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Drinking context and cause of injury: Emergency department studies from 22 countries

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Abstract

Background: It is estimated that up to a third of injuries requiring emergency department admission are alcohol-related. While injuries that are alcohol-related are unsurprising to emergency department staff, less is understood about the precursors to the injury event.

Methods: Using data from representative emergency department injury patients in 22 countries, we examined associations between context of injury (private or public), cause of injury (fall or trip, being stuck/cut/ or burned and violence) and alcohol use. Alcohol-related policy data were also obtained from each study locale.

Results: Injuries were similarly reported in private (54%) and public settings (46%) while cause of injury was most often due to falls (39%) or being struck/cut or burned (38%). Violence-related injuries were reported by approximately 1 in 5 patients (23%). Increased odds of drinking prior to the injury event was associated with injury due to violence in private settings but not public venues. Similarly, patients from regions with fewer restrictive alcohol policies were more likely to report drinking prior to an injury event and have elevated violence-related injuries in private settings.

Conclusion: Understanding the cause and context of injury and alcohol use are important components to evaluation and development of alcohol policies.

Keywords

alcohol; injury; injury context; cause of injury; violence; alcohol policy

1. Introduction

A strong body of research supports alcohol's association with acute, non-fatal injury (Cherpitel, 1993; Treno, Gruenewald, & Ponicki, 1997; Vinson, Maclure, Reidinger, & Smith, 2003) although the mechanism by which alcohol contributes to an increased risk for injury is of debate. Alcohol impairs motor function and cognition that presumably creates behavioral changes thereby altering the risk for injury. However, the intersection of alcohol use, impairment due to alcohol, and injury are complicated and not yet fully understood or developed (Hunt, 1993).

The individual traits of an alcohol-related injury, such as the cause of the injury and the context of the injury have added to the knowledge of how alcohol use may result in injury. A number of emergency department (ED) studies have examined alcohol involvement for specific causes of injuries but most have lacked representative populations necessary for comparative sampling. Of the studies using probability sampling in the ED, drinking-in-the-event varies significantly by cause of injury (Honkanen & Smith, 1990; Macdonald et al., 2006). Comparison of violence-related and non-violence related causes of injuries have received the most attention with those injuries related to violence more likely to be alcohol related (Borges, Macdonald, Cherpitel, Orozco, & Peden, 2009; Charalambous, 2002; Gawryszewski et al., 2008; Wathen et al., 2007).

Location, or context of an injury, prior to presentation to the ED has been given less attention in the literature though there is indication that drinking in public is associated with a higher incidence of heavier alcohol consumption and injury (Andreuccetti et al., 2012; Lloyd, Matthews, Livingston, Jayasekara, & Smith, 2013). Moreover, alcohol use has been implicated in up to 41% of recreational injuries (e.g., skiing, bicycle riding) though the rates vary considerably depending on the nature of the activity (Macdonald et al., 2013).

ED studies on injury cause and/or context have tended to focus on patient level traits with less consideration to societal influences though alcohol outlet density has been shown to be positively associated with violence-related injuries (Livingston, 2011). There is considerable evidence that effective alcohol policies can reduce cause of injury due to violence or motor vehicle accidents (Babor et al., 2010; Livingston, Chikritzhs, & Room, 2007; Popova, Giesbrecht, Bekmuradov, & Patra, 2009; Wagenaar, Tobler, & Komro, 2010; Wagenaar & Toomey, 2002). Similarly, alcohol policies aimed at limiting contexts where alcohol is consumed or sold have shown reductions in community alcohol consumption and harms (Popova, et al., 2009).

