response to both questions is taken as an indicator of driving conduct without alcohol influence.

3. Statistical Analysis

Health Screening Surveys were checked for completeness and scanned at the University of Wisconsin-Madison Scanning Lab. The scanned data were imported into an Oracle database and checked for data incongruencies. Data analysis consisted of three steps: (a) examination of demographic, sensation seeking, alcohol, environmental, and alcohol-impaired driving variables by way of frequencies (%) and mean values; (b) correlations between individual difference variables and the outcome measure; and (c) a series of logistic regression models for predicting alcohol-impaired driving behavior.

The logistic regression started with a reduced form model which controlled for exogenous predictors (e.g. gender, age, race, university site, year in school). Age was dichotomized as ages 18–20 and 21 or older. Two dummy variables were included to represent year in school: one indicating freshman class status and the other indicating graduate student status. While it is true that freshman status and inclusion in the 18–20 year old age group are highly correlated (r=.54), both variables were retained in the model on a theoretical basis. It was surmised that freshman status could potentially impact impaired driving behavior as freshman are in a transitional period in their lives. It was also surmised that being in the 18–20 year old age group

could potentially have an independent effect on both drinking and driving, as it represents a period of illegal alcohol use.

Sensation seeking and drinking were entered into the model next. The final full model added environmental confounders (residence, living arrangement, and drinking location) to examine the role of sensation seeking on alcohol-impaired driving behavior after controlling for these environmental effects. All analyses were performed with SAS version 9.1 for Linux (SAS Institute Incorporated, 2002–2003).

4. Results

The sample was composed of 1,587 currently enrolled US college students coming into the student health center of the participating universities for routine care during the study period and who provided responses to alcohol-impaired behavior outcomes and sensation seeking measures on the HSS-B. The HSS-B, an extended screening instrument, also contained questions on tobacco use, exercise, weight concerns, alcohol use, socio-demographic information, accidents and injuries, health care utilization, depression, emotional, physical and sexual abuse. Subjects were not asked whether or not they had a driver's license. Less than 10% of students asked to complete the HSS-B refused participation.

Overall, 647 (41%) of respondents reported alcohol-impaired driving and 566 (35%) subjects reported being passengers of alcohol-intoxicated drivers. One out of four participants (n=402) acknowledged both of the alcohol-impaired behavior outcome measures in the last 6 months.

Table 1 provides demographic information on the study participants, as well as a comparison of demographic characteristics based on whether the subject engaged in alcohol-impaired driving behavior in the past 6 months.

The overall sample of participants was predominantly female (67%), non-Hispanic white (78%), and somewhat older than the general student population. Fifty-six percent of participants were seniors or graduate students. Most of the participants lived off-campus (73%). The majority lived with roommates or friends (82%). A variety of locations were noted as common drinking locations, but bars (28%) and off-campus residences (39%) were the most frequently cited. Over 50% of the sample was recruited at a large university site in the Pacific Northwest. One percent of the data was missing for the ethnicity variable and 0.1% of the data was missing responses on living arrangements and drinking location.

Alcohol-impaired drivers or passengers of intoxicated drivers were more likely to be male (Chisquare=4.46, p=.04), older (Chisquare=96.94, p<.001), and non-Hispanic white (Chisquare=20.13, p=.003) than students who did not engage in alcohol-impaired driving behaviors. These students were far more likely to live off campus (82% vs. 64%, Chisquare=63.74, p<.001). The most common drinking location was an off-campus residence (44%) or a bar (38%).

Table 2 describes alcohol use among the study participants, comparing subjects who reported alcohol-impaired driving behavior in the past 6 months to those who did not. As expected, those who were involved in alcohol-impaired driving behavior drank more than those who were not. Students who reported being alcohol-impaired drivers or passengers of intoxicated drivers were far more likely to be heavy episodic drinkers in the past 30 days (68% vs. 41%, Chisquare=122.97, p<.001), defined in this study as 5 or more drinks in a row for men and for women.

Cross-tabulating alcohol-impaired driving behavior with sensation seeking scores on the Brief Sensation Seeking Scale (BSSS), participants who engaged in alcohol-impaired driving

behavior were significantly more likely to have high sensation seeking scores than those who did not. Fifty-one percent of self-reported alcohol-impaired drivers or passengers of drunk drivers had scores above the median (median= 3) on the BSSS, compared to only 37% of those who did not drive impaired in the last 6 months (Chisquare=30.72, p<.001).

