

# Who are Australia's young heavy drinkers? a cross-sectional population study

Sarah Callinan,<sup>1\*</sup> Alexandra Torney,<sup>1</sup> Michael Livingston,<sup>1,2</sup> Gabriel Caluzzi,<sup>1</sup> Amy Pennay<sup>1</sup>

<sup>1</sup>Centre for Alcohol Policy Research, La Trobe University, Melbourne, Australia

<sup>2</sup>National Drug Research Institute, Curtin University, Perth, Australia

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## Abstract

**Objective:** In light of the recent declines in youth drinking, the socio-demographic correlates of (1) annual total alcohol consumption (volume) and (2) monthly single occasion risky drinking among underage young people (14–17-year-olds) and young adults (18–24-year-olds) were examined.

**Methods:** Cross-sectional data were drawn from the 2019 National Drug Strategy Household Survey (n=1,547). Multivariable negative binomial regression analyses identified the socio-demographic correlates of total annual volume and monthly risky drinking.

**Results:** Those who spoke English as first language reported higher total volume and rates of monthly risky drinking. Not being in school predicted total volume for 14–17-year-olds, as did having a certificate/diploma for 18–24-year-olds. Living in affluent areas predicted a greater total volume for both age groups, and risky drinking for 18–24-year-olds. Young men in regional areas and working in labour and logistics reported higher total volume than young women in the same groups.

**Conclusions:** There are important differences among young heavy drinkers related to gender, cultural background, socio-economic status, education, regionality and work industry.

**Implications for public health:** Prevention strategies that are sensitively tailored towards high risk groups (e.g. young men in regional areas and working in trade and logistics) may be of public health benefit.

**Key words:** alcohol, youth drinking, risky drinking

In a promising trend for public health, youth drinking in Australia has declined markedly over the past twenty years. Prior to the COVID-19 pandemic in 2019, the National Drug Strategy Household Survey (NDSHS) reported its highest abstinence rates and lowest rates of risky drinking among young people aged 15–24.<sup>1</sup> However, alcohol remains the leading cause of preventable illness and injury in Australia for 15–24-year-olds<sup>2</sup> and early indications suggest alcohol-related harms have not decreased for young people alongside reductions in consumption.<sup>3</sup> Therefore, it is important that research and policy efforts continue to examine heavy drinking practices and explore sensitive ways of reducing the likelihood of harmful drinking among young drinkers.

Longitudinal research suggests that heavy drinking during adolescence is correlated with heavy drinking during adulthood and alcohol-related problems over the life course.<sup>4,5</sup> Efforts to delay the onset of heavy drinking have, therefore, been a key tenet of preventative efforts in Australia.<sup>6,7</sup> With drinking rates changing so markedly over the past 15 years, heavy drinking is now a minority

behaviour rather than the norm for adolescents.<sup>8,9</sup> Thus, an updated profile of which young people are continuing to engage in heavy drinking practices is needed. Research suggests that young individuals are more likely to drink episodically; however, recent trends have shown that young people (especially underage young people) have progressively been drinking less over time in terms of both quantity and frequency.<sup>9</sup> Therefore, including measures of both total consumption and single occasion risky drinking is important to get a good idea of how youth drinking has changed.

A range of factors can increase the likelihood of heavy drinking for young people. For example, research has identified key personality traits linked with heavy drinking for young Australians.<sup>10,11</sup> Parental heavy drinking, lax alcohol-related monitoring and poor alcohol-related communication are also associated with drinking among adolescents.<sup>12</sup> Peer norms<sup>13,14</sup> and alcohol-related policies<sup>15,16</sup> can also influence drinking rates among young people. There are also socio-demographic influences that have historically been correlated with heavy youth drinking, such as gender, cultural background and

### \*Correspondence to:

e-mail: [s.callinan@latrobe.edu.au](mailto:s.callinan@latrobe.edu.au).

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socio-economic status.<sup>17,18</sup> Research from Victoria in 2008 identified the correlates of very heavy drinking (20 or more standard drinks for men and 11 for women) for 16–24-year-olds. These included age (increasing up to 21 years), gender (decreasing for women relative to men after 21 years) and cultural background (higher for those who spoke English as their first language), and while no association was identified with socio-economic status, those living in remote or regional postcodes were more likely to be heavy drinkers.<sup>18</sup> However, these analyses are more than a decade old and focused on heavy episodic drinking at a level that is increasingly uncommon now. With significant changes to young people's drinking practices over the past fifteen years, it is important to re-examine heavy young drinkers in Australia to inform appropriate public health initiatives.