The present work will identify if alcohol-related injury contexts differ within cause of injury and if these associations change with restrictiveness of alcohol-related policies. This work adds to the extant literature on alcohol, injury and alcohol policy by examining cause of injury that is inclusive of violence-related injuries but also non-violence related causes that have not been traditionally examined. Additionally, injury contexts will include private and public contexts as well as contexts associated with drinking. We expect that higher rates of alcohol-related injuries will be found in contexts that promote or invite alcohol consumption (e.g., drinking establishments). Because prior work indicates that alcohol policy can effectively reduce violence-related injuries, it is expected that countries with more restrictive alcohol policies will have significantly lower rates of alcohol-related injuries for this cause of injury, especially in public venues. Though drinking in private settings is normative for some cultures, we do not expect that restrictive alcohol policies will predict alcohol-related injuries in this setting, regardless of the cause of injury.

Methods

This study examines probability samples of injured patients arriving within six hours of the event from studies conducted in 22 countries included in the Study [Study information removed for review]. Probability sampling was used in all studies to provide equal representation of each shift for each day of the week during the study period at each ED.

Patients ages 18 and over who presented to the ED were approached to participate in the study and those who were too severely injured upon arrival to the ED were approached in the hospital once they were stabilized and had the ability to consent. Response rates ranged from 76% to 92%. Reasons for non-study participation were refusal, incapacitation from injury, leaving the ED, language barriers, or police custody.

Patients agreeing to participate provided informed consent, were interviewed regarding the reason for the ED visit, the location where the injury occurred and the cause of the injury, as well as alcohol use via self-report within the six hours prior to the injury event. Other information obtained included a breathalyzer reading at the time of interview and the usual amount of alcohol consumed and the frequency of alcohol use within the past 12 months. All study procedures were reviewed and approved by each study's respective institutional review board.

Cause of injury—The cause of injury was based on patient self-report and given categorical assignment for the most prevalent reason of the injury. These categorical

assignments were broken down into 4 categories : 1) a fall or trip, 2) a stab, cut or bite, 3) being struck by or having a blunt force injury, and 4) other cause of injury. Additionally, all patients were asked if the injury was due to circumstances that involved getting into a fight, being beaten, raped, and/or attacked. These patients were coded as having experienced a violence-related, or intentional injury as the main cause of injury

Context of Injury—The context, or location of the injury, included private residence, licensed drinking establishment, workplace or school, a public place and other. Private residence was determined by indication of injury at either the patient's own home or the home of another, while a licensed drinking establishment included restaurant, bar, pub, tavern, hotel, nightclub or other drinking establishment. Public places included parks, beaches, recreations areas, sporting events, streets, and other public places.

A common cause of injury for many of the study participants was a vehicular accident. Because the cause and context of vehicular injury are virtually identical, patients presenting with this cause of injury are not included in the present analysis.

Alcohol-related policies—All studies included data collection on alcohol policies, matched in time to the respective ED study, and were obtained by documented sources (World Health Organization, 1999, 2004) (United Nations, 1992), country collaborators, and key stakeholders.

Table 1 shows alcohol policies and practices that fall into 3 of the 7 domains of best practices identified by Babor and colleagues (Babor, et al., 2010); drink-driving measures, limitations on alcohol availability and altering the drinking context. Sites such as the United States, Canada, Mexico and China reported differing policies either due to the length of time between the different studies in the same locality, or to regional variations in alcohol policies within the same country. Each policy was evaluated for the level of restrictiveness, and summed in the last column. Restrictiveness of drink-driving policy was determined by blood alcohol concentrations (BAC) levels at or below 0.05 percent concentration, random breathalyzer testing at roadside stops, restrictions on location of alcohol consumption, and moderate to high sanctions for intoxicated driving. Limitations on alcohol availability were identified if restrictions on off-premise alcohol sales were highly enforced, drinking establishment closing hours occurred at or before midnight, and the legal drinking age was at or above 18 years of age. Monitoring of drinking contexts was considered restrictive if at least moderate enforcement of sanctions for selling alcohol to minors in licensed establishments were enforced. Countries/locales were dichotomized by restrictive alcohol policies such that countries with three or fewer restrictive policies were classified as 'less restrictive' while countries with four or more restrictive policies were indicated as 'more restrictive'.

