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Episodic Heavy Drinking, Problem Drinking and Injuries – Results of the WHO/NIAAA Collaborative Emergency Room Study in South Korea

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Abstract

Alcohol is the 5th leading risk factor to the global disease burden and disability and about half of the global alcohol burden was attributable to injuries. Despite a large body of evidence documenting the associations between alcohol and injuries, data from Asian countries including South Korea are sparse. The aim of this study was to investigate the associations between episodic heavy past-year drinking, problem drinking symptomatic of alcohol dependence and alcohol-related and intentional injuries. Data from 1,989 injured patients recruited for the WHO/NIAAA Collaborative Study on Alcohol and Injury in South Korea were analyzed with respect to the prevalence rates and associations between injuries and frequency of past-year episodic heavy drinking and problem drinking. In estimating the odds ratios (ORs) and the associated 95% confidence intervals between alcohol intake and injuries multivariable logistic models were employed to adjust for sociodemographic characteristics and selected drinking variables. All analyses were conducted using the SAS 9.2 software. Findings of this study were consistent with prior studies that the risk of alcohol-related or intentional injury was positively associated with the frequency of episodic heavy drinking. The magnitudes of the associations were larger with frequent consumption of 5+ drinks (OR=4.0 approximately) than with frequent consumption of 12+ drinks (OR=3.1). Strong associations were also noted between RAPS4-assessed alcohol dependence and alcohol-related and intentional injuries. Further, the prevalence of intentional injury and its association with alcohol increased sharply once the acute alcohol intake exceeded 90 ml. Our results were consistent with prior studies that episodic heavy consumption, acute intoxication and problem drinking are pervasive among emergency room patients. Results of our study also lent support for administering a single-item screener querying consumption of 5+ drinks at a sitting in the past 12 months as a triage tool in Korea.

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Keywords

emergency room (ER) study; episodic heavy drinking; problem drinking; alcohol-related and intentional injury

Introduction

Injuries have been recognized as major causes of morbidity and mortality among many societies in the world. In the United States, alcohol is the single most important contributor to injury (Maier, 2005). It is also the 5th leading contributory factor to the global disease burden and disability (World Health Organization, 2002), and about half of the global alcohol burden was attributable to injuries. Additionally, intentional injury accounts for about 12.1% of the alcohol-related disease burden. A recent review of international emergency room studies revealed that based on the BAC estimates, 4% to 59% of injuries presented at the emergency department (ED) were alcohol-related (Cherpitel, 2007).

Increasing evidence from studies conducted among ED patients in North and South America, Europe, Africa, Asia, and Australia suggests that usual drinking patterns, particularly episodic heavy drinking (e.g., 5 or more drinks per occasion), rather than just the volume of ethanol intake, are closely related to injuries and alcohol-related harms (Midanik et al., 1996; Rehm et al., 1996; Gutjahr et al., 2001). Compared to the general population, the ED patients generally have a higher weekly alcohol consumption with more frequent heavy drinking episodes (Cherpitel, 2007; Nordqvist et al., 2006). A study comparing injured patients among 14 countries further suggested that both frequent heavy drinking and problem drinking symptomatic of dependence were predictive of ED visits and multiple uses of the emergency room services in the past 12 months (Cherpitel et al., 2006).

According to a recent World Health Organization (WHO) report that South Korea's per capita pure alcohol intake is among the few countries in the highest ranking (the only Asian country with higher per capita consumption than the U.S. (14.8 liters vs. 9.88 liters, World Health Organization, 2011). Further, a recent epidemiologic survey conducted by the Korean Ministry of Health and Welfare has demonstrated that the prevalence of alcohol use disorders (AUD) was 5.6% among the Korean general population (the rates were 8.7% and 2.5% among males and females, respectively) (Korean Ministry of Health & Welfare, 2008). The emerging trend also indicated that alcohol use among teenagers and women are increasing steadily (Korean National Statistical Office, 2008). In 2004, the socioeconomic cost associated with alcohol accounted for approximately 2.9% of the Korean gross domestic product (GDP), which was substantially greater than those of the United States (2.3%), Japan (1.9%) and Canada (1.1%) (Jung, 2006). These facts have lead to the concern as to whether there is steady increase in the number of alcohol-related ED visits in Korea. Specifically, the magnitude of the risk of injury attributable to alcohol among ED patients in Korea has yet to be quantified.