Recent analyses suggest that the top 5% of drinkers consume more than a third of Australia's alcohol.<sup>19</sup> Therefore, reducing the drinking of heavy drinkers is likely to have a significant impact on the rates of alcohol-related harm. With this in mind, it is important that policy efforts strategically target heavy drinkers to maximise the likelihood of real benefit. Contemporary work on heavy drinking groups led by the Victorian Health Promotion Foundation has emphasised the need to look beyond whole-of-population policies and instead focus on ways to target heavy drinking sub-groups, such as through particular settings (e.g. school or university) or social worlds (e.g. occupations).<sup>20,21</sup> Furthermore, the possibility that there are interactions between some of these key variables is yet to be assessed. Therefore, the examination of heavy drinkers within demographic groups, in this case, younger drinkers, is currently considered particularly important.

To this end, this study investigated.

- 1 The socio-demographic correlates of annual total alcohol consumption and
- 2 The socio-demographic correlates of monthly single occasion risky drinking (five or more standard drinks) for 14–17 and 18–24-year-olds, reflecting young people below and above the legal drinking age.
- 3 The possibility of an interaction between these correlates when predicting alcohol consumption.

## Methods

### Design

This paper is based on cross-sectional survey data. Outcome variables are based on alcohol consumption, and we have a range of demographic variables as predictor variables.

*Participants:* We used data from the 2019 NDSHS,<sup>1</sup> a national population study of alcohol and other drug uses undertaken every three years. Multi-stage stratified area random sample design was used to identify participating households. The household member aged 14 or older with the next birthday was asked to participate in the study. If that person was unavailable or declined, the next house was sampled. Respondents were able to complete the questionnaire online, on paper or over the phone. The 2019 sample size was 22,274 and the response rate was 49.0%.<sup>1</sup> This is similar to previous waves.<sup>22,23</sup> Given our focus on young people, only data for 14–24-year-olds were included (n=1,547). Please see [Supplementary Table 1](#) for a STrengthening the Reporting of OBServational studies in Epidemiology.(STROBE) checklist.

### Measures

*Outcome variables:* The NDSHS survey includes questions on alcohol, tobacco and illicit drug use, as well as a wide range of socio-demographic questions. Using the graduated frequency approach, respondents were asked whether in the last 12 months they had consumed various quantities of alcohol (e.g. 1–2 drinks, 3–4 drinks, all the way to 20+ drinks) and how often they had consumed these drinks (e.g. every day, 5–6 days a week, all the way to once a month, less often and never).

#### Annual total volume of alcohol

Using the graduated frequency questions, the mid-point of every volume group (e.g. a volume of 15 is used for the 11–19 drinks category) is multiplied by the mid-point of every frequency group (e.g. for 5–6 days per week, a frequency of 5.5\*52 was used). If a respondent reported more than 365 drinking occasions across the last 12 months, then their heaviest 365 drinking occasions were used.<sup>24</sup>

#### Single occasion risky drinking

Using the same set of graduated frequency items, people were classified as single occasion risky drinkers if they reported consumption of more than four standard drinks in a day at least monthly (as per the part of the National Health and Medical Research Council guidelines that refer to consuming no more than four standard drinks in a day; 7).

#### Predictor variables

##### Language

Respondents were asked to provide their first language spoken at home. Potential answers included English, Aboriginal and/or Torres Strait Islander languages and Language other than English. For the purpose of the current study, the variable was split into English as first language or English not as first language.

##### Sex

Respondents were asked “what is your sex?”. Responses could include male, female or the option to write in “other”. 115 respondents reported their sex as ‘other’ in the 2019 NDSHS survey. However, these people's responses to this question are not included in the NDSHS dataset available to researchers as the sample size for ‘other’ sex was too small for reliable estimates—as such they will be missing for any multivariable analysis involving gender.<sup>25</sup>

##### Age

Respondents gave their age and this was converted into a dichotomous variable.<sup>14-24</sup>

##### Geographic classifications

Residential postcodes were linked to the Socio-Economic Indexes for Areas index of relative disadvantage, which reflects the level of socio-economic disadvantage in an area. Rankings range from 1 (most disadvantaged) to 5 (most advantaged).<sup>26</sup> Region was calculated using the Australian Statistical Geography Standard<sup>27</sup> and designated as metropolitan, inner regional and outer regional/remote.