2.1 Data Analysis

Descriptive data in Tables 1 and Table 2 report the percentages of cause and context for injury patients while Tables 3 and 4 report the odds ratio of drinking the 6 hours prior to the injury event. All logistic regression models control for age, gender, employment status and education. Reported sample sizes were unweighted while reported percentages and odds

ratios were weighted. Weights were assigned to several studies to adjust for data that were not collected with equal representation of all shifts in a day across all days of the week. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 17.0.

3. Results

Table 2 displays the breakdown of cause and context of injury. Approximately a third of the patients reported a cause of injury from a fall or a trip (34%) followed by a 20.2% reporting an injury due to violence (Table 2). Fewer injury patients reported a cause of injury due to a stab, cut or bite (18%), a strike or blunt force trauma (15%), or other cause (12%). The most commonly reported contexts of an injury were in a private residence (34%) and in public places (29%) while injuries in a licensed drinking establishment were the least reported context (5%). Injuries caused by a stab, cut or bite most commonly occurred in private residences (48%) while injuries due to violence or a fall or trip were more often reported in public places (at 43% and 36%, respectively).

Figure 1 shows the percentage of those drinking alcohol in the 6 hours prior to the injury event for each injury cause, by context. A greater percentage of patients injured in licensed establishments reported drinking alcohol prior to the injury event within every injury cause category, ranging from 63% for a cut, burn, or gunshot injury to 80% for injuries caused by violence. The second most commonly reported injury context was in public places, ranging from 22% for a fall or trip to nearly 50% for a violence-related injury. Conversely, patients injured in the workplace or at school reported the lowest percentages of drinking prior to the injury event for all causes of injuries. Though percentages of those drinking prior to the injury varied for each cause of injury, the context of drinking was ranked in the same manner with patients in licensed drinking establishments having the highest prevalence of drinking prior to the injury, followed by a public place, private residence, other place of injury, and workplace or school.

Table 3 examines drinking in the 6 hours prior to the injury by context of injury for a given cause. Five logistic regression models were performed for each of the causes of injury. Using patients that were injured in a private residence as a reference category, patients injured in licensed establishments were significantly more likely to report drinking prior to the injury event while patients injured in the workplace or school were significantly less likely to report drinking prior to the injury event in every injury category. Patients with injuries in public places were no more or less likely to be drinking prior to the injury compared to patients injured in a private residence for all causes of injuries with the exception of cause of injury due to a cut, burn or gunshot.

To examine how the association between alcohol consumption and context of injury for each cause of injury was influenced by policies directed at reducing alcohol harms, models similar to Table 3 were conducted with the inclusion of an interaction term of restrictiveness of alcohol policies by injury context. Again, 5 models were conducted for each cause of injury and controlled for age, gender, employment status, and education. Each odds ratio represents the odds of drinking prior to injury based on less restrictive policies within each

injury context. To illustrate, patients reporting an injury caused by violence and injury in a private residence were 70% more likely to report drinking prior to the injury event in countries with less restrictive alcohol policies compared to patients with violence-related injuries injured in a private residence from countries with more restrictive alcohol policies. Similarly, patients from countries with less restrictive alcohol policies with a violence-related injury were 30% more likely to have been drinking prior to an injury that occurred in a public place than patients injured in public places in countries with more restrictive policies.

4. Discussion

Cause and context are key factors in understanding alcohol use and injury however, these factors are part of a much larger puzzle that includes the contribution of both micro and macro environments. This work relied on self-report of alcohol use in the 6 hours prior to injury event to identify alcohol use that was closest to the injury occurrence. Though a breathalyzer reading was also obtained at the time of the ED interview, this estimate was not used because of the time difference between drinking, injury, and arrival to the ED. Previous study of BAC and the number of drinks consumed among ED patients have found a linear relationship though false negatives (i.e., reporting alcohol use when a breathalyzer reading was zero) were more common (Bond et al., 2010).