Table 3 presents a series of logistic regression models examining the relationship between sensation seeking and alcohol-impaired driving behavior, adjusting for potential confounding variables. Model I is a reduced-form model including exogenous predictors of alcohol-impaired driving behavior: gender, age, race, university site, freshman status, and graduate student status. Males (Odds Ratio=1.27, p=.034) and older students (OR=2.44, p<.001) were significantly more likely to report driving impaired or riding with intoxicated drivers. Asian students (OR=0.50, p<.001) were less likely to be alcohol-impaired drivers or passengers of intoxicated drivers.

Model II adds sensation seeking to the predictor variables. As evidenced by the significance of this addition to the model (OR=2.12, p<.001), sensation seeking is an independent predictor of alcohol-impaired driving behavior after adjusting for potential confounders. The lack of significance of gender in Model II indicates some potential confounding by gender in the unadjusted relationship.

Model III adds heavy episodic drinking to the logistic regression model. The strength of association between sensation seeking and alcohol-impaired driving behavior is reduced (OR=1.70, p<.001), indicating some confounding with heavy drinking, but sensation seeking is still a significant predictor in Model III.

Model IV is the full model, including residence, living arrangement, and drinking location. Even with all the predictors in the model, sensation seeking remains a statistically significant independent predictor of alcohol-impaired driving behavior (OR=1.52, p<.001). There is evidence of potential confounding by drinking location and residence, as living off-campus (OR=1.46, p=.026) and drinking in a bar (OR=2.20, p<.001) or drinking at an off-campus residence (OR=2.90, p=.002) are significant in the model, and the strength of association between sensation seeking and impaired driving behavior is further reduced from Model III.

5. Discussion

This study's objective was to examine the link between sensation seeking and self-reported alcohol-impaired driving behavior (i.e. drinking and driving or riding with a drunk driver) in a college student population. Our full-form logistic regression model allowed us to isolate the sensation-seeking association after adjusting for a range of covariates (age, gender, race, level of study, university site, alcohol consumption, residence, living arrangement, drinking location). College students of European descent who were 24 years of age or older, scored high on the sensation-seeking scale, engaged in heavy episodic drinking, consumed alcohol at bars, and lived off-campus were significantly more likely to report being either a drunk driver or a passenger of a drunk driver. Although alcohol-impaired driving was more prevalent among males than females in the sample, the regression results were not moderated by gender. A possible explanation for this is that males were more likely to score high on sensation-seeking and to report more heavy episodic drinking, so that the gender effect was subsumed by these relationships.

The findings of this investigation lend support to previous research by uncovering an independent main effect between sensation seeking and self-reported alcohol-impaired driving behavior among college students seen at university health services for a variety of health issues (cf. Stacy et al., 1991). Interestingly, not only drivers but passengers of drunk drivers score higher on the sensation-seeking scale. This difference in passenger personality disposition is

a new finding uncovered in this study. Our results come to light if put in the context of sensation seeking being an independent predictor of alcohol traumatic injury in a hospital setting (cf. Field and O'Keefe, 2004; Cherpitel, 1999).

Sensation seekers on college campuses may need to be targeted by university alcohol safety programs that aim to reduce deaths and injuries from vehicle crashes. Given the close but independent association between alcohol consumption, sensation seeking, and risky driving conduct, it may be wise, as part of alcohol injury prevention efforts on college campuses, to promote non-alcohol alternative activities such as supervised competitive sports (e.g. competitive sailing, sculling, kayaking, sky diving, rock climbing). While there is limited information on the ability of these activities to reduce rates of drunk driving among students who score high on sensation seeking scales, competitive sports could satisfy their desire for novel and intense experiences in a controlled environment and reduce reliance on alcohol to achieve the thrill sensation, thus avoiding detrimental alcohol-impaired driving outcomes (cf. D'Silva et al., 2001). Future studies are needed to test if supervised competitive sports can reduce alcohol-impaired driving behavior.

Furthermore, interventions to prevent alcohol-impaired driving may need to influence the environmental factors that mediate the link between sensation seeking and alcohol-impaired driving behavior. Our results indicate drinking location and residence influence the association between sensation seeking and alcohol-impaired driving behavior. There is limited evidence on the impact of environmental interventions targeting drinking location and distance to the primary residence. One environmental approach, which may reduce the frequency of drunk driving, relies on the availability of safe ride programs, such as free bus or cab rides, between bars frequented by students and off-campus student housing, especially during late-night and after-bar hours. Several studies (e.g. Sarkar et al., 2005; Caudil et al., 2000; Harding et al., 2001) point to safe ride programs as a potentially effective environmental strategy. Future studies may wish to investigate whether sensation seekers take full advantage of safe ride services.

