

Understanding recent trends in Australian alcohol consumption

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Executive summary

This report examines recent trends in alcohol consumption in Australia across three measures: rates of abstinence, rates of episodic heavy drinking and the distribution of drinking across the population. The study relies on five waves of the National Drug Strategy Household Survey involving more than 120,000 respondents.

It found that there have been small but significant increases in the proportion of the Australian population (aged 14 and over) reporting lifetime abstinence from alcohol in the past decade, from 9.4 per cent in 2001 to 14.1 per cent in 2013. This shift has been concentrated in the younger subgroups of the population, with significant increases for all age groups up to 40-49 year olds. There have been no significant increases observed for respondents aged 50 or over. By far the largest shift has occurred among teenagers, with abstinence among 14-17 year olds increasing from 28 per cent in 2001 to 57.3 per cent in 2013.

An analysis of abstinence by cultural background suggested that the shifts in the population abstaining rates among adults were driven partly by changes in the cultural makeup of the population and survey sample. Among respondents aged 18 and over living in households where only English was spoken, rates of abstinence increased only slightly (for instance from 4.5 to 7.3 per cent for 18-24 year olds) during the period examined. In contrast, there were large increases in abstinence rates in households where a language other than English was spoken alongside a general increase in the proportion of these households included in the sample.

Trends in the rates of heavy episodic drinking in Australia from 2001 to 2013 produced contrasting pictures by age groups. For younger drinkers (aged less than 40) there were steady declines in the prevalence of consuming five or more drinks in an occasion, and relatively stable rates of consuming 20 or more drinks in an occasion. For older respondents (aged 40-49) the number of occasions on which 20 or more drinks had been consumed had generally increased (from 6.4 per cent to 9 per cent). There was some evidence of diverging consumption, with rates of heavy episodic drinking at lower levels (five or more drinks per occasion) more likely to decline than rates of very heavy episodic drinking (20 or more drinks per occasion). Across the entire sample, heavy episodic drinking declined from 42.9 to 38.5 per cent, while very heavy episodic drinking rates were relatively unchanged between 2001 and 2013 (9.4 and 9.5 per cent respectively).

To explore this potential divergence, this study incorporates a detailed analysis of changes in the distribution of alcohol consumption in Australia over the last 13 years. This analysis shows that consumption had declined across the entire drinking distribution – for both heavy and light drinkers. However these declines were generally steeper for lighter drinkers.

Therefore, even though Australia's overall level of drinking has declined, the top ten per cent of drinkers are now responsible for an increasing proportion of the total consumption (from 48.9 per cent in 2001 up to 53.2 per cent in 2013). The share of alcohol consumed by the top five per cent of heavy drinkers has increased to 35.3 per cent in 2013 (up from 32.3 per cent in 2001), even while the average volume of alcohol the top five per cent consume has declined from 37.1 litres to 36.6 litres. This provides limited evidence of diverging drinking patterns, with the declines which Australia is seeing in drinking spread across the whole drinking distribution but most concentrated among lighter drinkers.

Taken together, the findings of this study provide a complex picture of changes in Australian drinking. In the last 13 years young people, particularly those aged under 25, have sharply reduced their drinking; with increases in abstinence rates among young adults driven by both changes in the cultural

makeup of the population and the ageing of abstaining teenage cohorts into adulthood. At the general population level consumption has been more stable, with some evidence of increasing rates of very heavy episodic drinking among older adults (significant increases in the number of occasions where 20 or more drinks are consumed for respondents aged between 30 and 59).

The implications of these findings are important. Firstly, they suggest that public health advocates need to ensure that policy and prevention focuses on older adults as well as young people, since Australians over the age of 40 have shown signs of increasingly problematic drinking between 2001 and 2013. The sharp declines in drinking among teenagers and, in more recent years, young adults during this period are promising signs, and further research into the factors driving these changes is needed to facilitate and reinforce them.

It is important to keep in mind that the data presented here is limited in a number of ways. In particular, this data relies on self-reports of alcohol consumption from surveys with modest response rates, meaning that the trends identified here should be treated with caution and validated by analyses of other data sources where possible.