Despite an impressive body of evidence from countries of several continents documenting associations between alcohol and injuries, data from Asian countries, including Korea, are sparse. Data on associations between drinking behaviors and injuries among patients presenting to EDs in Korea are necessary to inform the development and implementation of appropriate, evidence-based screening, prevention, and treatment protocols targeting both alcohol consumption and its associated harms. This information may be particularly critical given the rapid modernization and urbanization currently underway in Korea, which may give rise to both alcohol consumption and alcohol-related injuries. Accordingly, the purposes of the current investigation were to: a) examine the sociodemographic correlates of

alcohol-related and intentional injuries; b) estimate associations between heavy drinking patterns and injuries; and c) assess associations of problem drinking symptomatic of alcohol dependence with alcohol-related and intentional injuries among a sample of injured Korean ED patients.

Materials & Methods

Patient sample

Data were collected from October, 2008 through July, 2009 from 4 EDs located in geographically diverse regions of Korea: Seoul; Suwon, Gyeonggi Province; Chuncheon, Gangwon Province; and Kwangju, Gwangju Province. A representative probability sample was drawn from patients admitted to each ED for the first time within 6 hours of an injury, with a target sample size of 500 per site. Patients were approached by the field worker upon their arrival at the ED to obtain informed consent. Participants were later administered the breathalyzer by the field worker and the reading was recorded to estimate the blood alcohol concentration (BAC) level.

Study participants were also asked whether they had anything to drink 6 hours prior to injury. The amount consumed was queried if they answered affirmatively to the preceding question, as well as the amount of consumption during the same 6-hour period in the previous week. Usual quantity and frequency of consumption in the past year were obtained by asking questions similar to the ones used in other emergency room studies (Cherpitel et al., 2005). An individual was considered a past-year drinker if he/she reported any drinking in the past 12 months.

The total sample comprised 1,989 patients 18 years and older, representing a 66.6% response rate. Interviewers were trained and supervised by the Korean ER study collaborators who were then assisted and monitored by staff at NIAAA to ensure data quality and progress of the collaborative study on schedule. Technical details of the WHO/NIAAA Collaborative Study on Alcohol and Injury can be found elsewhere (Borges et al., 2006a).

Sociodemographic characteristics

Sociodemographic characteristics considered were: ER site, sex (male vs. female), age categories (18–24, 25–44, 45–54 and 55+), education (< high school, high school graduate, some college or beyond), employment status (currently employed, otherwise), urbanicity (urban vs. rural).

Heavy drinking patterns

Two measures of episodic heavy drinking in the past 12 months were considered in this study. The first was drinking 5 or more drinks in one occasion; the second was drinking 12 or more drinks in one occasion. Frequent heavy consumption was defined if the patient drank 5+ or 12+ drinks monthly or more frequently; infrequent heavy drinking as consuming 5+ or 12+ drinks less than monthly; the last patient group was those who never drank 5+ or 12+ drinks in the past 12 months.

Problem drinking symptomatic of dependence

Cherpitel (1998; 2000) proposed a four-item Rapid Alcohol Problems Screen, RAPS4 (Remorse, Amnesia, Perform, Starter) for alcohol dependence to be used in clinical settings. We adopted the RAPS4 brief screener to identify those patients whose drinking problems were consistent with symptoms of alcohol dependence.

Other drinking variables

Usual past-year volume of ethanol intake in milliliters (ml) was computed as (% pure alcohol) $\times$ drink size $\times$ (number of drinks consumed) for each beverage type, then summed over various beverage types that the patients reported consuming per drinking occasion. Likewise, volume of ethanol intake within 6 hours prior to injury (acute ethanol intake) in ml was computed. Based on usual volume of ethanol intake, patients were classified into 4 levels of usual drinking: light (< 30 ml), moderate (30 to < 75 ml), heavy (75 to < 90 ml), and very heavy (90+ ml). A 4-level acute drinking typology: nondrinker (did not drink within 6 hours prior to injury), light (< 45 ml), moderate (45 to < 90 ml), and heavy (90+ ml) was also created.

