

1 **TITLE: Alcohol consumption and associated harms among university students in Australia: findings**
2 **from a cross-sectional study**

3 **RUNNING TITLE:** Students alcohol consumption and harms

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19 **CONFLICT OF INTEREST**

20 The authors declare no conflict of interest.

21

22 **ABSTRACT**

23 **Issue addressed:** University students regularly report alcohol consumption in excess of Australian
24 guidelines for harm. However, previous studies have overlooked the experiences of mature-aged
25 students. This study assessed alcohol consumption and alcohol-related harms among university
26 students aged 18-50 years old in Australia.

27 **Methods:** Cross-sectional online survey with convenience sample of university students. Unadjusted
28 ordinal logistic regressions were performed to explore associations between student characteristics
29 and frequency of alcohol consumption as well as number of standard drinks consumed. Logistic
30 regressions adjusted for student characteristics were performed to assess associations between
31 alcohol consumptions and alcohol-related harm.

32 **Results:** Of the respondents (n=486), 82% consumed alcohol, of which 50% consumed more than two
33 standard drinks on any day. Age was significantly associated with amount consumed and blackout.
34 Students aged 31-50 years were less likely to consume more than two standard drinks on any day
35 (odds ratio, OR: 0.62, 95% confidence interval (95%CI): 0.40, 0.97); and less likely to experience
36 blackout (OR: 0.45; 95%CI: 0.25, 0.83) than those aged 18-20 years. Interestingly, reducing
37 consumption to no more than once a month, when compared to more than twice a month, reduced
38 risk of blackout only for those aged less than 31-50 years old (adjusted OR: 0.22; 95% CI: 0.04, 1.13).

39 **Conclusions:** Older university students are less likely to drink more than two standard drinks on any
40 day than their younger counterparts.

41 **So what?** It is recommended that interventions target younger students, however, older students may
42 assist in understanding factors that influence low risk alcohol consumption.

43

44 **Keywords:** Alcohol, University students, Alcohol-related-harms

45

46 **INTRODUCTION**

47 Prevalence of current alcohol consumption in Australia is one of the highest globally,¹ with three in
48 every four (77%) Australians reporting consumption of alcohol in the past 12 months.² This is similar
49 to Australian university studies which have reported that between 70% and 90% of students
50 consumed alcohol in the past 12 months.³⁻⁶

51

52 In Australia, the health and societal costs of alcohol harms are estimated to be about \$14 billion.⁷ The
53 Australian National Health and Medical Research Council Alcohol Guidelines to reduce health risks
54 (AAG) recommend consuming no more than two standard drinks on any day to reduce the risk of
55 alcohol-related disease or injury over lifetime, or no more than four standard drinks on any occasion
56 to reduce risk of injury or death on that occasion.⁸ The recently revised draft AAG propose there is no
57 level of alcohol consumption that can be recommended as safe and there is no global consensus on
58 safe levels of alcohol consumption.⁹

59

60 Although the proportion of Australians who exceeded the alcohol lifetime risk guidelines from 2013
61 to 2016 declined by 1%, the proportion that frequently consumed high levels of alcohol (consuming
62 11 or more drinks at least once a month) remained the same.² However, alcohol consumption varied
63 across age groups with 42% of 18-24 year olds reporting drinking at a single occasion risky level (more
64 than 4 standard drinks at least once a month); 36% of 25-29; 32% of 30-39; and 30% of those aged 40-
65 49 years.⁹

66

67 Australian university students report consuming alcohol in excess of the AAG^{4, 5} with an average of
68 five and nine standard drinks commonly consumed on any occasion by female and male students,
69 respectively.³ Drinking in excess of the AAG has been associated with the need for medical attention
70 and hospitalisation due to alcohol related injury, along with verbal and physical abuse, feelings of fear,
71 emotional and sexual harm^{2, 10} and unprotected and regretted sex among university students.¹¹
72 Despite awareness of related health risks, a perceived inescapable Australian drinking culture,
73 enhanced social status and motivation to become intoxicated have been reported as key reasons for
74 alcohol consumption among younger (<25 years old) university students.¹² The drinking behaviour of
75 older students is less studied but may provide insights into development of adequate policy at
76 universities and the wider communities to reduce alcohol consumption.