Background

In general, international and historical epidemiological research has demonstrated that changes in population-level alcohol consumption are linked with changes in rates of heavy drinking and alcohol-related harm (for instance Babor et al., 2010; Norström & Ramstedt, 2005). In other words, when the mean population consumption increases, harms tend to increase (and vice versa).

Recent Australian studies have identified a divergence in this relationship for both adults (Livingston et al. 2010) and young people (Livingston, 2008). These studies show sharply increasing rates of alcohol-related harm during a period where both per-capita consumption and survey-derived measures of risky drinking are stable. Similar patterns have been identified in the UK (Meier, 2010) and Sweden (Tryggvesson, 2013).

It's not immediately clear why rates of harm linked to alcohol would increase when consumption rates are not increasing. One potential explanation that has been put forward is that trends in the overarching measures of alcohol consumption usually examined are hiding a redistribution of drinking patterns (Livingston et al. 2010, Meier, 2010). For example, increases in very heavy alcohol consumption may be offset by reductions in lighter drinking leaving no overall change in consumption while increasing the number of people at very high risk of alcohol-related harm.

There have been few attempts to test this empirically, although one recent analysis of data among Swedish adolescents finds some evidence of this kind of divergence (Hallgren et al, 2012). This study examined six waves of a Stockholm survey (spanning ten years) and found diverging consumption trends for males, with increases in consumption in the heaviest five to ten per cent of drinkers and decreases in consumption over the remainder of the distribution of drinkers. Contrasting results were found in a national study of Swedish teenagers (Norström & Svensson, 2014). Another recent Swedish study examined the distribution of drinking in the general adult population during a period with substantial declines in per capita consumption and found that, although there were no signs of a polarisation in drinking, the decline in consumption had not been unanimous across different consumption groups. Instead it was found that the low and mid-range consumers had lowered their consumption far more than the heaviest drinkers and that the decline had foremost happened among younger age groups, while among older respondents the drinking trends were found to be stable

(Raninen et al, 2013). Taken together, these studies provide mixed evidence of consumption polarisation, which has substantial implications for policy.

Recent data on alcohol consumption in Australia suggest that the last decade has been one of stability, or even reduction in drinking. National estimates of per-capita consumption based on excise data show a slight decline from 10.22 litres of pure alcohol per person in 2000-01 to 9.71 litres in 2013-14 (ABS, 2011). National survey data has provided a mixed picture of trends over the same period. Analyses of the National Health Survey provide some evidence that risky drinking increased between 2001 and 2007-08 (AIHW, 2012), while the National Drug Strategy Household Survey (NDSHS) trends point to stable or declining rates of risky drinking (AIHW, 2014; AIHW, 2009). Rates of abstinence from alcohol also appear to be increasing, particularly among young people (White & Bariola, 2012). In contrast, data from a number of sources suggest steady increases in rates of alcohol-related harm (Livingston et al. 2010; Livingston, 2008; FARE, 2013).

This report examines data from five waves of the NDSHS to try to provide a deeper understanding of these trends. The study will examine trends in three measures of consumption:

- abstinence from alcohol
- rates of heavy and very heavy episodic drinking
- the overall distribution of alcohol consumption in the population.

These analyses will provide critical context for examining alcohol-related trends in Australia and may offer a potential explanations for the diverging trends previously identified.

Methods

Data

This study makes use of five waves of the National Drug Strategy Household Survey (NDSHS), the largest alcohol and drug survey in Australia. The data used is from the 2001, 2004, 2007, 2010 and 2013 waves. The NDSHS data was collected using a combination of drop and collect and computer assisted telephone interview (CATI)-based sampling methods (aside from the 2010 and 2013 waves, which were solely based on drop and collect data). Response rates across the five waves have been steady, ranging from a low of 49.1 per cent in 2013 to a high of 50.6 per cent in 2010. Samples are stratified by geography and involve multi-stage selection (for the drop and collect: geographical area, then household, then respondent; for the CATI component: household then respondent).

