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Undergraduate student drinking and related harms at an Australian university: web-based survey of a large random sample

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Abstract

Background: There is considerable interest in university student hazardous drinking among the media and policy makers. However there have been no population-based studies in Australia to date. We sought to estimate the prevalence and correlates of hazardous drinking and secondhand effects among undergraduates at a Western Australian university.

Method: We invited 13,000 randomly selected undergraduate students from a commuter university in Australia to participate in an online survey of university drinking. Responses were received from 7,237 students (56%), who served as participants in this study.

Results: Ninety percent had consumed alcohol in the last 12 months and 34% met criteria for hazardous drinking (AUDIT score ≥ 8 and greater than 6 standard drinks in one sitting in the previous month). Men and Australian/New Zealand residents had significantly increased odds (OR: 2.1; 95% CI: 1.9-2.3; OR: 5.2; 95% CI: 4.4-6.2) of being categorised as dependent (AUDIT score 20 or over) than women and non-residents. In the previous 4 weeks, 13% of students had been insulted or humiliated and 6% had been pushed, hit or otherwise assaulted by others who were drinking. One percent of respondents had experienced sexual assault in this time period.

Conclusions: Half of men and over a third of women were drinking at hazardous levels and a relatively large proportion of students were negatively affected by their own and other students' drinking. There is a need for intervention to reduce hazardous drinking early in university participation.

Trial registration: ACTRN12608000104358

Background

A high prevalence of hazardous drinking by university students has been reported in many countries [1-3] with this population group often drinking more than their non-university/college student peers [4-7]. In large-scale national surveys in the United States, 37-44% of students report binge drinking (more than five standard drinks per occasion; each containing 12 g ethanol) in the previous two weeks [8-10] with men drinking more than women, although this difference has narrowed over time [10-12]. Among New Zealand (NZ) university

students, 37% have reported one or more binge episodes in the previous week [13].

Factors within the university environment contribute to these high levels of consumption leading to a range of negative consequences [5,7,14]. These include: social, physical and psychological harms to the student e.g. academic impairment, blackouts, injury, suicide, unintended sexual activity and sexual coercion; harm to other people including interpersonal and sexual violence; and costs to the institution such as property damage and student attrition [13,15-21]. The secondhand effects of people's drinking on others are also assuming greater importance for advocacy in alcohol control policy, both for the victims experiencing assaults, sexual violence

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and impacts on studying [18,22] and for the wider community experiencing litter, noise and vandalism [23].

Australian studies report between 70-96% of university students regularly consume alcohol [24-29] with 50% drinking to intoxication at least weekly [30,31]. However, previous studies have relied on convenience samples [24-39] and most are at least a decade old [24-33,38]. The one Australian study that used a random sample [40] surveyed only international students and therefore is not generalizable to all university students. This study found, that 66% consumed alcohol and 2% drank five standard drinks or more per occasion once or more a week.

There is significant support for the use of the Internet to collect epidemiological data particularly among university populations [41-45]. Online surveys permit fast application and wide accessibility [46,47]. With their capacity for interactivity, automaticity, respondent anonymity and cost effectiveness [48-50], ability to facilitate more honest and thoughtful responses [42,51] and good validity and reliability [43,52-57], a carefully conducted online survey may help overcome many of the barriers associated with collecting epidemiological data [58-60]. Unlike the proportionate cost to attain large sample sizes using traditional modes of survey implementation, marginal costs are low and therefore they are advantageous for large sample sizes [59,61]. In addition, unique features such as complex logic and branching [62] and real-time error checking and automated data entry [63] allow statistical processing to occur in real time [64]. This enables web-survey technology to deliver concurrent feedback interventions [65]. It may be ethically obligatory when surveys identify harmful behaviours among respondents to provide feedback. This may be an efficient option given that provision of immediate feedback in this context has been shown to change behaviour [65,66].

As part of a larger efficacy trial of a web-based alcohol screening and brief intervention [65,67], this study estimated the frequency and quantity of alcohol consumption, and prevalence of hazardous drinking and secondhand effects among a large sample of undergraduate students attending a university in Perth, Western Australia.