##### Employment

Industry was categorised using the Australian and New Zealand Standard Classification of Occupations.<sup>28</sup> To generate response

**Table 1: Annual total volume (mean and median) and monthly single occasion risky drinking (%) for 14–17-year-olds, and 18–24-year-olds, by socio-demographic subgroup (NDSHS, 2019).**

14–17-year-olds	N	Annual total volume (absolute alcohol, mL) Mean, 95% CI	Annual total volume (absolute alcohol mL) Median	Monthly single occasion risky drinking (5+), 95% CI
<b>Total</b>	597	91.2 (38.9, 143.5)	0.0	11.5 (8.9%–14.7%)
<b>Male</b>	290	113.0 (1.3, 225.0)	0.0	11.0% (7.5%–15.7%)
<b>Female</b>	307	67.1 (37.8, 96.4)	0.0	12.1% (8.5%–16.8%)
<b>14</b>	135	19.4 (-6.4, 45.3)	0.0	2.2% (0.1%–7.1%)
<b>15</b>	116	35.2 (-1.5, 72.0)	0.0	5.0% (1.9%–12.6%)
<b>16</b>	168	107.9 (44.6, 171.2)	0.0	13.2% (0.8%–20.4%)
<b>17</b>	178	203.7 (10.1, 397.3)	3.0	26.0% (19.0%–34.3%)
<b>Seifa 1 (lowest)</b>	114	182.6 (49.0, 414.3)	0.0	11.9% (6.7%–20.4%)
<b>Seifa 2</b>	114	94.2 (27.6, 160.8)	0.0	16.1% (9.7%–25.9%)
<b>Seifa 3</b>	99	56.4 (4.1, 108.8)	0.0	7.9% (3.6%–16.7%)
<b>Seifa 4</b>	110	47.8 (21.3, 74.3)	0.0	10.7% (5.9%–18.8%)
<b>Seifa 5 (highest)</b>	160	66.3 (26.3, 106.4)	0.0	10.6% (6.7%–16.4%)
<b>Still in school</b>	531	53.3 (33.2, 73.5)	0.0	9.9% (7.4%–13.1%)
<b>Not in school</b>	36	624.9 (-88.9, 1338.8)	54.0	27.7% (14.4%–46.6%)
<b>English first language</b>	499	105.9 (43.6, 168.2)	0.0	12.6% (9.7%–16.2%)
<b>English not first language</b>	73	3.6 (-1.0, 8.1)	0.0	0% (N/A—No obs)
<b>Metropolitan</b>	424	91.9 (14.9, 168.8)	0.0	9.5% (6.8%–13.1%)
<b>Inner regional</b>	101	73.3 (27.0, 119.5)	0.0	15.0% (9.1%–23.5%)
<b>Outer regional/remote</b>	72	131.3 (29.5, 233.1)	0.0	15.8% (7.5%–30.2%)
18–24-year-olds		Annual total volume (absolute alcohol, mL) Mean, 95% CI	Annual total volume (absolute alcohol mL) Median	Monthly single occasion risky drinking (5+), 95% CI
<b>Total</b>	1547	452.8 (407.4, 498.2)	163.5	51.6% (48.7%–54.4%)
<b>Male</b>	731	584.2 (509.9, 658.6)	231.0	58.6% (54.5%–62.6%)
<b>Female</b>	816	307.5 (262.1, 352.9)	120.0	43.8% (39.9%–47.8%)
<b>18</b>	211	365.1 (256.2, 474.0)	138.0	48.6% (40.7%–56.6%)
<b>19</b>	206	395.2 (274.4, 516.0)	132.0	44.2% (35.9%–52.8%)
<b>20</b>	204	460.8 (343.9, 577.7)	156.0	50.6% (43.0%–58.2%)
<b>21</b>	205	416.3 (322.9, 509.6)	186.0	53.1% (45.4%–60.7%)
<b>22</b>	237	468.4 (324.2, 612.5)	150.0	45.6% (38.8%–52.8%)
<b>23</b>	239	558.9 (443.1, 674.7)	217.5	59.8% (52.7%–66.4%)
<b>24</b>	245	451.7 (339.0, 564.3)	172.5	55.6% (48.5%–62.5%)
<b>Seifa 1 (lowest)</b>	319	378.2 (296.3, 460.1)	132.0	48.1% (41.8%–54.4%)
<b>Seifa 2</b>	285	507.9 (374.2, 641.6)	156.0	48.8% (42.2%–55.4%)
<b>Seifa 3</b>	283	381.8 (288.9, 474.6)	138.0	47.3% (40.7%–54.1%)
<b>Seifa 4</b>	327	484.1 (392.7, 575.5)	174.0	56.0% (49.7%–61.9%)
<b>Seifa 5 (highest)</b>	333	512.6 (411.5, 613.7)	207.0	57.5% (51.4%–63.4%)
<b>Less than Year 12</b>	128	382.9 (237.3, 528.5)	126.0	42.1% (32.7%–52.1%)
<b>Completed Year 12</b>	553	440.7 (369.3, 512.1)	150.0	49.8% (44.9%–54.6%)
<b>Certificate or diploma</b>	486	503.0 (422.8, 583.2)	207.0	58.0% (52.8%–63.0%)
<b>Bachelors or higher</b>	283	406.9 (295.3, 518.5)	138.0	50.0% (43.6%–56.2%)
<b>English first language</b>	1259	484.7 (437.8, 531.6)	207.0	57.3% (54.1%–60.5%)
<b>English not first language</b>	240	237.2 (108.0, 366.4)	12.0	22.1% (16.5%–29.1%)
<b>Metropolitan</b>	1138	407.3 (357.7, 457.0)	138.0	48.8% (52.1%–66.4%)
<b>Inner regional</b>	242	575.2 (451.7, 698.7)	231.0	59.5% (52.1%–66.4%)
<b>Outer regional/remote</b>	167	633.6 (447.0, 820.2)	236.5	62.2% (52.3%–71.2%)
<b>Labour/logistics</b>	189	626.9 (486.8, 766.9)	333.0	66.3% (58.1%–73.7%)
<b>Professional/administrative</b>	272	527.9 (396.7, 659.1)	186.0	57.2% (50.5%–63.7%)
<b>Healthcare services</b>	131	302.1 (215.8, 388.4)	126.0	45.9% (36.3%–55.7%)
<b>Hospitality/retail</b>	441	432.7 (357.5, 507.9)	182.5	53.2% (47.8%–58.5%)

