Drink-driving and perceptions of legally permissible alcohol use

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ABSTRACT

Objective

The leading cause of death for young people in developed countries is road traffic crashes, a large proportion of which are attributable to drink-driving. The aims of the study were to estimate the prevalence of drink-driving and drink-riding in a sample of New Zealand university students, and to identify potential risk factors, in particular, students' perceptions of legally permissible consumption before driving.

Methods

Participants were 1,564 survey respondents (82% response, mean age = 20.5 years) who were asked to indicate whether they had driven after having 'perhaps too much to drink to be able to drive safely', if they had been a passenger in a vehicle 'where the driver had perhaps too much to drink to be able to drive safely', and how many standard drinks they could consume in one hour and legally drive a car. An estimated blood alcohol concentration was computed and compared with legal limits.

Results

Drink-driving (past four weeks) was reported by 3.4% of women and 8.4% of men. Drinkriding (past four weeks) was reported by 7.0% of women and 11.5% of men. Estimated blood alcohol concentrations from students' reports of how much they could drink in one hour and be below the legal limit of 0.08g/ml, showed that most respondents dramatically underestimated permissible consumption; only 5.8% overestimated it.

Conclusions

This may be a case where misperception of a public health message serves the public good. Further reductions in drink-driving/riding will require attention to transport needs, more visible enforcement of existing legislation, and modification of youth drinking behavior.

KEY WORDS: drink-drive, drink-ride, perception, college, student, estimated BAC

INTRODUCTION

In 2001, drink-driving was identified by police as a contributing factor in 26% of fatal road traffic crashes in New Zealand (Land Transport Safety Authority, 2002), and the social cost of these crashes was estimated at \$620 million (Land Transport Safety Authority, 2001). One third of the fatally injured drink-drivers were aged 15-24 years, a group greatly over-represented among road traffic crash casualties in New Zealand (Kypri, Chalmers, & Langley, 2002; Kypri, Chalmers, Langley, & Wright, 2002).

The youth road toll remains high despite a range of prevention initiatives, including graduated driver licensing (introduced 1987), a low blood alcohol limit (0.03g/ml) for drivers under 20 years-old (1992), random breath alcohol testing (1993), and a long-running government advertising campaign on the health, legal, and social consequences of drink-driving (Land Transport Safety Authority, 2002). These kinds of prevention initiatives are used to varying degrees in most industrialized countries.

One group expected to be responsive to such efforts is university students, who fall into the target age group and have the ability to understand and act on the prevention messages. Recent research examining the drink-driving behavior of university students in 23 countries spanning Europe, Asia, Africa, and the Americas (but not Australasia), estimated the past-year prevalence of drink-driving at 20% for men and 7% for women (Steptoe et al., in press). Perhaps surprisingly, given the high prevalence of hazardous drinking among tertiary students in Australasia (Kypri, Langley, McGee, Saunders, & Williams, 2002; Roche & Watt, 1999; Wilks, 1989), research on this topic is limited to one study of a convenience sample, in which 26% of Australian students reported, in the past 12 months, being under the influence of alcohol while a designated driver (Stevenson et al., 2001). That study highlighted the problems of both drink-driving and being the passenger of a drink-driver (so-called "drink-riding").

The aims of this study were to estimate the prevalence of drink-driving and drink-riding at a large New Zealand university, and to identify individual factors associated with these behaviors.

METHODS

Sample and Procedures

The data used for this study came from an Internet-based survey of alcohol use among students at the Dunedin campus of the University of Otago. With approximately 17,000 students, Otago is the third largest of eight universities in New Zealand. Around 80% of students originate from outside of Dunedin (University of Otago Financial Services Division, 2003).

The sample and data collection procedures have been described in detail elsewhere (Kypri, Gallagher, & Cashell-Smith, 2004). In summary, a random sample of 1,910 university students aged 16-29 years was sent an invitation to participate in a web survey of their alcohol use. Responses were received from 1,564 students (82%), including 902 women and 662 men. The mean age of the respondents was 20.5 years (SD=2.5).

Possible non-response bias was assessed. Men were slightly less inclined to participate than women, but this difference had a negligible effect on the estimated prevalence of hazardous drinking or estimates of alcohol consumption (Kypri, Stephenson, & Langley, 2004). Late responders had higher scores on the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) than did early responders, but the effect on estimated hazardous drinking prevalence and consumption was also small (Kypri, Stephenson et al., 2004). The sample was representative of the wider Otago student population on several demographic variables.