The 2001 survey interviewed respondents aged 14 and over, while the subsequent waves included twelve and thirteen year olds as well. To ensure comparability over the full time period being examined, all analyses presented in this study exclude these 12 and 13 year olds. With these respondents excluded, the sample sizes for the five waves were (chronologically): 26,744, 28,582, 22,912, 26,157 and 23,521.

Full methodological details are available in the published survey reports (AIHW, 2014; AIHW, 2009; AIHW, 2011; AIHW, 2005; AIHW, 2002).

Alcohol consumption data

Data on alcohol consumption were collected using two sets of questions. The more detailed set used the graduated frequency approach, asking respondents to report the frequency of consumption at a range of levels (20+ drinks, 11-19, 7-10, 5-8, 3-4, or 1-2 drinks) over the previous 12 months.

Each frequency category for these questions was then recoded into an annual frequency at the midpoint of the range (for instance, 1-2 times per week is coded as $1.5 \times 52 = 78$ occasions). Similarly, each volume range is recoded into a specific volume at the midpoint of the range (thus 7-10 drinks is treated as 8.5 drinks). For the top category, the specific volume was conservatively assigned as one above the threshold (in this case 21).

Where respondents provided more than 365 drinking occasions (by for example, saying they consumed 5-8 drinks 5-6 days a week and 1-2 drinks 3-4 days a week) their responses were capped to include only their 365 heaviest drinking occasions (see Greenfield, 2000 for a good summary of the rationale behind this approach). Where respondents fully completed these questions, their responses were used to derive measures of total annual volume of alcohol consumed (simply by multiplying the number of drinking days at each level by the quantity assigned to that level) and whether or not they had engaged in at least one drinking session of more than five drinks and a similar measure for a session of 20 or more drinks. Respondents answered all questions in terms of Australian standard drinks (10g alcohol). For the volume measure, these have been converted to litres of pure alcohol (where 1 standard drink = 0.0127 litres of pure alcohol).

Where respondents had skipped the graduated frequency questions their responses to the simpler quantity frequency items were used. These two items simply ask respondents to report how often they drink and the amount that they usually drink. Using the same midpoint approach described above, these two items can provide a proxy measure of total volume (although it generally underestimates consumption due to the smoothing out of respondents' less frequent, heavy drinking occasions). Respondents who reported usually consuming 20+ drinks were classified as having consumed twenty or more drinks in a session in the last year, as were respondents who reported usually consuming five or more drinks (on the binary measure of 5+ drinking). These questions were only utilised where the more comprehensive questions were not answered ($n=2931$ across all five waves, 2.3 per cent of cases). A further 3,243 cases (2.5 per cent) were excluded for providing insufficient data in both sets of consumption questions while still classifying themselves as current drinkers.

Abstinence from alcohol was measured using a series of three questions. The first two, capturing lifetime abstinence, asked whether the respondent had ever tried alcohol and, if yes, if they had ever had a full serve of alcohol. Those who responded 'no' to either of these questions were classified as 'lifetime abstainers'. The third question, asked of all respondents who reported having had at least one drink in their lives, asked whether or not they had consumed alcohol in the last 12 months. Those who responded 'no' to this question were classified as 'recent abstainers.' These two groups were then combined into an overall group hereafter referred to simply as 'abstainers'.

Other variables

Along with the alcohol consumption measures described above, a small number of socio-demographic variables were included in the analyses presented here. Besides age group and sex, two area-based measures were examined. The first of these was the index of relative socio-economic advantage and disadvantage (IRSEAD) produced by the Australian Bureau of Statistics (ABS, 2010). This is a composite

measure of neighbourhood socio-economic status, based on data from the Australian Census. The analyses for this study have used the IRSEAD quintiles, which divide the Australian population up into five groups based on neighbourhood socio-economic status. The second was a measure of rurality, based on the Australian Standard Geographic Classification (ABS, 2011). This classification divides localities in Australia up into five categories (major cities, inner regional, outer regional, remote and very remote). Due to sample size issues, these five categories were collapsed to three for this paper (major cities; inner regional; and a category combining outer-regional, remote and very remote). In addition, the analyses focusing on abstention from alcohol also made use of data collected on the languages spoken in the respondent's household. Respondents who reported that the main language spoken in their household was anything other than English were counted as being from non-English speaking backgrounds (NESB). This is a relatively weak proxy measure for cultural background, which is not provided in detail in the NDSHS unit record data and excludes respondents from culturally and linguistically diverse families where English is the main language spoken at home.