Findings in Table 3 and Figure 1 suggest that alcohol-related contexts were similar across the causes of injuries. Unsurprisingly, drinking establishments were associated with high odds of alcohol-related injuries. The context of the workplace or school was significantly less likely to be alcohol related, regardless of the cause of injury. While the workplace is not traditionally a place to drink for most cultures, other reasons for lowered alcohol-related injury may be the result of non-attendance at work because of drinking related problems or being assigned duties with lowered injury risk due to drinking habits (Rehm et al., 2003). Interestingly, the odds of an alcohol-related injury in private residences did not significantly differ from injuries in public settings with the exception of injuries involving a cut, burn, or gunshot wound. More concise study of injury severity as well as injury cause would help to understand these causes of injury. Injuries due to violence in countries with less restrictive alcohol policies increased the odds of an alcohol-related injury in the context of public places. Countries with less restrictive policies may inadvertently encourage alcohol related injuries in public because there are fewer repercussions due to alcohol use such as the threat of a drinking and driving arrest or random breathalyzer stops. Unexpectedly, injuries due to violence sustained at a private residence in countries with less restrictive policies were *also* predictive of alcohol use prior to the injury event. The current work did not identify specific factors that may moderate the relationship between cause of injury, context of injury and alcohol policies but some other studies have looked at types of injury and how key demographic factors may change the nature of the injury. For example, in a study examining injury characteristics of victims of violence, Tingne and colleagues {, 2014 #12} found that women were more likely to be attacked by a spouse with a blunt object in a private setting while males were more likely be attacked in a public setting by a stranger with a sharp object. Moreover, this work indicates that intimate partner violence (IPV) may play a role in private residence injuries but we were unable with the present work to establish violence-

related injuries due to IPV vs. other types of violence-related injuries. Similarly, the cause of injury due to a fall has received more attention in recent years due to societal aging and higher risk of experiencing a fall that could result in an ED visit {Jojczuk, 2016 #25; Albert, 2017 #3}. Further work on the interaction of alcohol-related injury and sociodemographic aspects of injury could substantially inform policy at the country level.

Findings also showed that countries with restrictive alcohol policies were not associated with drinking prior to a violence-related injury in licensed drinking establishments. This may indicate that alcohol policies work to deter individuals from intentional violence; however, the data reported here can only examine those who already attended these establishments and were injured. Further study to parse out the relative impact of individual choice and behavioral change due to policy is needed to understand how to best enact and implement alcohol policy.

Limitations

The present work shows strength with a large, international and representatively sampled data set of ED patients yet weaknesses should be noted. Because we examined injury at a single time point, all significant findings show associations but are not causative and study participant information was based on self-report which includes the usual limitations of uncorroborated information. Though the ED patients were carefully sampled, the population may not be representative of the general population and population surveillance of cause and context may give different results from those presented here. Moreover, while we collected alcohol policy information during the time of the study, the information does not fully identify the level of enforcement of these policies. Vehicular cause and context were not included in the present paper but we felt that inclusion of alcohol policies that were directed at drinking and driving were important because they may alter the context of an alcohol-related injury (e.g., drinking at home rather than at a drinking establishment to avoid repercussions of drinking and driving). Finally, policy data were not exhaustive and future work should include pricing, taxes, education, prevention and awareness. Furthermore, categorizations of the injury cause were sometimes grouped differently for some studies (e.g., cut/stab were grouped together) and the level of injury severity was not collected. Groupings based on cause and severity would have allowed for more understanding of the cause of injury.

Conclusions and future directions

Clinicians in an ED setting take a tangible approach to injury and prioritize treatment of the condition(s) resulting from an injury while giving less attention to the causal factors that may have increased the likelihood for the presentation (Weiland, Dent, Phillips, & Lee, 2008). Evidence from the literature indicates that injuries occur most often when there is single occasion acute alcohol consumption than with alcohol dependence (Spurling & Vinson, 2005; Taylor et al., 2010). Thus, alcohol-related injury to self or others occurs across a broader population than only those that are high-risk heavy drinkers. Policies need to be implemented in a two pronged fashion with universal and prevention policies directed at the population at large while policies directed at intervention and treatment need to be directed toward heaviest of users (Stockwell & Giesbrecht, 2013). The policy information

we examined included passive strategies to deter alcohol misuse but a combination of both passive and active strategies (e.g., brief interventions) may best serve to reduce the risk of injury associated with drinking (Nilsen, Bourne, & Verplanken, 2008).