categories with a sufficient sample size for the paper's analyses, we collapsed these into four groups: Labour and Logistics (Agriculture, Forestry, Fishing; Mining; Manufacturing Electricity, Gas, Water and Waste Services; Construction; Wholesale Trade; Transport, Postal and Warehousing); Professional and Administrative (Information Media and Telecommunication; Financial and Insurance Services; Rental, hiring and Real Estate services; Professional, Scientific and Technical; Administrative and Support Services; Public Administration and Safety; Education and Training; Arts and Recreation Services); Healthcare Services (Health Care and Social Assistance); Hospitality and Retail (Retail Trade; Accommodation and Food Services). A fifth category was additionally created, that included all respondents who were not able to be categorised into an industry due to missing or incomplete responses (514 participants). Please note, while this category has been added to all models, the results for this category are not shown so that these respondents are not omitted from the models.

**Analysis:** Analyses were undertaken in Stata 14,<sup>29</sup> using the 'svy' command to adjust for the complex survey design. Missing data on all variables ranged from 0 to 6.25%, cases with missing data on any variable were excluded from the relevant analyses. The one exception to this was the question on professional industry where 42.4% of all respondents failed to answer. As noted above, these respondents are retained by generating a missing category that is included in the models but not shown in results. All analyses were weighted to correct for disproportionate representation of age, sex and region compared to estimates from the Australian Bureau of Statistics.

Due to the skewed nature of data and high proportion of respondents who did not consume any alcohol, multivariable negative binomial regression analyses were undertaken to estimate the relationship between the socio-demographic variables and both total alcohol consumed and single occasion risky drinking. To aid in ease of interpretability, all results in the analyses are presented in the form of incidence-rate ratios. To check if the relationship between the alcohol and socio-demographic variables was affected by gender, interactions between gender and all other predictor variables were also run. As there was insufficient power to include all of these interactions in one model, a separate model per variable was generated with a given variable and an interaction between said variable and gender. Due to the low number of English as a Second Language (ESL), respondents 14–17 year olds who participated in risky drinking this model could not be run and was not included in our analyses. Holm's sequential Bonferroni method was to adjust the levels of significance and correct for multiple testing for our thirteen interaction models. Accordingly, we sorted the interaction effects by significance level—the highest p value was compared to a p value of 0.05/13, the next to a p value of 0.05/12 and so on.