The strength of the study lies in the large sample size, a variety of explanatory variables available for the analysis, and a clinical study sample.

Finally, this study has several limitations, including the self-reported alcohol-impaired driving outcome, which may suffer from recall bias and misreporting. However, available studies suggest that self-report data on driving behavior is fairly accurate (Aberg et al., 1997; Ulleberg and Rundmo, 2002). The investigation assumed that self-reported alcohol-impaired driving behavior is associated with increased risk for vehicle inflicted injuries. No measures of student perception of drinking norms on campuses, a known factor of college heavy drinking, were considered in the study. Other personality traits such as anger, hostility, and impulse control, which are reported to be associated with risky driving, were not available for the analysis. In addition, using the median split for sensation seeking may create artificial distinction between subjects who do not vary to a great extent on this personality trait.

To conclude, this study contributes to the body of research aiming to understand the personality factors involved in alcohol-impaired driving behavior. It provides important insights for policy development and injury prevention efforts. Future studies are needed to test if sensation seekers fully participate in safe ride services if such are offered and if competitive sports interventions targeting sensation seekers on college campuses may influence alcohol-impaired driving behavior.

6. Implications for prevention

Our results purport that injury prevention efforts may have to focus on sensation-seeking students on college campuses. Safe rides services between frequented bars and off-campus housing where students reside should be considered and promoted as an alternative to alcohol-impaired driving.

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Table 1

Descriptive Characteristics of College Students Seen in College Health Clinics for Routine Care by Driving Behavior in the Last 6 Months

	Alcohol-impaired driving behavior	No alcohol-impaired driving behavior	Total
	n=811	n=776	n=1587
	No. (%)	No. (%)	No. (%)
Gender			
Male	286 (35)	235 (30)	521 (33)
Female	525 (65)	541 (70)	1066 (67)
		χ^2=4.46, p<0.04	
Age			
18–20 years old	190 (23)	363 (47)	553 (35)
21–23 years old	282 (35)	205 (26)	487 (31)
24 or older	339 (42)	208 (27)	547 (35)
		χ^2=96.94, p<0.001	
Ethnicity[a]			
Non-Hispanic white	656 (81)	581 (75)	1237 (78)
Hispanic origin	34 (4)	29 (4)	63 (4)
Black	18 (2)	19 (3)	37 (2)
Asian	65 (8)	116 (15)	181 (11)
Native American	12 (2)	11 (1)	23 (2)
Other	15 (2)	14 (2)	29 (2)
		χ^2= 20.13, p<0.003	
Year in School			
Freshman	66 (8)	143 (18)	209 (13)
Sophomore	65 (8)	131 (17)	196 (12)
Junior	126 (16)	152 (20)	278 (18)
Senior	226 (28)	157 (20)	383 (24)
Masters or PhD program	318 (39)	189 (24)	507 (32)
Other	10 (1)	4 (1)	14 (1)
		χ^2=100.13, p<0.001	
Residence			
Off-campus	661 (82)	494 (64)	1155 (73)
On-campus	150 (19)	282 (36)	432 (27)
		χ^2=63.74, p<0.001	
Living Arrangement[a]			
With roommates or friends	645 (80)	655 (84)	1300 (82)
Alone	165 (20)	121 (16)	286 (18)

	Alcohol-impaired driving behavior	No alcohol-impaired driving behavior	Total
		χ^2=6.12, p<0.01	
Drinking Location[a]			
On-campus residence	29 (4)	69 (9)	98 (6)
Off-campus residence	359 (44)	253 (33)	612 (39)
Greek house	13 (2)	33 (4)	46 (3)
Bar	305 (38)	130 (17)	435 (28)
Parents house or other	71 (9)	61 (8)	132 (8)
Abstainers	33 (4)	226 (29)	259 (16)
		χ^2=257.60, p<0.001	
US Clinic Location			
Large Northwestern University	419 (52)	384 (50)	803 (51)
Large Midwestern University	309 (38)	313 (40)	622 (39)
Medium Midwestern University	83 (10)	79 (10)	162 (10)
		χ^2=0.88, p=0.645	

[a] Number of participants may not add up to the correct total due to missing data for this category.

Table 2

Alcohol Use among College Students Seen in College Health Clinics for Routine Care by Driving Behavior in the Last 6 Months.