Additionally, qualitative expansion of injury in a larger context is needed to incorporate important elements of the where, who, how and when of an injury event (Phoenix & Howe, 2010) to allow us a better understanding into the interplay of alcohol and injury. Because policies are still undeveloped and under-resourced in most countries (Giesbrecht, Cherpitel, Room, & Stockwell, 2009), research needs to examine how communities incorporate and use alcohol so that the most efficacious policy measures can be implemented to reduce the harms due to alcohol (Swart & Seedat, 2001).

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References

- Andreuccetti, Carvalho, Korcha, Ye, Bond, & Cherpitel. (2012). A review of emergency room studies on alcohol and injuries conducted in Latin American and the Caribbean Region. *Drug and Alcohol Review*, 31(6), 737–746. doi: 10.1111/j.1465-3362.2012.00419.x [PubMed: 22340601]
- Babor, Caetano, Casswell, Edwards, Giesbrecht, Graham, Grube, Hill, Holder, Homel, Livingston, Österberg, Rehm, Room, & Rossow. (2010). *Alcohol: No Ordinary Commodity: Research and public policy* (2nd ed.). New York: Oxford University Press.
- Bond, Ye, Cherpitel, Room, Rehm, Borges, Cremona, Gmel, Hao, Sovinova, & Stockwell. (2010). The relationship between self-reported drinking and BAC level in emergency room injury cases: is it a straight line? *Alcoholism: Clinical and Experimental Research*, 34(6), 1118–1125. doi: 10.1111/j.1530-0277.2010.01188.x