Respondents were asked the following questions concerning drink driving and being the passenger of a drink-driver ("drink-riding"), based on measures previously developed (Begg, Langley, & Stephenson, 2003):

"In the past 4 weeks, how many times have you driven a car after you had perhaps too much to drink to be able to drive safely?"

"In the past 4 weeks, how many times have you been a passenger in a vehicle where the driver had perhaps too much to drink to be able to drive safely?"

Response categories for each of the above questions were: "zero", "once", "twice", "3 times", "4 times", "5-9 times" and "10 or more times". For the purpose of analysis, each of these variables was made dichotomous, with one or more instance of drink-driving or drink-riding coded as 1 and the remainder of respondents coded as 0.

Participants were also asked the following question: "How many standard drinks do you think you can consume in an hour and legally drive a car?" Extensive description of standard drink measures, including graphical illustrations, had been provided earlier in the questionnaire. A standard drink was defined as containing 10 grams of ethanol. In addition to the graphic illustrations were examples showing the number of drinks in common servings of alcohol, for example, "A jug of beer = 3 standard drinks". The illustrations and questionnaire can be viewed at http://ipru.otago.ac.nz/ausdemo.

Elsewhere in the questionnaire respondents were asked to indicate their gender and weight. These parameters, together with the response to the question concerning legally permissible consumption (converted to grams of ethanol), were used to compute an estimated blood alcohol concentration (EBAC) at the end of one hour. The calculation was based on the formula provided by the United States National Highway Traffic Safety Administration (NHTSA, 1994). A previous study comparing naturalistic breathalyzer results with EBACs computed from self-report the following day, revealed that the two measures were highly correlated (r=0.83), although not for BACs over 0.08g/ml (Carey & Hustad, 2002). Given the objective of the present study, to compute estimates for legal driving, i.e., at BAC levels no higher than 0.08, the limitation identified by Carey and Hustad (2002) is inconsequential.

For each respondent, the maximum permitted BAC for their age (0.03 for those aged <20 years, and 0.08 for those aged 20 years and over) was subtracted from their EBAC. The resulting figure is indicative of how much the respondent over- or under-estimated the amount of alcohol they could consume and legally drive a vehicle.

Analyses

Chi-squared statistics, p-values, risk ratios and associated 95% confidence intervals were calculated using the methods described by Armitage and Berry (Armitage & Berry, 1987). In the analysis of drink-driving, those with an AUDIT score of 0, which includes non-drinkers, were excluded from analyses of association between measures of drinking levels and drink-driving incidence. Multivariate analyses were not performed due to small numbers in some groups.

RESULTS

Drink-driving

Of the 1526 respondents for whom drink-driving data were available, 84 (5.5%) reported one or more episodes of drink-driving in the preceding four weeks. Table 1 presents demographic characteristics and alcohol use status, and their degree of association with drink-driving. Men were more likely to drink-drive than were women. Hazardous drinkers, as defined by an AUDIT score of 8-14, were more than three times as likely to drink-drive than moderate drinkers (AUDIT score 1-7), while harmful drinkers (AUDIT score 15+) had a risk more than five times that of moderate drinkers.

Drink-riding

Of 1526 respondents, 136 (8.9%) reported that they had been the passenger of a drink-driver in the preceding 4 weeks. Table 2 presents demographic characteristics and measures of drinking, and their degree of association with drink-riding. Men were more likely to have been a passenger of a drink-driver than were women. Harmful drinkers were over three times more likely to drink-ride than those who did not drink at all. In other analyses risk ratios were not statistically significant.

Estimates of Permissible Consumption for Legal Driving

Figures 1 and 2 show the distributions of estimates for 16-19 year-olds and 20-29 year-olds respectively. Eighty-three students (5.8%) over-estimated the amount they could consume and legally drive. Seventy-nine of them were under 20 years of age, therefore being subject to the 0.03 limit. Of the young drivers who over-estimated the amount of alcohol they could consume and then drive legally, 43 (54.4%) gave estimates that put them in the BAC range 0.03-0.04. Table 3 presents the characteristics of individuals who over-estimated permissible BACs. Notably, women were more likely than men to over-estimate permissible alcohol consumption levels. Individuals of "other" ethnicity were also at higher risk, while drinking status was not associated with over-estimation of permissible alcohol consumption. Finally, the tendency to over-estimate was not associated with self-reported drink-driving or drink-riding.