Methods

Participants

A random sample of 13,000 undergraduate students aged 17-25 years, enrolled full-time and studying on campus at a Western Australian university, were invited to complete a web survey on alcohol consumption, secondhand effects, attitudes toward nutrition/ingredient labeling [68] and tobacco use [69]. Women made up

52.4% of the sample and 20.6% were non-residents. The term 'non-resident' refers to students enrolled at the university that are not permanent residents of Australia or New Zealand and includes those on student visas and humanitarian visas.

Procedure

We adopted a survey recruitment procedure described in detail elsewhere [59,65,67,70]. Four weeks after the start of the first semester of 2007 the University Surveys Office accessed the enrolment database to identify a random sample of 13,000 full-time undergraduates aged 17-25 years. A personally addressed letter from the research team was sent to each student, inviting them to participate in the survey. The letter explained that they would soon receive a hyperlink to the questionnaire in an email message, that responses would be confidential and that the research team was independent of the university administration. Students were offered the opportunity to win one of 40 AU\$100 gift vouchers for participating. After 1 week, a reminder email was sent encouraging completion of the questionnaire to those who had not yet responded. A second reminder was sent 10 days later.

Measures

The questionnaire included items on: past alcohol use [71]; current alcohol use [Alcohol Use Disorders Identification Test (AUDIT) [72]]; peak consumption in the previous 4 weeks [73]; height and weight (in order to estimate Blood Alcohol Concentration); secondhand effects of drinking [22]; attitudes toward nutrition/ingredient labelling on alcohol packaging [68]; and tobacco use [74]. The use of standardised instruments for measuring personal use [Alcohol Use Disorders Identification Test (AUDIT) [72]] and secondhand effects [22] make it comparable to studies carried out in other countries. The complete wording and layout of all items can be seen at: <http://lamp.health.curtin.edu.au/thrive/baselinetest.php>.

Data analysis plan

Descriptive statistics were computed for the following: demographic data [age (17-19, 20-25 year olds), sex, and citizenship (Australian and NZ residents, non-residents)] of respondents and the sample; early or late response to the survey; the quantity and frequency of alcohol use; AUDIT scores; and the number of secondhand effects. Three AUDIT subscale scores were calculated to measure alcohol consumption (AUDIT items 1-3), dependence (items 4-6) and problems (or adverse consequences) (items 7-10) [72,75]. Total AUDIT scores were divided into four ordinal categories: moderate (0-

7), hazardous (8-15), harmful (16-19), and dependent (20-40) [72]; and binary categories of hazardous (≥ 8) and non-hazardous (< 8).

The representativeness of responders to the random sample was assessed using chi-squared tests. The association between participant demographics and being either early or late responder, or to having an AUDIT score ≥ 8 , was assessed using chi-squared tests. T-tests were used to compare the mean AUDIT measure for the three subscales (alcohol consumption, dependence and problems) against participant age, sex, and citizenship and to compare total AUDIT score between early and late responders.

The association of secondhand effects experience to participant demographics and frequency of consuming six or more drinks on one occasion (item three in the AUDIT [72]) was also assessed using chi-squared tests. The association between frequencies of consuming six or more drinks (60 g ethanol) on secondhand effects was assessed using multivariable logistic regression after adjusting for gender, age and citizenship. Results are presented as odds-ratio and associated 99% confidence intervals.

The associations between age, sex and citizenship and hazardous drinking were analysed using binary logistic regression. To protect against small effects being considered as being statistically significant due to the large sample size in the study, p -values of < 0.01 will be considered as statistically significant. The assumptions behind the statistical models fitted were assessed to ensure validity of results.

This study received ethical approval from Curtin University [HR 189/2005] and is registered with the Australian and New Zealand Clinical Trial Register [ACTRN12608000104358].

Results

Of the 13,000 students invited, 7,237 responded (56% response rate) with 57% of these being women ($n = 4123$) and 16.2% non-Australian/NZ residents ($n = 1172$). The mean age of the respondents was 19.5 years ($SD = 1.9$).