Analyses

Population weights were provided with the unit record survey data to ensure that estimates were as representative of the Australian population as possible (benchmarks were based on sub-populations defined by geography, age group and sex). All analyses were undertaken using weighted data, making use of the complex survey design options in Stata (StataCorp, 2011).

Initial descriptive analyses were undertaken to assess the comparability of the survey samples as a whole. Thus, estimates of the average volume of alcohol consumed per capita were calculated for each survey wave. These were compared with published estimates of total per-capita consumption to assess whether the survey data matched with the trends observed based on the more reliable data collected via taxation, imports and exports.

Trends in heavy drinking were examined using simple prevalence estimates of very heavy episodic drinking (defined as 20 or more standard drinks in a session, at least once in the last 12 months) compared with prevalence estimates of 'risky drinking', defined by the National Health and Medical Research Council as five or more drinks in a session (NHMRC, 2009). Trends in prevalence of these two measures were compared for subpopulations based on sex, age group and rurality. Prevalence estimates with 95 per cent confidence intervals were developed and time trends were tested using logistic regression with the drinking behaviours as the outcome variables and survey year as the independent variable.

To analyse the distribution of drinking volume, the sample was broken up into twenty groups based on the total volume of alcohol consumed (for instance, the first group includes the five per cent of people who consumed the least alcohol, and the last group includes the five per cent who consumed the most alcohol). These groups will be referred to as quantile groups or quantiles throughout this paper.

The average volume consumed by respondents in each quantile group was estimated for each wave of the survey to provide a way of examining whether the distribution of total alcohol consumption had changed over the decade studied. Trends in the consumption for each quantile were tested using linear regression (again using the 'svy' commands to account for the survey design). A separate regression model was run for each quantile group to see whether consumption levels in, for example, the top five per cent of drinkers had changed over the four survey waves. The first three groups in each wave were excluded from these analyses as they were made up entirely of abstainers.

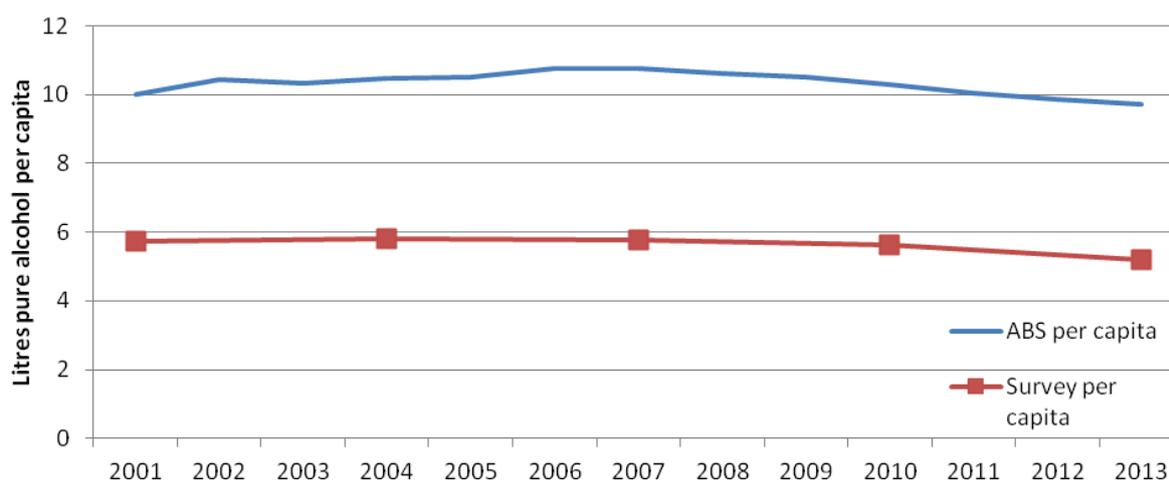
Analyses of trends in abstinence rates used similar approaches to the heavy drinking analyses described above. Trends in lifetime, recent and total abstinence rates were examined using logistic regression models with abstinence as the outcome variable and year as the independent variable.