Alcohol-related and intentional injury

An alcohol-related injury was defined as either self-reported drinking within 6 hours prior to injury, or a positive BAC estimate (BAC $\geq 0.01\%$) captured at the initiation of the ER study.

Intentional injury was defined to include both self-inflicted injuries and interpersonal violence; all other injuries were categorized as unintentional.

Statistical analysis

All analyses were conducted using SAS 9.2 (SAS Institute, 2008). Prevalence rates were calculated for sociodemographic characteristics and selected drinking variables. Multivariate logistic regression was employed to calculate odds ratios (ORs) for each of the sociodemographic characteristics in one single regression model controlling for all other sociodemographic variables. In addition, ORs were derived using multivariate logistic regression to estimate the associations between episodic heavy or problems drinking (predictor variables) and alcohol-related and intentional injuries (outcome measures). Regression models were constructed separately for the two alternative measures of alcohol-related injuries, i.e., self-report drinking or BAC ≥ 0.01 , and intentional injury. At stage 1 all sociodemographic characteristics were entered in the models as covariates. At stage 2 we additionally adjusted for the effects of other drinking variables, i.e., usual drinking level or acute ethanol intake in estimating the associations between episodic heavy or problem drinking and the three measures of injuries. Statistical significance was set at $p < 0.05$ in all logistic regression models.

Results

Characteristics of the Korean sample

Overall, there were 1,989 injured patients recruited for this WHO/NIAAA collaborative study. Among them, 1,526 (76.7%) were current drinkers (Table 1a). A majority of these patients were males, currently employed, and overwhelmingly residing in the urban area. Relatively few injured patients were 18–24 years old, 55 years old or older, or attained less than high school education.

The prevalences and associations between selected sociodemographic characteristics and alcohol-related and intentional injury among past-year drinkers

All sociodemographic variables were entered simultaneously into a single model, and the resultant ORs and their respective prevalences are presented in Table 2. As shown, the site in Kwangju had the highest and the site in Seoul had the lowest prevalences of alcohol-related injury. Similarly, the Kwangju site had the highest and the Chuncheon site had the lowest prevalences of intentional injuries. Males, older patients (except those 55 years or

older), and those not currently employed had higher rates of alcohol-related and intentional injuries. In addition, patients residing in urban area had higher rates of intentional injury.

The prevalences and bivariate associations between selected drinking variables and alcohol-related and intentional injuries among past-year drinkers

The estimated prevalences and unadjusted ORs measuring associations between selected drinking variables and alcohol-related and intentional injuries are presented in Table 3. Rates of alcohol-related injuries were higher among frequent past-year consumers of 12+ drinks than among consumers of 5+ drinks at least monthly. Conversely, the resultant ORs showed that the association was stronger for consumption of 5+ drinks than for consumption of 12+ drinks. A gradient was observed when the rates of injury were examined by ethanol volume-based type (light, moderate, heavy, very heavy) of drinker: the heavier the consumption, the greater likelihood of sustaining an alcohol-related injury. In addition, the majority of patients who screened positive on the RAPS4 presented with alcohol-related injuries (54.3% and 58.2% respectively for BAC-based and self-reported alcohol-related injuries).

Similar patterns of associations emerged between episodic heavy past-year drinking and intentional injury. Episodic heavy consumption (either 5+ or 12+ drinks at least monthly) was positively associated with the likelihood of sustaining an intentional injury. Also, the association between type of drinker and intentional injury was positive, either based on usual drinking or acute consumption. Of note, prevalences and odds of intentional injury increased sharply once the acute alcohol intake exceeded 90 ml. Furthermore, patients who screened positive on the RAPS4 had a prevalence of intentional injury of 19.5% (vs. 7.6% among those who screened negative on the RAPS4), yielding an OR of 2.99.