- Borges, Macdonald, Cherpitel, Orozco, & Peden. (2009). Variation in alcohol-related injury by type and cause In Cherpitel CJ, Borges G, Giesbrecht N, Hungerford D, Peden M, Poznyak V, Room R & Stockwell T (Eds.), *Alcohol and Injuries. Emergency Department studies in an international perspective* (pp. 15–25). Geneva, Switzerland: World Health Organization.
- Charalambous. (2002). Alcohol and the accident and emergency department: a current review. *Alcohol Alcohol*, 37(4), 307–312. [PubMed: 12107029]
- Cherpitel. (1993). Alcohol and injuries: a review of international emergency room studies. *Addiction*, 88(7), 923–937. doi: 10.1111/j.1360-0443.1993.tb02110.x [PubMed: 8358264]
- Gawryszewski, da Silva, Malta, Kegler, Mercy, Mascarenhas, & Neto. (2008). Violence-related injury in emergency departments in Brazil. [Article]. *Lesiones relacionadas con la violencia en los servicios de emergencia de Brasil.*, 24(6), 400–408.
- Giesbrecht, Cherpitel, Room, & Stockwell. (2009). Alcohol policy and public health implications in a global perspective In Cherpitel CJ, Borges G, Giesbrecht NA, Hungerford DW, Peden M, Poznyak V, Room R & Stockwell T (Eds.), *Alcohol and Injuries. Emergency Department studies in an international perspective* (pp. 279–286). Geneva, Switzerland: World Health Organization.
- Honkanen, & Smith. (1990). Impact of acute alcohol intoxication on the severity of injury: a cause-specific analysis of non-fatal trauma. *Injury*, 21(6), 353–357. [PubMed: 2276795]
- Hunt. (1993). Neuroscience research: how has it contributed to our understanding of alcohol abuse and alcoholism? A review. *Alcohol Clin Exp Res*, 17(5), 1055–1065. [PubMed: 7506499]
- Livingston. (2011). A longitudinal analysis of alcohol outlet density and domestic violence. *Addiction*, 106(5), 919–925. [PubMed: 21205052]
- Livingston, Chikritzhs, & Room. (2007). Changing the density of alcohol outlets to reduce alcohol-related problems. *Drug & Alcohol Review*, 26(5), 557–566. doi: 781264020 [pii]10.1080/09595230701499191 [PubMed: 17701520]
- Lloyd, Matthews, Livingston, Jayasekara, & Smith. (2013). Alcohol intoxication in the context of major public holidays, sporting and social events: a time-series analysis in Melbourne, Australia, 2000–2009. [Article]. *Addiction*, 108(4), 701–709. doi: 10.1111/add.12041 [PubMed: 23134431]
- Macdonald, Cherpitel, DeSouza, Stockwell, Borges, & Giesbrecht. (2006). Variations of alcohol impairment in different types, causes, and contexts of injuries: results of emergency room studies from 16 countries. *Accident Analysis and Prevention*, 38(6), 1107–1112. doi: 10.1016/j.aap.2006.04.019 [PubMed: 16828047]
- Macdonald, Greer, Brubacher, Cherpitel, Stockwell, & Zeisser. (2013). Alcohol consumption and injury In Boyle P, Boffetta P, Lowenfels AB, Burns H, Brawley O, Zatonski W & Rehm J (Eds.), *Alcohol – Science, Policy and Public Health* (pp. 171–178). Oxford, UK: Oxford University Press.
- Nilsen, Bourne, & Verplanken. (2008). Accounting for the role of habit in behavioural strategies for injury prevention. [Article]. *International Journal of Injury Control & Safety Promotion*, 15(1), 33–40. doi: 10.1080/17457300701794253 [PubMed: 18344094]
- Phoenix, & Howe. (2010). Working the When, Where, and Who of Social Context: The Case of a Traumatic Injury Narrative. [Article]. *Qualitative Research in Psychology*, 7(2), 140–155. doi: 10.1080/14780880802571176
- Popova, Giesbrecht, Bekmuradov, & Patra. (2009). Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review. *Alcohol Alcohol*, 44(5), 500–516. doi: 10.1093/alcalc/agp054agp054 [pii] [PubMed: 19734159]
- Rehm, Rehn, Room, Monteiro, Gmel, Jernigan, & Frick. (2003). The global distribution of average volume of alcohol consumption and patterns of drinking. *European Addiction Research*, 9(4), 147–156. [PubMed: 12970583]
- Spurling, & Vinson. (2005). Alcohol-related injuries: evidence for the prevention paradox. *Annals of Family Medicine*, 3(1), 47–52. [PubMed: 15671190]
- Stockwell, & Giesbrecht. (2013). Strategies to prevent alcohol-related injury targeted to high-risk products, settings and populations In Cherpitel CJ, Borges G, Giesbrecht N, Montiero M & Stockwell T (Eds.), *Prevention of alcohol-related injuries in the Americas: from evidence to policy action* (pp. 149–158). Washington, DC: Pan American Health Organization.
- Swart, & Seedat. (2001). An epidemiological study of injury in a low socioeconomic context: implications for prevention. [Article]. *Injury Control & Safety Promotion*, 8(4), 241.