Results

Overall consumption trends

The overall consumption trends found in the NDSHS closely mirror those reported by the ABS based on official tax data (ABS, 2015) (Figure 1). The survey estimates have declined since 2007 slightly more sharply than the ABS estimates, meaning that coverage has dropped from 57 per cent in 2001 to 53 per cent in 2013. This change in coverage is relatively minor and the similarity of the trends in the two series suggests that the survey data provides a reasonably robust basis for comparisons of alcohol consumption over time, which will be presented below.

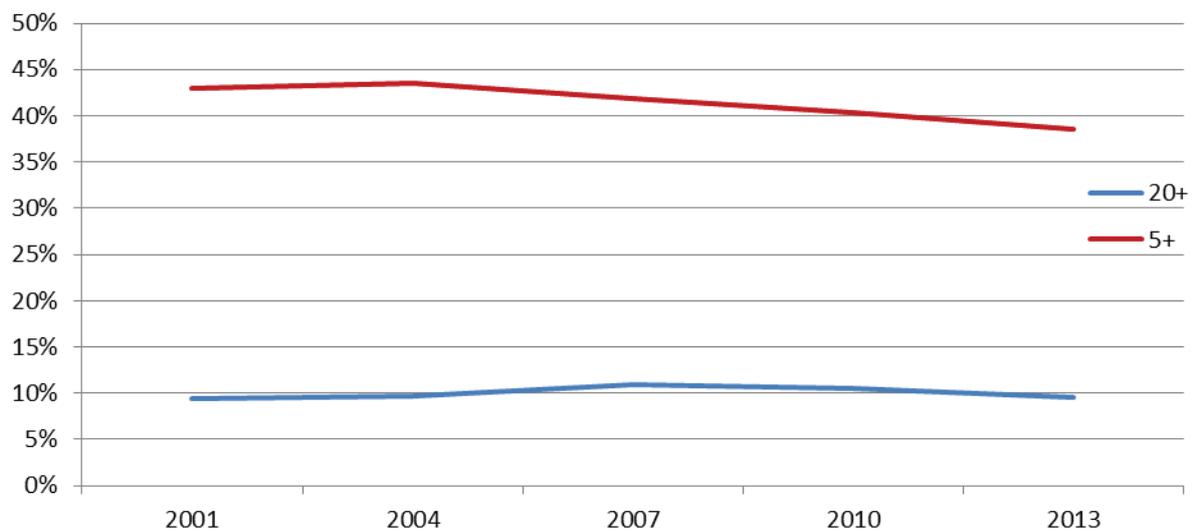
Figure 1. Per capital alcohol consumption estimates, official recorded data from the Australian Bureau of Statistics (ABS) and estimates from the National Drug Strategy Household Survey, litres of pure alcohol.



Trends in heavy episodic drinking

The overall prevalence rates of the two measures of heavy drinking (20 or more and five or more drinks, at least once in the last 12 months) are presented in Figure 2. The rate of very heavy episodic drinking was stable over the time period ($p=0.186$), varying between 9.4 per cent in 2001 and 10.9 per cent in 2007. In contrast, rates of risky drinking (five or more drinks) declined significantly over the study period ($t=-10.32$, $p<0.01$) from 42.9 per cent in 2001 to 38.5 per cent in 2013.

Figure 2. Prevalence of 5+ and 20+ drinking behaviour (at least once in the last 12 months) in the National Drug Strategy Household Survey, 2001-2013 (population aged 14 and over)



The trends in 5+ and 20+ episodic drinking for population subgroups based on age group, sex and rurality are presented in Tables 1 and 2. Again, trends were tested for statistical significance via logistic regression.