## Results

Table 1 displays the mean annual drinks consumed and rates of monthly single occasion risky drinking for 14–17-year-olds and 18–24-year-olds, by socio-demographic subgroup. In 2019, Australians aged 14–17 years consumed a mean of 91 drinks in the past year. This was significantly lower than young adults aged 18–24 years, who averaged 453 drinks in the past year. Just over one in ten (12%) 14–17-year-olds participated in single occasion risky drinking at least

**Table 2: Negative binomial regression analyses examining the socio-demographic predictors of annual total volume and monthly single occasion risky drinking for 14–17-year-olds, and 18–24-year-olds (NDSHS, 2019).**

14-17-year-olds	Annual total volume		Monthly single occasion risky drinking (5+)	
	(absolute alcohol, mL)			
	IRR	95% CI	IRR	95% CI
14–15 years	(ref)		(ref)	
16–17 years	9.69***	4.05, 23.2	4.81***	2.16, 10.70
Male	(ref)		(ref)	
Female	0.78	0.38, 1.61	1.07	0.65, 1.75
Seifa 1 (lowest)	(ref)		(ref)	
Seifa 2	3.53*	1.03, 12.07	1.72	0.83, 3.59
Seifa 3	0.53	0.21, 1.30	0.68	0.24, 1.91
Seifa 4	3.80*	1.09, 13.25	1.39	0.61, 3.18
Seifa 5 (highest)	7.05**	2.05, 24.18	1.63	0.78, 3.41
Still in school	(ref)		(ref)	
Not in school	14.32***	4.70, 43.6	1.94	0.97, 3.90
English not first language	(ref)			
English first language	43.67***	13.26, 143.78	-	
Metro	(ref)		(ref)	
Inner regional	1.26	0.49, 3.26	1.68	0.95, 2.96
Outer regional/remote	3.06	0.94, 9.98	2.04	0.96, 4.32
18-24-year-olds	Annual total volume		Monthly single occasion risky drinking (5+)	
	(absolute alcohol, mL)			
	IRR	95% CI	IRR	95% CI
18–20 years	(ref)		(ref)	
21–24 years	1.22	1.00, 1.50	1.10	0.97, 1.25
Male	(ref)		(ref)	
Female	0.51***	0.41, 0.63	0.74***	0.65, 0.83
Seifa 1 (lowest)	(ref)		(ref)	
Seifa 2	1.30	0.92, 1.86	0.97	0.94, 1.55
Seifa 3	1.01	0.76, 1.34	1.05	0.86, 1.27
Seifa 4	1.52**	1.13, 2.04	1.19*	1.01, 1.41
Seifa 5 (highest)	1.65***	1.22, 2.23	1.25*	1.05, 1.50
Less than Year 12	(ref)		(ref)	
Completed Year 12	1.30	0.91, 1.86	1.21	0.94
Certificate or diploma	1.58*	1.10, 2.25	1.36*	1.55
Bachelors or higher	1.34	0.89, 2.04	1.28	1.67
English not first language	(ref)		(ref)	
English first language	2.09***	1.39, 3.14	2.38***	1.77, 3.20
Metropolitan	(ref)		(ref)	
Inner regional	1.37**	1.08, 1.74	1.15	0.99, 1.33
Outer regional/remote	1.68***	1.23, 2.30	1.27**	1.07, 1.50
Labour/logistics	(ref)		(ref)	
Professional/administrative	1.05	0.74, 1.47	0.92	0.77, 1.10
Healthcare services	0.64*	0.44, 0.94	0.82	0.64, 1.04
Hospitality/retail	0.95	0.71, 1.26	0.92	0.78, 1.08

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

monthly, while more than half (52%) of 18–24-year-olds reported doing the same.

Table 1 shows that in 2019, young men were generally more likely to drink than women, with the exception of monthly single occasion risky drinking for underage drinkers, where rates were similar. Total

volume and single occasion risky drinking increased with age, with 23-year-olds reporting higher mean volume (559 drinks per year) and 22-year-olds reporting the highest rates of monthly single occasion risky drinking (60%) than their younger counterparts. There was little difference between groups based on socio-economic status, with the exception that those in the middle quintile reported the lowest levels of drinking (i.e. heavier drinking was more apparent among the highest and lowest socio-economic groups).