There was a higher representation of women, Australian/NZ residents and those aged 17-19 years among the survey respondents compared to the sample ($p < 0.001$) (see Table 1). The small differences (less than 5%) between early (before the second reminder) and late (after the second reminder) survey responders in relation to age, citizenship and gender were not significant. There was also no significant difference in mean AUDIT score between early and late survey responders.

Consumption characteristics

Ninety percent of respondents had consumed alcohol in the last 12 months, with a mean volume per typical occasion of 5.1 ($SD = 5.0$) standard drinks for women and 8.7 ($SD = 8.6$) for men. The National Health and Medical Research Council (Australia) thresholds for acute harm (40 g/60 g ethanol for women/men) [76] were exceeded at least once in the last 4 weeks by 48% of respondents.

A significantly higher mean AUDIT score ($p < 0.001$) was observed for men (8.6; $SD = 6.9$) than women (6.5; $SD = 5.9$); and for Australian/NZ residents (8.1; $SD = 6.4$) than non-residents (3.5; $SD = 4.6$). There was not a significant difference ($p = 0.730$) between 17 and 19 year olds (7.7; $SD = 6.4$) and 20-25 year olds (7.0; $SD = 6.5$). There were significant differences in the proportions scoring 8 or higher on the AUDIT (see Table 2) with 44.5% of 17-19 year olds versus 39.1% of 20-25 year olds ($p < 0.001$), 50.6% of men versus 35.7% of women ($p < 0.001$) and 47.0% of residents versus 16.5% of non-residents ($p < 0.001$). Men and Australian/NZ residents had significantly increased odds (OR: 2.1; 95% CI: 1.9-2.3; OR: 5.2; 95% CI: 4.4-6.2) of being categorised as dependent (AUDIT score 20 or over) compared to women and non-residents.

Men had higher odds of drinking at hazardous levels compared to women (OR: 2.0; 95% CI: 1.8-2.2). Australian/NZ residents had higher odds compared to non-residents (OR: 5.1; 95% CI: 4.3-6.0) and the association with age was non-significant ($p = 0.113$).

Table 1 Demographic comparison of responders vs. study sample and early vs. late responders

		Sample N = 13000	Responders N = 7237	p -value	Early responder N = 4627	Late responder N = 2610	p -value
Demographic characteristic		% (N)	% (N)		% (N)	% (N)	
Age	17-19	48.6 (6321)	54.7 (3956)	< 0.001	53.3 (2465)	57.1 (1491)	0.020
	20-25	51.4 (6679)	45.3 (3281)		46.7 (2162)	42.9 (1119)	
Gender	Female	52.4 (6811)	57.0 (4123)	< 0.001	57.5 (2660)	56.1 (1463)	0.024
	Male	47.6 (6189)	43.0 (3114)		42.5 (1967)	43.9 (1147)	
Citizenship	Aust/NZ	79.4 (10322)	83.8 (6065)	< 0.001	84.5 (3909)	82.6 (2156)	0.370
	Non-Aust/NZ	20.6 (2678)	16.2 (1172)		15.5 (718)	17.4 (454)	

Significantly higher mean AUDIT scores ($p < 0.001$) were observed for men and Australian/NZ residents compared to women and non-residents in all AUDIT subscales (shown in Table 2). There were significant differences in relation to age in the AUDIT Consumption subscale with higher mean scores for 17-19 year olds compared to 20-24 year olds, but not the other subscales.

Secondhand effects

The 4-week prevalence of secondhand effects is shown in Table 3. The most commonly reported effects were having to 'baby-sit' inebriated students (27.2%); having studying or sleep interrupted (20.9%); being insulted or humiliated (12.9%); having a serious argument (12.5%); or experiencing an unwanted sexual advance (10.9%).