The only population subgroup in which 20+ drinking significantly decreased was the 14-17 year olds. Rates were stable for young adults (18-24 and 25-29 year olds) but had increased significantly among older respondents (aged between 30 and 59). Similar patterns were evident for 5+ drinking, with significant declines among younger age groups (14-17, 18-24, 25-29, 30-39 year olds) and stability or increase in some older subpopulations (40-49, 50-59 and 60-69 year olds). Rates of 20+ drinking were stable for both males and females, while the prevalence of 5+ drinking among both sexes decreased significantly.

There was no obvious pattern to the trends based on neighbourhood socio-economic status – no quintile had seen significant change in 20+ drinking and all had seen significant declines in 5+ drinking. In contrast, there was a clear pattern by rurality – remote and outer regional Australia was the only area in which 5+ drinking did not decline significantly, while 20+ drinking increased sharply (from 10.6 per cent in 2001 to 13.8 per cent in 2013).

Looking across all the trends presented, the general picture is of stability or slight increases in 20+ drinking and steady declines in 5+ drinking. These conflicting trends suggest a potential underlying shift in the distribution of alcohol consumption, with decreases at lower levels of consumption not matched by declines in very heavy drinking. This will be explicitly tested in the following set of analyses.

Table 1. Prevalence of 20+ drinking behaviour (at least once in the last 12 months) in the National Drug Strategy Household Survey, 2001-2013 (population aged 14 and over), by age group, gender, socio-economic status and rurality

	2001	2004	2007	2010	2013
Age group					
14-17 years	10.0% (8.0-11.9)	8.0% (6.5-9.6)	7.9% (6.0-9.7)	6.8% (5.2-8.4)	5.1% (3.0-7.1) *
18-24 years	23.5% (21.5-25.5)	23.4% (21.4-25.4)	26.2% (23.8-28.8)	24.8% (22.6-27.0)	20.0% (17.8-22.2)
25-29 years	18.6% (16.5-20.8)	20.4% (18.2-22.5)	22.4% (19.7-25.2)	18.8% (16.7-20.9)	18.2% (16.0-20.4)
30-39 years	11.8% (10.7-12.9)	12.6% (11.5-13.7)	14.6% (13.3-15.9)	14.6% (13.4-15.8)	14.7% (13.5-16.0) +
40-49 years	6.4% (5.6-7.3)	7.4% (6.5-8.2)	9.5% (8.4-10.6)	9.2% (8.1-10.2)	9.0% (8.0-10.1) +
50-59 years	3.3% (2.7-4.0)	4.0% (3.3-4.7)	5.1% (4.2-5.9)	5.2% (4.4-5.9)	4.7% (3.9-5.5) +
60-69 years	2.2% (1.5-2.8)	2.1% (1.6-2.7)	2.2% (1.6-2.9)	2.4% (1.9-2.9)	2.8% (2.1-3.4)
70+	1.2% (0.7-1.6)	1.2% (0.8-1.6)	1.5% (1.0-1.9)	1.8% (1.3-2.4)	1.3% (0.9-1.7)
Gender					
Male	14.6% (13.8-15.4)	15.3% (14.5-16.1)	17.0% (16.1-18.0)	15.8% (14.9-16.6)	14.9% (14.1-15.8)
Female	4.4% (4.0-4.8)	4.3% (3.9-4.7)	5.1% (4.6-5.5)	5.5% (5.0-5.9)	4.3% (3.9-4.7)
Neighbourhood socio-economic status					
Quintile 1 (disadvantaged)	10.3% (9.1-11.5)	10.7% (9.6-11.8)	11.9% (10.5-13.2)	10.7% (9.5-11.8)	9.0% (7.9-10.1)
Quintile 2	9.7% (8.8-10.6)	10.7% (9.6-11.8)	11.6% (10.3-13.0)	11.2% (10.1-12.4)	9.8% (8.7-10.9)
Quintile 3	9.9% (8.8-11.0)	9.5% (8.5-10.4)	11.4% (10.1-12.7)	11.0% (9.8-12.1)	10.6% (9.4-11.9)
Quintile 4	9.9% (8.7-11.2)	9.3% (8.3-10.2)	10.3% (9.2-11.4)	10.7% (9.7-11.7)	9.4% (8.4-10.4)
Quintile 5 (advantaged)	7.9% (7.1-8.7)	9.0% (8.1-9.9)	10.2% (9.1-11.2)	9.6% (8.5-10.6)	9.0% (9.0-10.1)
Rurality					
Major cities	8.6% (8.1-9.2)	9.0% (8.4-9.5)	10.2% (9.5-10.8)	9.7% (9.1-10.3)	9.0% (8.4-9.5)
Inner regional	11.3% (10.0-12.5)	10.2% (9.2-11.2)	11.9% (10.7-13.2)	11.3% (10.2-12.4)	9.2% (8.1-10.3)
Outer regional/remote	10.6% (9.5-11.8)	13.4% (11.9-14.8)	14.1% (12.5-15.7)	14.8% (13.2-16.4)	13.8% (12.1-15.5) +