Also demonstrated in Table 1, those who spoke English as their first language reported much higher volumes of drinking and single occasion risky drinking than those for whom English was not their first language in both age groups. For 18–24-year-olds, those who lived in outer regional/remote areas were more likely to report higher total volume and single occasion risky drinking than those who lived in metropolitan areas. Being in school was linked with lower consumption for 14–17-year-olds, while for 18–24-year-olds, those working in labour and logistics or professional/administrative roles drank more heavily than those working in hospitality and retail or healthcare services.

Table 2 displays the findings of the negative binomial regression analyses predicting total volume and monthly single occasion risky drinking. Among underage drinkers, older age was a strong predictor of both total volume and single occasion risky drinking. For underage drinkers, there was no effect for gender; however, young adult men were consumed more and were more likely to participate in single occasion risky drinking than young adult women. Among underage drinkers, those who lived in Socio-Economic Indexes for areas 4 and 5, the more affluent areas, were more likely to consume greater volume, a trend that was evident for both total volume and single occasion risky drinking for 18–24-year-olds. In the total volume model, 14–17-year-

olds who were not in school consumed significantly more than those in school; however, among those aged 18–24, those with a certificate or diploma were more likely to drink greater total volume and engage in risky single occasion drinking than those who had not completed high school. Speaking English as their first language was predictive of higher total volume for 14–17-year-olds and both total volume and single occasion risky drinking for 18–24-year-olds, but the Incidence Rate Ratios (IRRs) were much greater for 14–17-year-olds, suggesting the effect of English as first language on alcohol consumption diminishes with age. Residing in an inner regional or outer regional/remote area was a stronger predictor of total volume and single occasion risky drinking for respondents aged 18–24, while no effect for region was found for the younger group. Finally, 18–24-year-olds whose work industry could be categorised into healthcare services were significantly less likely to drink a higher total volume than other industries.

Finally, interactions between gender and age and the remaining socio-demographics were explored. Separate interaction models predicting total annual volume and number of risky occasions with each variable and an interaction between said variable and gender can be found in Supplementary Tables 2–14. Two statistically significant interactions were found with total volume only. Firstly, an interaction was identified between gender and work industry for 18–24-year-olds predicting total volume, and the estimated marginal means from this analysis is presented in Figure 1. Men working in labour and logistics consumed significantly more alcohol than women working in labour and logistics, relative to other industries. The next significant interaction found was between gender and region for 14–17-year-olds predicting total volume, displayed in Figure 2. Underage men in inner regional areas consume significantly more alcohol than women.

Figure 1: Interaction between gender and industry predicting annual total volume among 18–24-year-olds (NDSHS, 2019). NDSHS, National Drug Strategy Household Survey.