Associations between episodic heavy drinking, problem drinking and alcohol-related injury

Overall, the magnitudes of associations of episodic heavy past-year drinking with BAC-defined and self-reported alcohol-related injury were comparable (Table 4). The associations between frequent consumption of 5+ drinks and alcohol-related injuries were stronger than those with frequent consumption of 12+ drinks. When usual alcohol consumption was entered into these models, almost all associations remained statistically significant, though somewhat weakened.

The associations between episodic heavy drinking, problem drinking and intentional injury

Table 5 examines associations between episodic heavy drinking, problem drinking and intentional injuries. With adjustment only for sociodemographic characteristics, frequent past-year consumption of 12+ drinks and 5+ drinks increased the odds of sustaining an intentional injury about 3-fold and 2-fold, respectively. After further adjustment for acute alcohol consumption, associations of each measure of heavy episodic drinking with intentional injury were no longer significant.

A positive screen on the RAPS4 increased the odds of sustaining an intentional injury about 3-fold. The strength of the RAPS4-intentional injury association retained statistical significance (OR=1.62, 95% CI=1.08–2.44) even after adjustment for acute alcohol consumption.

Discussion

Findings of this study were consistent with prior studies that the risk of alcohol-related or intentional injury was positively associated with the frequency of episodic heavy drinking.

The magnitudes of the associations were larger with frequent consumption of 5+ drinks than with frequent consumption of 12+ drinks. Associations of both measures of episodic heavy drinking with intentional injury were rendered nonsignificant once acute consumption was entered into the logistic regression models.

Strong associations were also noted between RAPS4-assessed alcohol dependence and alcohol-related and intentional injuries. Moreover, the strengths of the associations between positive RAPS4 and alcohol-related injuries were substantially greater than that between positive RAPS4 and intentional injury. The intention of the current study was, however, not to further assess the performance of the RAPS4 scale. Rather, we attempted to explore the potential of adopting the RAPS4 as a useful tool to screen the ED patients for alcohol dependence in Korea.

Among this Korean ED sample, 23.2% of them reported having consumed alcohol within 6 hours prior to injury, which was greater than those of China (18.8%) and India (21.7%) based on the WHO-ER project (Borges et al., 2006b). We also found that 46.0%, 30.0% and 17.5% of this Korean ED sample had frequent 5+ drinks, 12+ drinks and alcohol dependence (as assessed by the RAPS4), respectively (data not shown). The latter rate was about 3 times of the prevalence of 5.1% of alcohol dependence (assessed by the DSM-IV) among the Korean general population (Cho et al., 2007). This finding was consistent with the growing evidence that heavy consumption, acute intoxication and problem drinking are pervasive among emergency room patients.

The acute effects of alcohol include impaired cognitive abilities and psychomotor performance, decreased discernment of impending dangers, increased vulnerability as the target of aggressive behaviors, and increased likelihood of engaging in risky and provocative behaviors that precipitate violence. Findings of the current study were consistent with prior research that the risk of acute harm escalates rapidly once a certain amount has been consumed on one occasion (McLeod et al., 1999). Rehm and colleagues have shown that BAC as low as 0.04 to 0.05% may impair the psychomotor performance and increase the risk of road traffic crashes (Rehm et al., 2002). Further, results of the current investigation confirmed that the risk of intentional injury was more strongly associated with acute than chronic exposure of alcohol (Vinson et al., 2003). Additional research needs to be conducted to help formulate a better public policy to inform the public the consequences of excessive drinking in one setting, or alternatively, to establish the “safe drinking limits” in Korea.