77

78 A number of strategies such as encouraging alternatives to alcohol; controls on promotion of alcohol;
79 resources for policy implementation; and developing policy for the local contexts, have been put

80 forward to reduce alcohol-related harm amongst young Australian university students¹³. There is need
81 to also investigate the alcohol consumption of mature-aged university students and the associated
82 alcohol-related harms and responses. Understanding older university students drinking behaviour
83 may help to shape targeted and more effective policy or interventions at university settings to reduce
84 alcohol consumption and alcohol-related harms. This study aimed to assess alcohol consumption and
85 alcohol-related harms among a group of Australian university students aged 18-50 years.

86

87 **METHODS**

88 *Study design and setting*

89 This online cross-sectional study was conducted at an Australian metropolitan university. An email
90 invitation to participate was sent to 3,000 randomly selected students aged 18 -50 years by the
91 University's Office of Strategy and Planning, who had access to students' email addresses. To recruit
92 a representative sample of students, the researchers worked in consultation with the office, which is
93 responsible for analysis and projection of student data, and were able to provide the appropriate
94 sample size considering the university student population profile using stratified sampling technique.
95 The strata included various ages group (young; mature-aged students), gender (male; female; others
96 or prefer to not say), country of birth (Australia; other countries), education level (undergraduate;
97 postgraduate). The initial email contained information about the study, participants' rights and a link
98 to access the online questionnaire which was administered through Qualtrics XM. The anti ballot-
99 stuffing option was enabled in Qualtrics to prevent duplicate entries. The IP addresses were also
100 checked to ensure the 'Prevent ballot box stuffing' option worked. The unique participant identifiers
101 were also checked to ensure there were no duplicate entries. None of the completed survey was a
102 duplicate. The instrument was tested for face and content validity using an expert panel comprised
103 health promotion academics and practitioners and university students.¹⁴ Relevant questions were
104 extracted from previously validated questionnaires retrieved from an extensive literature review.¹⁴
105 The panel assessed the questionnaire to ensure the questions informed the objectives.¹⁴ Reliability
106 test was conducted with a sample of university students (intraclass correlations range from 0.57 to
107 0.90) indicating adequate level of reliability.¹⁴ Non-respondents were sent follow up emails at one
108 week and ten days after the original message, which contained a copy of the original link to the survey
109 and information about the study. Participant consent was provided prior to completing the online
110 questionnaire. Ethics approval was received from the University Human Research Ethics Committee
111 (approval number: DHS-272-15).

112

113 *Variables*

114 Collected data included demographic characteristics (age, gender, country of birth, education level,
115 self-rated health) and tobacco use. These are the independent variables. The dependent variables
116 were alcohol consumption (frequency of alcohol consumption; number of standard drinks on any day)
117 as well as alcohol-related harms (regretted sex; blackout; injury). To reduce participant burden,
118 hazardous alcohol consumption was assessed via a subscale of the Alcohol Use Disorders Identification
119 Test (AUDIT)¹⁵, the three item AUDIT-C scale to assess hazardous alcohol consumption or active
120 alcohol disorders. The three items are: 1) “How often do you have a drink containing alcohol?”; 2)
121 “How many standard drinks containing alcohol do you have on a typical day?”; and 3) “How often do
122 you have six or more drinks on a single occasion?” (to assist participants in reporting consumption, a
123 standard drinks chart was included in the survey to help them understand the concept of standard
124 drinks). An additional two questions from the full AUDIT were asked which relate to harmful
125 consumption: 8) “How often during the last year have you been unable to remember what happened
126 the night before because you had been drinking?” (blackout); and 9) “Have you or someone else been
127 injured as a result of your drinking?” (injury). Consistent with previous research¹⁰⁻¹², a question was
128 included regarding unwanted sex because of alcohol consumption (regretted sex) from the Second
129 Australian Study of Health and Relationships¹⁶ and the 2013 National Survey of Australian Secondary
130 Students and Sexual Health.¹⁷