* p < 0.05 (decreasing trend), + p < 0.05 (increasing trend)

Note: the statistical tests here are testing for a linear trend across the whole time period. Thus, for example, there has been a statistically significant drop in 20+ drinking for 18-24 year olds between 2010 and 2013, but the trend over the whole time period is not consistently down.

Table 2. Prevalence of 5+ drinking behaviour (at least once in the last 12 months) in the National Drug Strategy Household Survey, 2001-2013 (population aged 14 and over), by age group, gender, socio-economic status and rurality

	2001	2004	2007	2010	2013
Age group					
14-17 years	41.8% (38.7-44.8)	33.3% (30.7-36.0)	31.8% (28.6-34.9)	28.2% (25.1-31.3)	19.8% (16.6-23.0) *
18-24 years	71.0% (68.9-73.0)	70.8% (68.6-72.9)	68.3% (65.7-70.9)	64.9% (62.3-67.4)	62.6% (60.0-65.4) *
25-29 years	64.8% (62.5-67.2)	63.2% (60.7-65.7)	62.1% (59.1-65.1)	58.3% (55.6-61.0)	55.4% (52.5-58.2) *
30-39 years	51.2% (49.6-52.7)	53.3% (51.6-54.9)	51.8% (50.0-53.7)	50.7% (49.0-52.4)	47.3% (45.6-49.1) *
40-49 years	43.4% (41.7-45.0)	47.1% (45.5-48.8)	44.9% (43.0-46.8)	43.5% (41.8-45.2)	44.8% (43.0-46.6)
50-59 years	32.6% (30.9-34.3)	34.2% (32.6-35.8)	35.2% (33.4-37.0)	35.3% (33.6-37.0)	34.1% (32.4-35.9)
60-69 years	19.2% (17.6-20.8)	23.2% (21.6-24.7)	22.4% (20.8-24.0)	22.6% (21.1-24.0)	23.2% (21.7-24.7) +
70+	11.7% (10.4-13.0)	12.1% (10.9-13.4)	10.8% (9.6-12.1)	9.5% (8.5-10.6)	9.6% (8.5-10.6) *
Gender					
Male	54.9% (53.8-55.9)	55.4% (54.3-56.4)	52.5% (51.3-53.7)	50.7% (49.5-51.8)	49.1% (47.9-50.3) *
Female	31.3% (30.4-32.2)	32.0% (31.2-32.9)	31.5% (30.5-32.4)	30.3% (29.4-31.2)	28.0% (27.1-28.9) *
Neighbourhood socio-economic status					
Quintile 1 (disadvantaged)	40.0% (38.2-41.8)	38.7% (37.0-40.5)	38.0% (36.2-39.9)	36.5% (34.7-38.3)	33.4% (31.5-35.2) *
Quintile 2	41.2% (39.8-42.6)	42.2% (40.6-43.8)	39.7% (37.9-41.6)	40.3% (38.6-41.9)	36.6% (34.9-38.4) *
Quintile 3	43.4% (41.8-45.1)	43.4% (41.8-44.9)	41.1% (39.3-43.0)	40.9% (39.3-42.6)	39.7% (38.0-41.5) *
Quintile 4	45.0% (43.1-46.9)	44.3% (42.8-45.8)	43.0% (41.3-44.6)	40.9% (39.4-42.4)	39.7% (38.1-41.3) *
Quintile 5 (advantaged)	45.4% (44.0-46.8)	47.3% (45.9-48.8)	45.7% (44.1-47.3)	42.7% (41.1-44.2)	41.9% (40.2-43.5) *
Rurality					
Major cities	41.7% (40.8-42.5)	42.9% (42.0-43.7)	41.1% (40.2-42.1)	38.9% (38.0-39.7)	37.1% (36.2-38.0) *
Inner regional	46.6% (44.8-48.3)	44.1% (42.6-45.6)	41.7% (40.0-43.4)	42.8% (41.3-44.4)	40.0% (38.1-41.8) *
Outer regional/remotely	43.5% (41.8-45.3)	46.5% (44.6-48.5)	46.4% (44.3-48.5)	45.2% (43.2-47.3)	44.5% (42.3-46.6)