In the United States alcohol screening is now required at major trauma centers and currently a routine procedure in many EDs (Woolard, et al., 2009). At the quest for minimally burdensome approaches to screening patients at hospital’s emergency department, one line of research has been investigating the potential utility of using a single-item screener about binge drinking as a triage tool (Vinson et al., 2004; Ramchand, et al., 2009). In this Korea ED sample, about 1 in 2 patients (55.6%) reported consuming 5+ drinks on one occasion at least once in the past 12 months. Given both the high prevalence and the strong association of this consumption pattern with alcohol-related injuries in Korean ED settings, the feasibility, utility, and acceptability to patients and ED staff of administering a single-item screener querying consumption of 5+ drinks at a sitting warrant further investigation. This approach would be consistent with a single-item screener developed by NIAAA to be used in the U.S. primary care and mental health settings (Willenbring et al., 2009): “Have you had 5 or more drinks (4 or more for women) in a single day in the past year?” Recently Dawson and colleagues (Dawson et al., 2010) provided evidence on the use of another single question: maximum number of drinks consumed in a single day as an alternative screening tool (Dawson et al., 2010). Desy and colleagues further reported that screening alone can act as an intervention because reduced drinking frequency and quantity were noted

even among those who received no intervention (Desy, et al., 2010). Thus, a universal screening protocol in the ED would be highly desirable.

To the best of our knowledge, this is the first report documenting the associations between drinking practices and alcohol-related and intentional injuries among adult (18 years old and older) ED patients in Korea. However, results of this study should be interpreted in the context of several limitations. First, even though sex was entered in the regression analysis as a model covariate, sex differences in other risky behaviors were not adjusted for because these variables were not available in the ER data. Moreover, the generalizability of these findings to all patients seeking care in Korean EDs, and to the Korean population as a whole, is unclear. Although efforts were made to cover four geographically diverse regions in Korea, no rigorous sampling design was employed to ensure the study's representativeness. Likewise, the generalizability is questionable to those injured Koreans who do not seek medical attention. In addition, the study's response rate of 66.6% calls for some caution because of the possibility that refusals were differential with respect to drinking variables or type or severity of injuries. Further, our study did not consider use of any drugs other than alcohol, nor measures of risky behavior apart from drinking.

There is inherent correlation between usual (chronic) and acute alcohol consumption. We attempted to disentangle the effects of episodic heavy drinking on the risk of intentional injury from those of acute intake of alcohol by entering the latter in the stage 2 logistic regression models. This rendered both measures of episodic heavy drinking non-significant, though associations of intentional injury with positive screens on the RAPS4 remained significant, albeit weakened. One conceptual model postulates that the association between usual consumption and injury may be indirect, mediating through short-term exposure of alcohol. It has been demonstrated in prior studies that the case-crossover study design (Maclure M & Mittleman MA, 2000; Vinson et al., 2003) is especially useful in disentangling the effects of chronic from acute exposure of alcohol (Vinson, et al., 2003; Borges et al., 2004). Thus, findings of this study should be considered preliminary.

The WHO/NIAAA Collaborative Study on Alcohol and Injury is currently underway and will expand to include additional countries in the South East Asia region. In view of the steady increase in alcohol use especially among more populous countries in that region, the ER data from this international collaboration will prove to be an important resource. This is particularly crucial among those countries where existing data on alcohol-related health consequences is scarce. The wealth of data from this international collaboration will afford us to examine associations and causal links between alcohol and injuries across cultures so that prevention initiatives and sound alcohol control policies can be developed to curtail the global burden of disease attributable to alcohol. Most significantly, data from the WHO/NIAAA Collaborative Study on Alcohol and Injury will be analyzed to estimate the alcohol attributable fraction of injury morbidity as a part of the continuing effort of updating the risk assessments for the global burden of disease 2005 (Giesbrecht et al., 2007).