Men were more likely than women to experience being 'pushed, hit or otherwise assaulted' (8.7% vs. 4.8%; $p < 0.001$) and to have been a victim of another crime off campus (2.8% vs. 1.8%; $p = 0.007$) while women were more likely to experience an unwanted sexual advance (13.8% vs. 7.1%; $p < 0.001$) and to have had to 'baby-sit' or take care of another student who had too much to drink (28.8% vs. 25.1%; $p = 0.001$). Those aged 17-19 years were more likely than 20-25 year olds to have had a serious argument (13.7% vs. 11.1%; $p = 0.001$); been assaulted (7.2% vs. 5.6%; $p = 0.005$); had to 'baby-sit' another student (31.9% vs. 21.6%; $p < 0.001$); had their studying or sleep interrupted (22.1% vs. 19.4%; $p = 0.004$) or to have experienced unwanted sexual advances (12.1% vs. 9.5%; $p = 0.001$).

There was a significant difference based on citizenship for most secondhand effects with Australian/NZ residents more likely than non-residents to have had a serious argument or quarrel (13.2% vs. 9.4%; $p < 0.001$); had to baby-sit another student (28.8% vs. 19.0%; $p < 0.001$) or to have experienced an unwanted sexual advance (11.9% vs. 5.8%; $p < 0.001$). Non-residents on the other hand were more likely to have had their studying or sleep interrupted (25.0% vs. 20.1%; $p < 0.001$); been a victim of sexual assault (2.1% vs. 0.8%); been a victim of another crime on campus (2.2% vs. 0.6%; $p < 0.001$) and were almost twice as likely to have found vomit in the halls or bathroom of their residence (10.0% vs. 5.6%; $p < 0.001$). The odds of experiencing most secondhand effects increases with increasing frequency of consuming six or more drinks (60 g ethanol) on one occasion, after adjusting for gender, age and citizenship. Being a victim of sexual assault, and being a victim of another crime on and off campus are not significantly associated with the frequency of this level of alcohol consumption (see Table 4).

Discussion

This study is the first known prevalence study of student drinking completed in Australia with undergraduate students. The vast majority of students were current drinkers (90%) and there was a high prevalence of hazardous drinking (48%), with a higher prevalence among men compared with women, and in Australian/NZ residents compared with non-residents. A relatively

Table 2 AUDIT subscale scores and hazardous drinking (AUDIT Score \geq 8) by demographic characteristics

Demographic characteristic	AUDIT Subscales			AUDIT Score \geq 8 % (N)	
	AUDIT Consumption ^a Mean (SD)	AUDIT Dependence ^b Mean (SD)	AUDIT Problems ^c Mean (SD)		
Age	17-19	4.8 (SD = 3.3)	0.8 (SD = 1.4)	2.1 (SD = 2.8)	44.5 (1762)
	20-25	4.3 (SD = 3.2)	0.8 (SD = 1.4)	1.9 (SD = 2.8)	39.1 (1284)
	<i>p</i> -value	< 0.001	0.587	0.35	< 0.001
Gender	Female	4.0 (SD = 3.0)	0.7 (SD = 1.2)	1.8 (SD = 2.6)	35.7 (1471)
	Male	5.3 (SD = 3.5)	1.0 (SD = 1.6)	2.3 (SD = 3.0)	50.6 (1575)
	<i>p</i> -value	< 0.001	< 0.001	< 0.001	< 0.001
Citizenship	Aust/NZ	5.0 (SD = 3.2)	0.9 (SD = 1.4)	2.3 (SD = 2.9)	47.0 (2853)
	Non-Aust/NZ	2.3 (SD = 2.6)	0.4 (SD = 1.0)	0.8 (SD = 1.9)	16.5 (193)
	<i>p</i> -value	< 0.001	< 0.001	< 0.001	< 0.001

^a Consists of AUDIT items 1-3: How often do you have a drink containing alcohol (0-4); How many drinks containing alcohol do you have on a typical day when you are drinking (0-4); and How often do you have six or more drinks no one occasion (0-4) [Total range 0-12]

^b Consists of AUDIT items 4-6: How often during the last year have you found that you were not able to stop drinking once you had started (0-4); How often during the last year have you failed to do what you normally expected from you because of drinking (0-4) and How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session (0-4) [Total range 0-12]