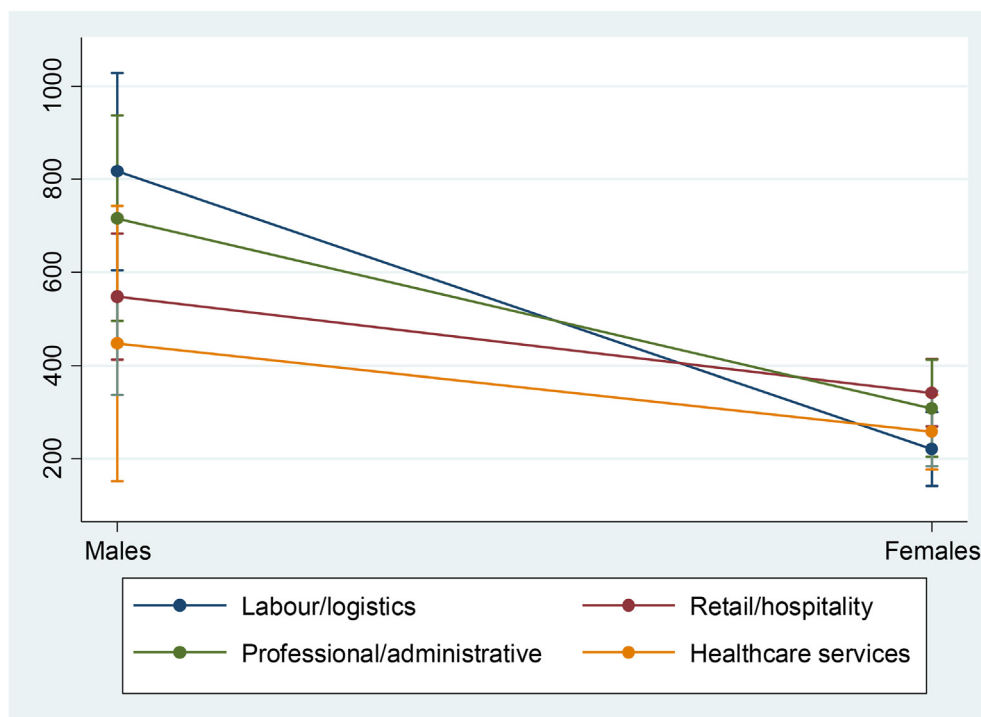
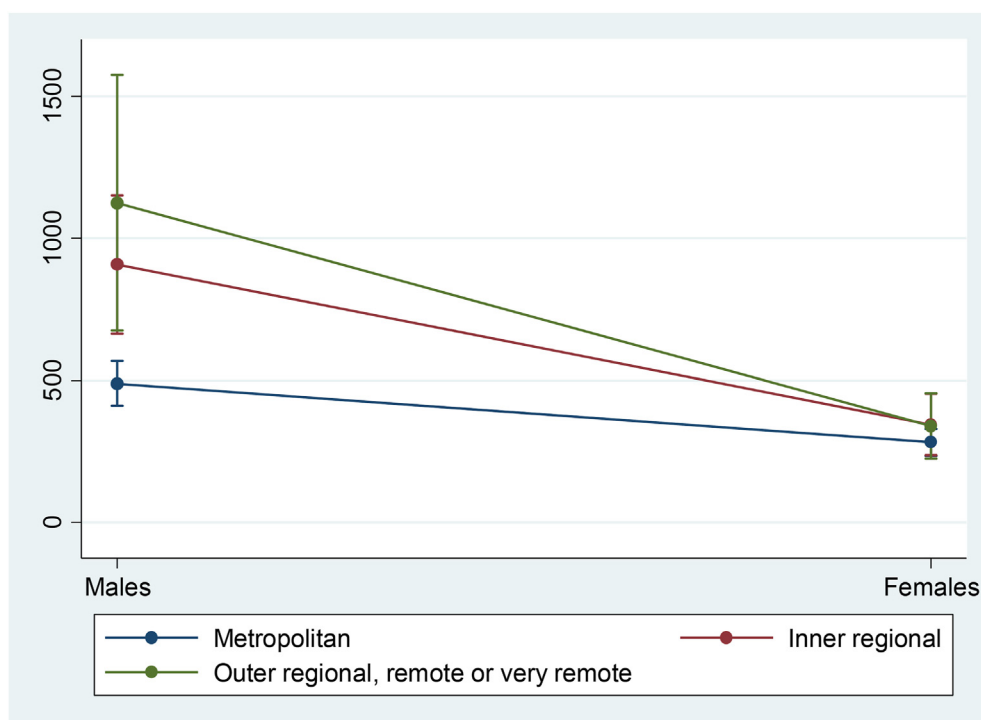


Figure 2: Interaction between gender and region predicting annual total volume among 14–17-year-olds (NDSHS, 2019). NDSHS, National Drug Strategy Household Survey.



## Discussion

There has been a marked decline in young people's drinking that has occurred over the past 15 years. Thus, to enable targeted, cost-effective prevention and health promotion work tailored to those who are drinking riskily or frequently, an updated understanding of which groups of young Australians are continuing to drink heavily is needed. We identified significant differences in the total annual volume of alcohol and rates of monthly single occasion risky drinking for 14–17 and 18–24-year-olds, relating to age, gender, education, cultural background, socio-economic status, regionality and work industry.

Young people aged 14–17 years reported consuming an average of 92 drinks per year, which amounts to approximately one drink every four or five days. This jumped significantly for young adults aged 18–24 who averaged more than a drink a day over the previous twelve months. Similarly, while only one in ten underage drinkers (aged 14–17) consumed alcohol at risky levels on a monthly basis in 2019, one in two young adults (aged 18–24) reported doing the same. While young Australian adults are drinking less than previous generations,<sup>30</sup> they are still drinking at levels that make drinking, and risky drinking, a common practice. However, an increasingly high proportion of teenagers are waiting until they reach the minimum purchase age of 18 before consuming alcohol.