131

132 *Statistical analysis*

133 Descriptive statistics were generated for student characteristics. Since the aim was to assess levels of
134 alcohol consumption and associated alcohol-related harms, not to identify hazardous drinkers only,
135 total score of the AUDIT-C was not calculated nor analysed. Instead, frequency of alcohol consumption
136 was re-categorised into ‘never drank’; ‘less than or once a month’; ‘at least twice a month’. The
137 number of standard drinks on any day was re-categorised into ‘none’; ‘one to two standard drinks’
138 (within AAGs for lifetime risk); and ‘more than two standard drinks’. Questions regarding alcohol-
139 related outcomes (regretted sex, blackout, injury) were coded as binary variables (yes; no).
140 Unadjusted ordinal logistic regressions were performed to explore associations between student
141 characteristics and frequency of alcohol consumption and number of standard drinks consumed on
142 any day while unadjusted logistic regressions were performed to assess associations between student
143 characteristics and presence of the alcohol-related harm (blackout, regretted sex and injury)
144 individually. For each student characteristic, the sub-category that had the highest percentage was set
145 as the reference group in the models. To determine associations between alcohol consumption and
146 the associated harms for university students of different age groups, only the outcome variable

147 significantly associated with age in the univariate model was selected for further analyses. Similarly,
148 student characteristics that were found to be significantly associated in the univariate models with
149 both alcohol consumption and the selected outcome variable were adjusted in the final logistic
150 regression models to assess associations between alcohol consumption and the associated harm.
151 Since all of the never drinkers did not experience alcohol-related harms, a small number (randomly
152 determined by the statistical software) of the never drinkers were randomly selected and recoded as
153 experienced alcohol-related harms to provide an estimate for the effect of being an abstainer. Listwise
154 deletion was applied in the models for variables with missing values. All statistical analyses were
155 performed using Stata IC 14.2. Significance level was set at 0.05.

156

157 **RESULTS**

158 Of the 486 participants (response rate 16.2%: 486/3,000), half (49%) were aged between 21 and 30
159 years, and were mostly female (67%), undergraduate students (79%), with most self-reporting their
160 health as at least fair (92%) (Table 1). In the past 12 months, 82% of participants reported consuming
161 alcohol, 54% consumed alcohol at least twice a month and 50% consumed more than two standard
162 drinks on any day (Table 1). As a result of alcohol consumption, 43% experienced regretted sex, 35%
163 experienced blackout, and 12% experienced injury.

164

165 Older students (aged 31 to 50 years old), non-Australian students and postgraduate students were
166 less likely to consume alcohol and high number of alcohol drinks on any occasion (Table 1). While
167 gender and self-rated health were not found to be significantly associated with alcohol consumption,
168 students who were current smokers were more likely to consume more standard drinks (OR: 2.43; p-
169 value = 0.021).

170

171 Non-Australian students were less likely to experience all alcohol-related harms (Table 1).
172 Postgraduate students were less likely to report regretted sex (OR: 0.41; p-value = 0.001) and blackout
173 (OR: 0.29; p-value <0.001) compared to undergraduate students. Students who rated their health as
174 excellent/very good were less likely to report regretted sex (OR: 0.58; p-value = 0.007) than students
175 who reported good/fair health. However, students who were current smokers were more likely to
176 have regretted sex (OR: 2.72; p-value = 0.006) and experience blackout (OR: 2.04; p-value = 0.048)
177 compared to non-smokers (Table 1).

178

179 Across all age groups, consuming fewer standard drinks was significantly associated with lower
180 likelihood of blackout when compared to consuming more than two standard alcoholic drinks on any

181 occasion (Table 2). After adjustment for student characteristics, likelihood of blackout was lower
182 across all age groups ($p < 0.05$). A similar trend was observed for consuming alcohol less frequently
183 albeit the risk reduction was not significant for students aged 31 years old and above (AOR: 0.22; p -
184 value = 0.07).