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Table 1a

Characteristics of past-year drinkers and total sample of the WHO/NIAAA collaborative ER study, South Korea

Sociodemographic characteristics	Past-year Drinker		Total	
	n	% (SE)	n	% (SE)
Site				
Seoul	338	22.15 (1.06)	514	25.84 (0.98)
Suwon, Gyeonggi Province	384	25.16 (1.11)	485	24.38 (0.96)
Chuncheon, Gangwon Province	357	23.39 (1.08)	466	23.43 (0.95)
Kwangju, Gwangju Province	447	29.29 (1.17)	524	26.34 (0.99)
Gender				
Male	1,077	70.58 (1.17)	1,220	61.34 (1.09)
Female	449	29.42 (1.17)	769	38.66 (1.09)
Age				
18–24	258	16.91 (0.96)	314	15.79 (0.82)
25–44	730	47.84 (1.28)	858	43.14 (1.11)
45–54	309	20.25 (1.03)	399	20.06 (0.90)
55 +	229	15.01 (0.91)	418	21.02 (0.91)
Education				
< high school	225	14.85 (0.91)	380	19.31 (0.89)
High school	536	35.38 (1.23)	698	35.47 (1.08)
Some college	754	49.77 (1.28)	890	45.22 (1.12)
Employment status				
Employed	941	61.66 (1.24)	1,065	53.54 (1.12)
Otherwise	585	38.33 (1.22)	924	46.46 (1.12)
Urbanicity				
Urban	1,314	87.60 (0.85)	1,721	88.17 (0.71)
Rural	186	12.40 (0.85)	231	11.83 (0.73)
Total	1,526		1,989	

Table 1b

Characteristics of past-year drinkers of the WHO/NIAAA collaborative by Episodic heavy drinking and problem drinking (RAPS4), South Korea

Episodic heavy drinking/Problem drinking (RAPS4)	Past-year Drinker	
	n	% (SE)
Episodic heavy drinking (5+ drinks)		
Frequent (at least monthly)	914	60.33 (1.26)
Infrequent (less than monthly)	195	12.87 (0.86)
Never during the past 12 months	406	26.80 (1.14)
Episodic heavy drinking (12+ drinks)		
Frequent (at least monthly)	597	39.64 (1.26)
Infrequent (less than monthly)	219	14.54 (0.91)
Never during the past 12 months	690	45.82 (1.28)
RAPS4		
Positive	348	22.80 (1.07)
Negative	1,178	77.19 (1.07)

Table 2

The prevalences and associations between selected sociodemographic characteristics and alcohol-related and intentional injury among past-year drinkers

Sociodemographic characteristics	Alcohol-related injury				Intentional injury	
	Based on BAC level		Based on self-report		% (SE)	OR (95% CI)
	% (SE)	OR (95% CI)	% (SE)	OR (95% CI)		
Total	29.16 (1.16)	-----	30.28 (1.18)	-----	10.22 (0.78)	-----
Site						
Seoul	22.19 (2.26)	0.66 (0.47–0.93)	21.19 (2.23)	0.54 (0.39–0.77)	8.36 (1.51)	0.65 (0.40–1.07)
Suwon, Gyeonggi Province	29.69 (2.33)	0.86 (0.63–1.18)	32.63 (2.42)	0.88 (0.64–1.20)	12.37 (1.69)	0.90 (0.58–1.40)
Chuncheon, Gangwon Province	31.65 (2.46)	0.96 (0.70–1.30)	32.95 (2.53)	0.91 (0.67–1.23)	7.34 (1.39)	0.51 (0.30–0.84)
Dong-Gu, Gwangju Province	31.99 (2.21)	1.00 (ref)	34.53 (2.25)	1.00 (ref)	12.36 (1.56)	1.00 (ref)
Sex						
Male	31.75 (1.42)	1.65 (1.25–2.17)	34.18 (1.45)	1.91 (1.45–2.53)	10.85 (0.95)	1.45 (0.96–2.19)
Female	22.94 (1.98)	1.00 (ref)	22.32 (1.99)	1.00 (ref)	8.99 (1.36)	1.00 (ref)
Age						
18–24	21.71 (2.57)	0.87 (0.55–1.38)	26.17 (2.75)	1.05 (0.66–1.67)	9.34 (1.82)	2.38 (1.06–5.30)
25–44	30.55 (1.71)	1.61 (1.09–2.37)	32.45 (1.74)	1.73 (1.17–2.56)	11.77 (1.20)	3.92 (1.92–8.01)
45–54	33.66 (2.69)	1.54 (1.04–2.30)	33.00 (2.69)	1.50 (1.00–2.25)	11.65 (1.83)	3.19 (1.55–6.58)
55 +	27.07 (2.94)	1.00 (ref)	27.15 (2.99)	1.00 (ref)	4.87 (1.43)	1.00 (ref)
Education						
< high school	33.33 (3.14)	1.00 (ref)	33.49 (3.20)	1.00 (ref)	10.81 (2.08)	1.00 (ref)
High school	31.72 (2.01)	0.93 (0.64–1.34)	31.63 (2.02)	0.90 (0.62–1.31)	12.05 (1.41)	0.83 (0.48–1.45)
Some college	26.13 (1.60)	0.71 (0.48–1.05)	39.32 (1.67)	0.78 (0.53–1.16)	8.93 (1.04)	0.51 (0.28–0.91)
Employment status						
Employed	29.12 (1.48)	0.76 (0.58–0.99)	30.32 (1.51)	0.73 (0.56–0.95)	9.65 (0.97)	0.62 (0.42–0.93)
Otherwise	29.23 (1.88)	1.00 (ref)	31.36 (1.94)	1.00 (ref)	11.36 (1.32)	1.00 (ref)
Urbanicity						
Urban	28.46 (1.25)	0.99 (0.70–1.41)	30.25 (1.28)	1.08 (0.76–1.54)	10.80 (0.86)	2.07 (1.06–4.04)
Rural	32.80 (3.44)	1.00 (ref)	32.97 (3.49)	1.00 (ref)	6.01 (1.76)	1.00 (ref)