^c Consists of AUDIT items 7-10: How often during the last year have you had a feeling of guilt or remorse after drinking? (0-4); How often during the last year have you been unable to remember what happened the night before because you had been drinking? (0-4); Have you or someone else been injured as a result of your drinking? (0-4); Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down? (0-4) [Total range 0-16]

Table 3 Secondhand effects experience by demographic characteristics

Secondhand effects	Age			Gender			Citizenship		
	17-19	20-25	p-value	Female	Male	P-value	Aust/NZ	Non	p-value
	% (N)	% (N)		% (N)	% (N)		% (N)	% (N)	
Been insulted or humiliated	13.6 (535)	12.1 (396)	0.070	12.2 (500)	13.9 (431)	0.027	13.4 (207)	10.7 (124)	0.015
Had a serious argument or quarrel	13.7 (541)	11.1 (362)	0.001	12.6 (518)	12.4 (385)	0.808	13.2 (794)	9.4 (109)	< 0.001
Been pushed, hit or otherwise assaulted	7.2 (283)	5.6 (181)	0.005	4.8 (195)	8.7 (269)	< 0.001	6.7 (403)	5.3 (61)	0.074
Had your property damaged	8.3 (325)	7.0 (227)	0.039	7.2 (296)	8.3 (256)	0.098	7.5 (452)	8.6 (100)	0.185
Had to 'baby-sit' or take care of another student who had drunk too much	31.9 (1256)	21.6 (706)	< 0.001	28.8 (1184)	25.1 (778)	0.001	28.8 (1742)	19.0 (220)	< 0.001
Found vomit in the halls or bathroom of your residence	6.5 (257)	6.0 (196)	0.364	5.6 (231)	7.2 (222)	0.008	5.6 (337)	10.0 (116)	< 0.001
Had your studying or sleep interrupted	22.1 (872)	19.4 (633)	0.004	21.5 (884)	20.1 (621)	0.128	20.1 (1215)	25.0 (290)	< 0.001
Experienced unwanted sexual advances	12.1 (474)	9.5 (310)	0.001	13.8 (565)	7.1 (219)	< 0.001	11.9 (717)	5.8 (784)	< 0.001
Been a victim of sexual assault	0.9 (35)	1.1 (36)	0.358	0.9 (36)	1.1 (35)	0.289	0.8 (47)	2.1 (24)	< 0.001
Been a victim of another crime on campus	0.8 (30)	1.1 (35)	0.165	0.8 (34)	1.0 (31)	0.448	0.6 (39)	2.2 (26)	< 0.001
Been a victim of another crime off campus	2.4 (93)	2.0 (66)	0.328	1.8 (74)	2.8 (85)	0.007	2.1 (125)	2.9 (34)	0.067

large proportion of students' experienced secondhand effects from other people's drinking.

The survey had a response rate of 56%, which is higher than large college surveys in the early 2000s in the United States (52%) [10], but lower than online surveys in New Zealand using similar procedures (63-82%) [13,59]. Higher response rates for online surveys have been linked to pre-notification, personalised contacts and follow up reminders [77]. Both this and the New

Zealand studies incorporated pre-notification, personalised emails and follow-up notices. However, the earlier New Zealand study used up to nine follow-up contacts (compared to five in this study) including a telephone reminder, which may explain some of the difference. Follow-up notices are likely to increase response rates though larger numbers of notices may not appreciably affect response if the contact develops resistance to participation [78]. It is also possible that the novelty factor

Table 4 Effects* of frequency of consuming six or more drinks (60 g ethanol) on secondhand effects