DISCUSSION

The four-week prevalence of drink-driving was 3% in women and 8% in men while drink-riding was reported by 7% of women and 11% of men. Male gender and drinking status were associated with each of these risk behaviors. Students of Maori ethnicity had a higher prevalence of drink-driving relative to those of European ethnicity. Only 83 respondents (5.8%) over-estimated how much alcohol they could consume and remain under the permissible BAC, and all but four of these were under 20 years of age, and therefore subject to the 0.03 limit. In contrast to the prevalence rates, women more often over-estimated legally permissible consumption, as did students of "other" ethnicity. Drinking status was unrelated to the tendency to over-estimate permissible consumption.

A study of drink-driving among university students in 23 countries revealed mean 12-month prevalence rates of 7% for women (range: Romania 1% to USA 28%) and 20% for men (range: Netherlands 6% to USA 43%) (Steptoe et al., in press). Rates of drink-driving for both men and women in this study were slightly lower than those reported by Dunedin 21 year olds in 1993/4 (women: 8% and men: 18%) (D. Begg, 1999). The measure used in the two studies was identical, although they are separated by approximately 11 years in time.

Strengths of the study include the use of random sampling and a high response rate, which together increase the reliability of prevalence estimates. The studies by Steptoe et al. (Steptoe et al., in press) and Stevenson et al. (Stevenson et al., 2001) were based on convenience samples, thus failing to rule out the possibility of biases resulting from coverage error and self-selection. Furthermore, computerized surveys have been shown to elicit higher reporting of stigmatized behaviors than pen-and-paper formats (Turner et al., 1998), thereby reducing a source of measurement error, though probably not eliminating it.

Other means of reducing measurement error include the use of validated instruments including reference periods which do not make unreasonable demands on memory. In this study we relied on the AUDIT, which has well known psychometric properties and is appropriate for young adults (Allen, Litten, Fertig, & Babor, 1997). The drink-driving/riding measures have also been used previously and were carefully developed (Begg, Langley, & Williams, 1999). The four-week reference period for the drink-driving questions is arguably more likely to elicit accurate recall than the 12-month reference period used in other studies (e.g. Steptoe et al. in press).

Limitations of the study include the small number of drink-drivers/riders, which made the precision of prevalence estimates relatively poor, and precluded multivariate analyses. The reliance on self-report introduces the possibility of social desirability effects, namely, the tendency for respondents to under-report socially stigmatized behaviors, such as drink-driving. This being the case, we would be under-estimating the true prevalence of drink-driving.

The results of this research compare interestingly with those of a study examining college student drinkers' ability to utilize a commercially available self-administered saliva test for estimating their BACs (Johnson & Voas, 2004). In apparent contrast to the present study, which revealed a tendency to false positives, users misinterpreted the results of the tests, producing a high false-negative rate. In addition, drinkers judged themselves to be less intoxicated having interpreted the test results relative to their pre-test estimate (Johnson & Voas, 2004). Together, the studies reveal a poor ability of drinkers to estimate their intoxication levels.

The results of the present study suggest that there may yet be work to do in educating a small proportion of teenage drivers, particularly females, about how little alcohol they can legally consume before driving. However, the majority of drivers under-estimate how much they can legally consume, by a big margin. In a previous study we found that university students overestimate the drinking levels of their peers, often dramatically (Kypri & Langley, 2003), a case of norm misperception (Prentice & Miller, 1993). We also found that the tendency to overestimate was positively related to the individual's consumption levels (Kypri & Langley, 2003), although causality could not be established. In New Zealand over the past decade there has been intensive public education on the subject of drink-driving, including levels of consumption likely to result in being over the permitted limit. The results of the present study may be a case where ignorance or misapplication of a public health message serves the public good, both in terms of reducing the potential for alcohol-involved road traffic crashes, and in moderating the alcohol consumption of those intending to drive. It is, however, possible that a proportion of individuals think (rightly or wrongly) they may be over the blood alcohol limit but drive anyway.

Given the consistent dose-response relationship of drinking status in drink-driving/riding, the findings reinforce the need to reduce hazardous drinking among university students. This need has been widely recognized in the USA (Taskforce of the National Advisory Council on Alcohol Abuse and Alcoholism, 2002) but remains a neglected public health problem in other countries, including New Zealand.