Numbers in bold print indicate statistical significance, $\alpha < 0.05$

The prevalences and bivariate associations between selected drinking variables and alcohol-related and intentional injury among past-year drinkers

Table 3

Selected drinking variable	Alcohol-related injury						Intentional injury	
	Based on BAC level			Based on self-report			% (SE)	OR (95% CI)
	% (SE)	OR (95% CI)	% (SE)	% (SE)	OR (95% CI)	% (SE)		
Frequency of 5+ drinks								
5+ drinks at least monthly	38.51 (1.61)	5.52 (3.89–7.83)	41.06 (1.63)		6.03 (4.25–8.55)	12.47 (1.10)		2.10 (1.35–3.27)
Less than 5+ monthly	23.08 (3.02)	2.42 (1.50–3.90)	23.59 (3.04)		2.70 (1.69–4.30)	8.29 (2.00)		1.28 (0.66–2.48)
Never during last 12 months	10.34(1.51)	1.00 (ref)	10.50(1.53)		1.00 (ref)	6.68 (1.24)		1.00 (ref)
Frequency of 12+ drinks								
12+ drinks monthly	44.39 (2.03)	3.96 (3.06–5.14)	47.13 (2.05)		4.38 (3.38–5.68)	16.39 (1.52)		2.79 (1.92–4.04)
Less than 12+ monthly	25.57 (2.95)	1.65 (1.14–2.38)	29.22 (3.07)		2.06 (1.44–2.94)	5.53 (1.55)		0.84 (0.43–1.61)
Never during last 12 months	16.96 (1.43)	1.00 (ref)	16.98 (1.44)		1.00 (ref)	6.72 (0.96)		1.00 (ref)
Usual drinking level								
Light	11.93 (1.73)	1.00 (ref)	10.23 (1.62)		1.00 (ref)	5.97 (1.26)		1.00 (ref)
Moderate	24.93 (2.29)	2.37 (1.58–3.55)	27.17 (2.35)		3.17 (2.09–4.82)	9.24 (1.53)		1.62 (0.92–2.86)
Heavy	30.82 (2.77)	3.32 (2.20–5.01)	32.26 (2.80)		3.95 (2.57–6.07)	6.45 (1.47)		1.11 (0.58–2.12)
Very heavy	42.18 (2.20)	5.35 (3.70–7.73)	45.74 (2.22)		7.30 (4.96–10.76)	16.44 (1.65)		3.12 (1.89–5.15)
Acute ethanol intake								
Did not drink prior to injury	3.31 (0.55)	----- ^a	-----		-----	3.88 (0.59)		1.00 (ref)
Light	72.73 (4.75)	-----	-----		-----	18.18 (4.11)		5.55 (2.96–10.39)
Moderate	87.00 (3.63)	-----	-----		-----	20.00 (4.00)		6.49 (3.62–11.64)
Heavy	93.31 (1.52)	-----	-----		-----	29.37 (2.78)		10.61 (7.03–16.00)
RAPS4								
Positive	54.31 (2.67)	4.53 (3.50–5.85)	58.19 (2.67)		4.92 (3.80–6.37)	19.48 (2.14)		2.99 (2.12–4.23)
Negative	21.73 (1.20)	1.00 (ref)	22.63 (1.23)		1.00 (ref)	7.61 (0.78)		1.00 (ref)