185

186 **DISCUSSION**

187 Studies between 2012 and 2017 which reported prior 12 month alcohol consumption among
188 university students showed that consumption remained relatively high, between 70% and 90%.^{3-6, 13}
189 Prevalence of alcohol consumption among the cohort in the present study is comparable and remains
190 high with 82% of students reporting alcohol consumption in the past 12 months and 50% consuming
191 alcohol at levels above the AAG for lifetime risk of harm (more than two standard drinks on any day).
192 These findings are consistent with those from previous Australian studies^{5, 13, 18} and reinforce
193 recommendations for appropriately resourced, tailored interventions, in the university setting which
194 integrate harm reduction strategies with comprehensive local policy that incorporates alcohol pricing
195 strategies, reduced availability and marketing^{13, 18-21} to combat an alcogenic environment and positive
196 norms towards high levels of alcohol consumption among young students. This study found older
197 students (aged 31-50) were less likely to consume a high number of standard drinks on any day.
198 Previous research reports that mature-aged drinkers (aged 30-49) were more likely to switch to low-
199 alcohol drinks or stop drinking than those aged 18-24.² Understanding the motivators of such changes
200 in behaviour may provide insights into the development of appropriate targeted university
201 interventions to reduce alcohol consumption in the future.

202

203 As expected, the risk of alcohol-related disease and injury increases with the quantity of alcohol
204 consumed on any day.¹ In a broader context, as there is no safe level of alcohol consumption,¹ findings
205 from current study reinforce the need for ongoing public health commitment to raise awareness of
206 the AAG with the intent to reduce alcohol-related harm from consumption above the recommended
207 guidelines, particularly on young drinkers. This includes the need for personalised communications¹⁸
208 about alcohol associated harms because it has been found that concern for one's own health has
209 prompted at least 48% of recent drinkers who consumed at least one serve of alcohol in last 12 months
210 to take action and reduce their alcohol consumption.² These efforts need to work synergistically to
211 combat ongoing and high exposure to alcohol advertising, which has been shown to increase the
212 likelihood of consuming alcohol.²² As people in their thirties were more likely to reduce the amount
213 they drank per session,² they may aid in the design of personalised communications for younger
214 drinkers to reduce their alcohol intake.

215

216 This was a cross-sectional survey and therefore was unable to report any causal effect. This indicates
217 the need for longitudinal studies that can establish the temporal ordering between alcohol
218 consumption and alcohol-related harms. A key limitation of this study is the low response rate of 16%,
219 which may suggest bias and limit the generalisability of our findings. Nevertheless, similar response
220 rates (5% and 15%) have been reported for other cross-sectional studies targeting university
221 students.²³ The current cohort also had similar characteristics as other university students.²³⁻²⁴
222 Additionally, variables (such as country of birth) were adjusted in this study to reduce potential
223 confounding bias. Another strength of the study was the inclusion of mature-aged students as
224 previous studies were primarily focused on young students. Future studies may recruit a more
225 representative sample when exploring associations of other factors, including stress or work/study
226 load during the semester, and their drinking behaviour in order to guide tailored, setting-based
227 interventions.

228

229 **CONCLUSION**

230 This study adds to the body of evidence that older university students drink less than their younger
231 counterparts. Encouraging adherence to the AAG to reduce associated harms amongst university
232 students amidst a prevailing Australian alcohol drinking culture is challenging, but could be assisted
233 by the experience of mature-aged university students. Findings reinforce the need for ongoing funding
234 and resources for tailored, setting-based public health interventions, such as at universities, to reduce
235 harms from alcohol consumption.

236

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- 298

299 **TABLE CAPTIONS**

300 Table 1: Summary statistics of student characteristics (n=486) and associations between student
301 characteristics and alcohol consumption (frequency of alcohol consumption; number of standard
302 drinks on any day) as well as alcohol-related harms (regretted sex; blackout; injury)

303 Table 2: Association between alcohol consumption and blackout by age groups with odds ratio (OR)
304 and 95% confidence interval (95% CI) reported

305