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	Drink	-driver in I	ast 4	Risk				
		weeks		χ2	р	ratio	(95% CI)	
	No	Yes	Yes					
	(n)	(n)	(%)					
Gender								
Female	852	30	3.4	17.75	0.000	1	reference	
Male	590	54	8.4			2.47	(1.60-3.81)	
Age (years)								
16-19	598	28	4.5	3.14	0.208	1	reference	
20-24	715	50	6.5			1.46	(0.93-2.29)	
25-29	129	6	4.4			0.99	(0.42-2.35)	
Ethnicity								
European	1017	55	5.1	5.80	0.055	1	reference	
Maori	195	19	8.9			1.73	(1.05-2.85)	
Other	230	10	4.2			0.81	(0.42-1.57)	
Type of Residence								
House sharing	904	62	6.4	4.46	0.108	1	reference	
Residential hall	302	11	3.5			0.55	(0.29-1.03)	
Other	236	11	4.5			0.69	(0.37-1.30)	
Drinking status (AUDIT score) *								
Moderate drinker (1-7)	431	8	1.8	28.54	0.000	1	reference	
Hazardous drinker (8-14)	482	30	5.9			3.22	(1.49-6.94)	
Harmful drinker (15+)	397	46	10.4			5.70	(2.72-11.93)	

Table 1. Driver characteristics associated with drink-driving

* Excludes participants with an AUDIT score of zero

	Passe	ngers of a	drink-	Risk			
	driver in last 4 weeks			χ2	р	ratio	(95% CI)
	No	Yes	Yes				
	(n)	(n)	(%)				
Gender							
Female	820	62	7.0	9.13	0.003	1	reference
Male	570	74	11.5			1.63	(1.18-2.26)
Age (years)							
16-19	561	65	10.4	3.12	0.210	1	reference
20-24	703	62	8.1			0.78	(0.56-1.09)
25-29	126	9	6.7			0.64	(0.33-1.26)
Ethnicity							
European	970	102	9.5	1.72	0.424	1	reference
Maori	197	17	7.9			0.83	(0.51-1.37)
Other	223	17	7.1			0.74	(0.45-1.22)
Type of residence							
House sharing	875	91	9.2	2.16	0.340	1	reference
Residential hall	284	29	9.1			1.00	(0.67-1.48)
Other	231	16	6.3			0.69	(0.42-1.16)
Drinking status (AUDIT score))						
Light Drinker (0)	126	6	4.5	30.08	0.000	1	reference
Moderate drinker (1-7)	419	20	4.6			1.00	(0.41-2.44)
Hazardous drinker (8-14)	466	46	9.0			1.98	(0.86-4.53)
Harmful drinker (15+)	379	64	14.4			3.18	(1.41-7.17)

Table 2. Passenger characteristics associated with drink-riding

						Risk	
	Overe	estimate	ed BAC	χ2	р	ratio	(95% CI)
	No	Yes	Yes				
	(n)	(n)	(%)				
Gender							
Female	767	64	7.7	13.69	0.000	1.00	reference
Male	592	19	3.1			0.40	(0.24-0.67)
Age							
16-19	513	79	13.3	106.68	0.000	1.00	reference
20-24	717	4	0.6			0.04	(0.02-0.11)
25-29	129	0	0.0			0.00	undefined
Ethnicity							
European	993	54	5.2	6.06	0.048	1.00	reference
Maori	198	11	5.3			1.02	(0.54-1.92)
Other	168	18	9.7			1.88	(1.13-3.13)
Drinking status (AUDIT s	core)						
Light drinker (0)	49	3	5.8	0.91	0.823	1.00	reference
Moderate drinker (1-7)	415	22	5.0			0.87	(0.27-2.82)
Hazardous drinker (8-14)	477	33	6.5			1.12	(0.36-3.53)
Harmful drinker (15+)	418	25	5.6			0.98	(0.31-3.13)
Self-reported drink-driving	g						
No	1277	81	6.0	1.87	0.171	1.00	reference
Yes	82	2	2.4			0.40	(0.09-1.60)
Self-reported drink-riding							
No	1238	73	5.6	0.94	0.333	1.00	reference
Yes	121	10	7.6			1.37	(0.73-2.59)

Table 3. Individual characteristics associated with over-estimation of legally permissible alcohol consumption for driving a motor vehicle