- Taylor, Irving, Kanteres, Borges, Cherpitel, Greenfield, & Rehm. (2010). The more you drink, the harder you fall: a systematic review and meta-analysis of how acute alcohol consumption and injury or collision risk increase together. *Drug and Alcohol Dependence*, 110(1–2), 108–116. [PubMed: 20236774]
- Treno, Gruenewald, & Ponicki. (1997). The contribution of drinking patterns to the relative risk of injury in six communities: a self-report based probability approach. *Journal Of Studies On Alcohol And Drugs*, 58(4), 372.
- United Nations. (1992). Statistical yearbook, thirty-seventh issue, 1988–89. New York: United Nations, Department of Economic and Social Development, Statistical Office.
- Vinson, Maclure, Reidinger, & Smith. (2003). A population-based case-crossover and case-control study of alcohol and the risk of injury. *Journal of Studies on Alcohol*, 64(3), 358–366. [PubMed: 12817824]
- Wagenaar, Tobler, & Komro. (2010). Effects of alcohol tax and price policies on morbidity and mortality: a systematic review. *American Journal of Public Health*, 100(11), 2270–2278. doi: 10.2105/AJPH.2009.186007 [PubMed: 20864710]
- Wagenaar, & Toomey. (2002). Effects of minimum drinking age laws: review and analyses of the literature from 1960 to 2000. *Journal of Studies on Alcohol and Drugs*(14), 206.
- Wathen, Jamieson, Wilson, Daly, Worster, & Macmillan. (2007). Risk indicators to identify intimate partner violence in the emergency department. *Open Med*, 1(2), e113–122. [PubMed: 20101295]
- Weiland, Dent, Phillips, & Lee. (2008). Emergency clinician-delivered screening and intervention for high-risk alcohol use: A qualitative analysis. [Article]. *Emergency Medicine Australasia*, 20(2), 129–135. doi: 10.1111/j.1742-6723.2007.01002.x [PubMed: 18377402]
- World Health Organization. (1999). *Global Status Report on Alcohol*. Geneva, Switzerland: World Health Organization.
- World Health Organization (2004). *WHO Global Status Report on Alcohol 2004* Geneva, Switzerland: Department of Mental Health and Substance Abuse, World Health Organization.

Figure 1.
Drinking prior to the injury by cause and context of injury, in percent.

Table 1.

Restrictive alcohol policies by country.

	Drink-driving countermeasures					Limitations on alcohol availability			Alteration of drinking context	Total # Restrictive policies
	Legal BAC limit 0.05	Conduct random breathalyzer screens	Open container laws	Moderate to high administrative sanctions for driving while intoxicated&	Restrictions on off-premise alcohol sales	Drinking establishment closing hours no later than midnight	Minimum Legal drinking age over 16	Moderate to high sanctions against drinking establishments for selling to minors		
Africa										
Mozambique	X					NA	X			2
South Africa	X						X			2
Asia										
China										
Changsha		X		X						2
Beijing, Changshu, Chenghu, Hangzhou,Hengyan	X	X		X			X			4
Korea	X	X		X			X	X		5
India	X		X	X	X	X	X	X		7
Australasia										
Australia	X	X		X			X	X		5
Europe										
Czech Republic	X	X		X			X	X		5
Ireland				X		X	X			3
Poland	X	X		X			X			4
Spain				X		X		X		3
Sweden	X	X		X	X	X	X			6
Switzerland	X	X		X	X					4
Latin America and Caribbean										
Argentina	X	X			X		X	X		5
Brazil				X		X	X	X		4
Dominican Republic	X	X	X				X	X		5

	Drink-driving countermeasures				Limitations on alcohol availability			Alteration of drinking context	
	Legal BAC limit 0.05	Conduct random breathalyzer screens	Open container laws	Moderate to high administrative sanctions for driving while intoxicated*	Restrictions on off-premise alcohol sales	Drinking establishment closing hours no later than midnight	Minimum Legal drinking age over 16	Moderate to high sanctions against drinking establishments for selling to minors	Total # Restrictive policies
Guyana		X		X			X	X	4
Mexico									
Mexico City				X	X		X		3
Acapulco				X	X		X		3
Pachuca				X			X		2
Mexico City				X			X	X	3
Nicaragua	X			X			X		3
Panama	X	X		X			X	X	5
Guatemala				X			X	X	3
North America									
Canada									
Alberta				X	X		X	X	4
Quebec				X	X		X	X	4
Ontario		X	X	X	X		X	X	6
Vancouver			X	X	X		X	X	5
United States									
San Francisco and Contra Costa County, California				X			X	X	3
Santa Clara, California				X			X	X	3
Jackson, Mississippi				X	X	X	X	X	5

NA=information not available

Table 2.

Percent breakdown of context of injury within each cause (N=17,110).