Secondhand effect	Frequency of consuming six or more drinks (cf Never)		
	Less than monthly OR (99% CI)	2-4 times a month OR (99% CI)	> 2 times a week OR (99% CI)
Been insulted or humiliated	1.39 (1.03-1.90)	1.88 (1.35-2.62)	2.57 (1.88-3.51)
Had a serious argument or quarrel	1.95 (1.36-2.79)	3.15 (2.16-4.60)	5.97 (4.19-8.52)
Been pushed, hit or otherwise assaulted	1.18 (0.76-1.85)	1.54 (0.95-2.49)	3.02 (1.96-4.64)
Had your property damaged	1.66 (1.11-2.47)	2.23 (1.45-3.44)	2.68 (1.77-4.05)
Had to 'baby-sit' or take care of another student who had drunk too much	1.96 (1.56-2.47)	2.81 (2.18-3.62)	3.66 (2.87-4.66)
Found vomit in the halls or bathroom of your residence	1.51 (0.97-2.34)	2.50 (1.56-4.01)	3.58 (2.29-5.60)
Had your studying or sleep interrupted	1.44 (1.12-1.86)	2.32 (1.77-3.06)	3.26 (2.51-4.23)
Experienced unwanted sexual advances	2.11 (1.46-3.05)	2.86 (1.93-4.24)	5.38 (3.72-7.79)
Been a victim of sexual assault (this includes date rape)	0.79 (0.31-1.97)	0.88 (0.29-2.69)	1.62 (0.63-4.17)
Been a victim of another crime on campus	0.65 (0.24-1.76)	0.77 (0.22-2.63)	1.56 (0.57-4.26)
Been a victim of another crime off campus	0.96 (0.48-1.89)	1.33 (0.63-2.79)	1.74 (0.88-3.45)

*Results are presented as odds-ratio and associated 99% confidence intervals after adjusting for gender, age and citizenship in multivariable logistic regression

of online surveys may have reduced in the years since the New Zealand studies and factors such as proliferation of junk mail, bombardment with online questionnaires and demands on student time may also have impacted on response rates [47].

The level of alcohol consumption reported in this study is less than that reported in New Zealand, for both men and women [13]. Although gender convergence in drinking has been reported elsewhere [10-12,79] and a similar trend appears to be occurring in Australia [80], this study shows a large discrepancy between men and women. However, there are no older prevalence studies from which to assess attenuation trends.

Large numbers of people were affected by other students' drinking. Of particular note was the 0.9% (n = 36) of women and 1.1% (n = 35) of men who reported being a victim of sexual assault in the previous 4 weeks. This is slightly higher than that found in a New Zealand sample [81] though with overlapping confidence intervals. While the New Zealand sample was limited to those who had consumed alcohol in the previous 4 weeks, our sample included non-heavy drinkers and may highlight the impact that hazardous alcohol consumption can have on all students. Extrapolated to the entire student population this may mean approximately 140 students at this university experience sexual assault in this context each month.

A limitation of this study was the imprecision in the specificity of crimes listed in the secondhand effects questions and the reliance on respondents to attribute responsibility for the effect. As only yes or no responses were available, multiple experiences of the same effect were not captured and therefore the prevalence of these effects may be underestimated. Given the high prevalence of some of these effects further research in this area is warranted. Our estimates may be biased by selective non-response but conversely computerised questionnaires are known to increase reporting of high-risk behaviour [42,51].

Universities with large on-campus resident populations may have higher levels of drinking than commuter universities due to students' greater proximity to peers [82]. As this study is based on a single commuter university and has a high proportion of students on temporary visas, the findings may be limited in their generalisability.

This study highlights the need for university programs to target drinking in this population. With half of male, and over a third of female, respondents drinking at hazardous levels, population approaches are needed. The literature suggests that programs should also address environmental factors, particularly the

availability and promotion of alcohol on and around campus [22,83].

Conclusions

Hazardous alcohol use among undergraduate students remains an issue of concern although there is a lack of prevalence data on this population's alcohol consumption in Australia. Some alcohol related harms such as sexual assault are only detected with large population samples. Web-based surveys are a cost-effective approach for measuring health behaviours in student populations, with a relatively high response rate. It is suggested that this research is replicated in other Australian universities, particularly residential campuses. Such surveys are required to develop trend data which will facilitate intervention program development.

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Authors' contributions

JH carried out the study and drafted the manuscript. PH, AM, KK and BM conceived of the study and participated in its design and coordination. SD participated in the design of the study and performed the statistical analysis. PH, BM, KK and AM helped to draft the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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