Our findings on the socio-demographic correlates did not diverge significantly from Victorian research undertaken a decade prior, which also showed the importance of older age, male gender and cultural background in very heavy episodic drinking.<sup>18</sup> In our study, monthly single occasion risky drinking rates were similar for underage men and women aged 14–17 years, although underage young men reported much higher total annual volume of alcohol. While a

convergence in the rates of risky drinking for underage young men and women has been observed over time in Australia,<sup>31</sup> the significant difference in total volume we detected suggests that on a heavy drinking occasion, underage men are consuming significantly more than underage women which has significant implications for the likelihood of alcohol-related problems. After legal drinking age, single occasion risky drinking becomes much more common for young adult men than women and yearly total volume almost doubles for men relative to women. This suggests that young men should be a particular focus of alcohol-related public health strategies.

We identified that both annual total volume and single occasion risky drinking increased with age up to 23 years. This differs from previous longitudinal Australian analyses (up until 2016) that reported consumption increasing for individuals up to age 18, before plateauing.<sup>32</sup> The differences in these findings could be related to a difference in measures (the longitudinal analysis used a quantity-frequency measure that traditionally under-estimates heavy episodic drinking).<sup>33</sup> Nevertheless, it appears that it is between the ages of 17 and 23 years that drinking increases and men of these ages should become a key target for harm reduction policy.

The results of our multivariable and interaction analyses suggest that there are particular groups that have an elevated chance of consuming higher volumes or engaging in more regular single occasion risky drinking, and these groups might benefit from tailored prevention or health promotion work. For 14–17-year-olds, this includes those who are not at school. Technical institutions might, therefore, be a key focus for health promotion and prevention activities. For 18–24-year-olds, young men in labour and logistics work could benefit from tailored interventions. However, we also noted in the multivariable analyses that those living in the most affluent areas

were more likely to drink heavily, suggesting that private high schools might be worthy avenues for prevention work. We do note that prevention efforts in Victoria are currently targeting some of these heavy drinking sub-groups through work led by the Victorian Health Promotion Foundation.<sup>21</sup> While the findings on those who leave school early, labour and logistics work and living outside of urban areas are in line with previous research,<sup>1,18,34</sup> the finding that heavy drinking is more prevalent in more affluent areas is an interesting one that is worthy of future research and health promotion attention.

It is important for health promotion efforts addressing heavy drinking young people to be targeted, cost-effective and productive, and therefore, some additional research is required. For example, sentinel data that allow exploration of the importance of factors such as sexuality, education type, political persuasion and leisure pursuits or interests might provide more finely honed ways of targeting heavier drinking youth populations. Exploration of longitudinal data sets (e.g. the Household Income and Labour Dynamics in Australia) might also provide key understandings of the ways drinking practices are shaped by the experiences of regionality, education type, neighbourhood affluence and so on. It may be through such additional analyses that gender or age intersects with key attributes in ways that we were unable to identify here. Finally, those respondents that are relevant to both outcome variables measured in the current study, risky drinking and overall consumption, may be worth investigating more closely.

There are also some limitations to note with respect to household population surveys in terms of not representing those who do not live in homes are not home to respond or refuse involvement. Response rates for the NDSHS could be considered low but are respectable when compared with survey response rates more generally.<sup>35</sup> The NDSHS relies on self-reported alcohol consumption, which is less reliable at the upper end of the distribution,<sup>36</sup> and while it has previously been shown that the NDSHS provides broadly reliable measurement of population trends in drinking,<sup>37</sup> it is likely that our sample excludes the heaviest drinking young people due to the nature of population survey sampling designs. Finally, information on those 115 respondents who did not select male or female for the question on gender was not available; these respondents were consequently excluded from all multivariable analyses that included gender as a variable. Future work on samples with sufficient respondents who do not identify as male or female for robust estimates is recommended.

### Implications for public health

Given significant shifts in alcohol consumption over time, older research on heavy drinking youth subgroups is out of date and poorly translatable now. Understanding who is drinking heavily is likely to be useful for sensitively tailoring ways of reducing the burden of disease alcohol still holds over 14–24-year-olds. Alcohol-related prevention and health promotion initiatives that consider different drinking practices relative to gender, age, cultural background, regionality, socioeconomic status and work industry could be useful for reducing harmful drinking practices among young heavy drinkers.

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## Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anzjph.2023.100020>.