	Fall,trip n=5,814		Stab, cut, bite n=3,107		Struck, blunt force n=2,594		Violence n=3,435		Other n=2,140		Total percent by context
	n	%	n	%	n	%	n	%	n	%	
Private residence	1993	34.3	1500	48.3	659	25.4	951	27.5	718	33.6	34.0
Licensed establishment	169	2.9	107	3.4	97	3.4	487	14.1	22	1.0	5.1
Workplace/school	778	13.4	932	30.0	745	28.7	311	9.0	712	33.3	20.3
Public place	2114	36.4	294	9.5	526	20.3	1471	42.6	471	22.0	28.5
Other	760	13.1	274	8.8	577	22.2	235	6.8	217	10.1	12.1
Total percent by cause	34.0		18.2		15.2		20.2		12.5		

Table 3.

Logistic regression models for each cause of injury. Odds ratios reflect the odds of drinking in the 6 hours prior to the injury event[^].

	Fall/trip			Cut/burn/gunshot			Struck/blunt force			Violence			Other		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Private residence (ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Licensed establishment	16.1 ^{***}	10.7	24.1	9.4 ^{***}	6.1	14.5	10.4 ^{***}	6.2	17.5	4.7 ^{***}	3.5	6.2	18.7 ^{***}	6.9	50.4
Workplace/school	0.2 ^{***}	0.2	0.3	0.3 ^{***}	0.2	0.4	0.3 ^{***}	0.2	0.4	0.2 ^{***}	0.1	0.3	0.4 ^{***}	0.3	0.6
Public place	1.2	1.0	1.4	1.5 [*]	1.1	2.0	1.2	0.9	1.6	1.0	0.8	1.2	1.3	0.8	1.9
Other	0.4	0.3	0.5	0.4 ^{***}	0.3	0.7	0.2 ^{***}	0.2	0.4	0.6 ^{***}	0.4	0.8	1.3	0.8	2.1

[^] 5 models were conducted for each cause of injury. Models control for age, gender, employment status, and education.

* p<0.05

** p<0.01

*** p<0.001

Table 4.

Logistic regression models of the odds of drinking prior to injury. Odds ratios represent the odds of drinking prior to an injury in countries with less restrictive alcohol policies^{**}.

	Cause of injury									
	Fall		Cut/burn/gunshot		Struck/blunt force		Violence		Other	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
(ref=more restrictive policy countries within each injury context)										
Private residence	1.0	(0.8, 1.3)	1.2	(0.9, 1.6)	0.9	(0.6, 1.4)	1.7 ^c	(1.3, 2.3)	1.4	(0.8, 2.7)
Licensed establishment	1.7	(0.8, 3.8)	2.9 [~]	(1.0, 8.6)	0.5	(0.2, 1.5)	1.2	(0.7, 2.0)	4.3	(0.3, 59.2)
Workplace/school	1.3	(0.7, 2.6)	1.6	(0.9, 2.8)	1.1	(0.6, 1.9)	0.7	(0.3, 1.4)	1.2	(0.4, 3.2)
Public place	1.2 [~]	(1.0, 1.6)	1.2	(0.7, 2.1)	0.9	(0.6, 1.3)	1.3 ^a	(1.0, 1.6)	0.8	(0.3, 1.9)
Other	0.3 ^c	(0.2, 0.6)	0.2 ^c	(0.1, 0.5)	0.1 ^c	(0.1, 0.2)	0.9	(0.5, 1.7)	1.1	(0.7, 1.9)

^{**} 5 models were conducted for each cause of injury and controlled for age, gender, employment status, and education. Each odds ratio represents the odds of drinking prior to injury based on less restrictive policies within each injury context; e.g., patients from countries with less restrictive alcohol policies with violence-related injuries that occurred in a private residence were 1.7 times more likely to report drinking prior to the injury event than patients injured in a private residence from countries with more restrictive alcohol policies

[~] p<0.10

^a p < 0.05

^c p < 0.001