Numbers in bold print indicate statistical significance, $\alpha < 0.05$

^a ----- numbers were omitted because they were not meaningful; self-report of alcohol-related injury was defined as having consumed alcohol within 6 hours prior to injury (i.e., acute ethanol intake)

Table 4
The associations between episodic heavy drinking, problem drinking and alcohol-related injury among past-year drinkers

Episodic heavy drinking/Problem drinking (RAPS4)	Controlling for sociodemographic characteristics [*] only		Controlling for sociodemographic characteristics [*] and usual drinking level	
	Alcohol-related injury		Alcohol-related injury	
	Based on BAC level	Based on BAC level	Based on BAC level	Based on BAC level
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Episodic heavy drinking (5+ drinks)				
Frequent (at least monthly)	6.60 (4.42–9.85)	6.24 (4.20–9.27)	4.40 (2.85–6.81)	4.18 (2.71–6.43)
Infrequent (less than monthly)	2.75 (1.67–4.52)	2.46 (1.51–4.03)	2.30 (1.37–3.87)	2.30 (1.38–3.82)
Never during the past 12 months	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Episodic heavy drinking (12+ drinks)				
Frequent (at least monthly)	4.37 (3.21–5.94)	4.43 (3.27–6.00)	2.86 (2.02–4.05)	2.90 (2.05–4.09)
Infrequent (less than monthly)	1.78 (1.19–2.66)	1.92 (1.31–2.83)	1.49 (0.98–2.26)	1.73 (1.16–2.59)
Never during the past 12 months	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
RAPS4				
Positive	4.29 (3.29–5.60)	4.76 (3.64–6.24)	3.59 (2.72–4.75)	3.89 (2.93–5.16)

Numbers in bold print indicate statistical significance, $\alpha < 0.05$

^{*} Adjusted for site, sex, age, educational attainment, employment status and urbanicity

Table 5
The associations between episodic heavy drinking, problem drinking and intentional injury among past-year drinkers

Episodic heavy drinking/Problem drinking (RAPS4)	Controlling for sociodemographic characteristics [*] only		Controlling for sociodemographic characteristics [*] and acute ethanol intake	
	Intentional injury		Intentional injury	
	OR (95% CI)		OR (95% CI)	
Episodic heavy drinking (5+ drinks)				
Frequent (at least monthly)	2.01 (1.21–3.36)		0.81 (0.45–1.45)	
Infrequent (less than monthly)	1.04 (0.52–2.08)		0.69 (0.33–1.44)	
Never during the past 12 months	1.00 (ref)		1.00 (ref)	
Episodic heavy drinking (12+ drinks)				
Frequent (at least monthly)	3.04 (1.94–4.76)		1.43 (0.87–2.37)	
Infrequent (less than monthly)	0.73 (0.36–1.48)		0.49 (0.23–1.04)	
Never during the past 12 months	1.00 (ref)		1.00 (ref)	
RAPS4				
Positive	3.11 (2.15–4.49)		1.62 (1.08–2.44)	

Numbers in bold print indicate statistical significance, $\alpha < 0.05$

^{*} Adjusted for site, sex, age, educational attainment, employment status and urbanicity