	Alcohol-impaired driving behavior	No alcohol-impaired driving behavior	Total
	n=811	n=776	n=1587
	No. (%)	No. (%)	No. (%)
Average number of drinks per week			
Abstainers	31 (4)	217 (28)	248 (16)
1–7 drinks per week	378 (47)	381 (49)	759 (48)
8–14 drinks per week	184 (23)	100 (13)	284 (18)
15–21 drinks per week	105 (13)	42 (5)	147 (9)
Over 22 drinks per week	113 (14)	36 (5)	149 (9)
		χ^2=230.49, p<0.001	
Number of Heavy Episodic Drinking Occasions[a] in the last 30 days			
None	256 (32)	460 (59)	716 (45)
1–2 time	241 (30)	169 (22)	410 (26)
3–4 times	150 (19)	85 (11)	235 (15)
5 or more times	164 (20)	62 (8)	226 (14)
		χ^2=134.07, p<0.001	

[a]Heavy episodic drinking occasion is defined as 5 drinks in a row for men and for women

Table 3

Odds Ratios and Confidence Intervals for Demographics, Sensation Seeking, Drinking, Drinking Location and Living Arrangements Characteristics on Alcohol-Impaired Driving Behavior (n=1587)

	OR	Model I 95% CI	OR	Model II 95% CI	OR	Model III 95% CI	OR	Model IV 95% CI
Gender								
Male	1.27*	1.02–1.58	1.08	0.86–1.36	0.92	0.72–1.17	0.97	0.76–1.24
Female	.	.	.	.	.	.	.	.
Age								
18–20 years old	0.41**	0.28–0.60	0.36**	0.24–0.53	0.31**	0.20–0.46	0.41**	0.26–0.65
20–23 years old	0.98	0.70–1.37	0.92	0.66–1.29	0.77	0.54–1.10	0.71	0.49–1.04
24+ years old	.	.	.	.	.	.	.	.
Race								
Hispanic	0.92	0.53–1.60	1.01	0.58–1.76	1.06	0.60–1.89	0.10	0.55–1.82
White	1.11	0.70–1.77	1.12	0.69–1.77	0.84	0.51–1.37	0.82	0.49–1.38
Black	0.91	0.44–1.87	0.90	0.43–1.87	0.97	0.45–2.07	1.01	0.49–2.47
Native American	1.32	0.58–2.98	1.25	0.54–2.87	1.01	0.43–2.39	1.06	0.44–2.57
Asian	0.50**	0.30–0.85	0.59*	0.32–0.90	0.56*	0.32–0.96	0.65	0.36–1.16
Hawaiian	1.63	0.56–4.79	0.79	0.54–4.63	1.47	0.48–4.50	1.58	0.48–5.24
Other	.	.	.	.	.	.	.	.
Clinic Site								
Large Northwestern University	0.79	0.55–1.13	0.79	0.55–1.15	0.85	0.58–1.25	0.88	0.59–1.30
Large Midwestern University	0.78	0.54–1.13	0.80	0.55–1.17	1.02	0.69–1.52	1.05	0.69–1.60
Small Midwestern University	.	.	.	.	.	.	.	.
Freshman	0.78	0.54–1.12	0.79	0.55–1.12	0.81	0.55–1.19	1.21	0.78–1.88
Masters or PhD program	1.30	0.93–1.80	1.39	0.10–1.95	1.40	0.99–1.98	1.20	0.83–1.72
Sophomore/Junior/Senior	.	.	.	.	.	.	.	.
		χ^2=131.61						
		Df=13						
Sensation Seeking								
High			2.12**	1.70–2.65	1.7**	1.34–2.14	1.52**	1.19–1.94
Low			.	.	.	.	.	.
				χ^2=176.52				
				df=14				

	OR	Model I 95% CI	OR	Model II 95% CI	OR	Model III 95% CI	OR	Model IV 95% CI
Heavy Episodic Drinking								
5+heavy drinking occasions in the last 30 days					3.52**	2.78–4.49	2.56**	1.72–2.96
<5 heavy drinking occasions in the last 30 days					.	.	.	.
						χ^2=285.76		
						df=14		
Residence								
Off-campus							1.46*	1.05–2.04
On-campus							.	.
Living Arrangement								
With roommates or friends							0.99	0.73–1.34
Alone							.	.
Drinking Location								
Off-campus residence							2.20	1.33–3.66
Greek house							0.88	0.39–1.99
Bar							2.90**	1.67–4.97
Parents house or other							2.12	1.15–3.89
Other							0.41	0.22–0.77
On-campus residence								
								χ^2=384.48
								df=22

* p<0.05;

** p<0.01