* p < 0.05 (decreasing trend), + p < 0.05 (increasing trend)

Examining the distribution of drinking

The mean total volume of alcohol consumed in each of the 20 quantile groups is presented in Table 3.

Excluding the first three quantiles, all of which were made up of abstainers across all survey waves, there were statistically significant trends in all quantiles except for the top quantile.

In other words, consumption had declined significantly for all consumers except for the heaviest five per cent of drinkers, for whom it had remained stable, at around 37 litres of pure alcohol per person.

Table 3. Mean annual volume of alcohol consumed (litres) by consumption quantile group, National Drug Strategy Household Survey, 2001-2013 (population aged 14 and over)

Quantile	2001	2000	2007	2010	2013
1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00
4	0.07	0.03	0.01	0.00	0.00
5	0.11	0.11	0.08	0.04	0.03
6	0.21	0.22	0.19	0.13	0.10
7	0.46	0.49	0.43	0.28	0.21
8	0.68	0.86	0.72	0.55	0.46
9	1.21	1.42	1.30	1.00	0.78
10	1.55	1.93	1.80	1.54	1.35
11	2.20	2.43	2.32	2.09	1.88
12	3.27	3.20	3.08	2.67	2.41
13	4.09	3.99	3.84	3.52	3.19
14	5.38	5.25	5.03	4.64	4.07
15	6.63	6.58	6.33	6.02	5.39
16	7.90	7.87	7.71	7.51	6.89
17	10.62	10.54	10.33	10.01	8.91
18	14.36	14.52	14.38	14.12	12.89
19	19.05	19.56	20.05	19.59	18.52
20	37.06	36.97	38.21	38.79	36.59

Table 4 shows the proportion of the total alcohol consumed in each year that was consumed by each quantile.

All quantiles have consumed declining proportions of the total alcohol with the exception of the top two – drinkers in the nineteenth quantile went from consuming 16.6 per cent of all alcohol in 2001 to 17.9 per cent in 2013, while the contribution of those in the top quantile increased from 32.3 to 35.3 per cent. Thus, the top ten per cent of drinkers are responsible for an increasing proportion of the total consumption – from 48.9 per cent in 2001 up to 53.2 per cent in 2013.

Table 4. Proportion of total alcohol consumed by each quantile group, National Drug Strategy Household Survey, 2001-2013 (population aged 14 and over)

Quantile	2001	2000	2007	2010	2013
1	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	0.0%	0.0%	0.0%
3	0.0%	0.0%	0.0%	0.0%	0.0%
4	0.1%	0.0%	0.0%	0.0%	0.0%
5	0.1%	0.1%	0.1%	0.0%	0.0%
6	0.2%	0.2%	0.2%	0.1%	0.1%
7	0.4%	0.4%	0.4%	0.3%	0.2%
8	0.6%	0.7%	0.6%	0.5%	0.4%
9	1.1%	1.2%	1.1%	0.9%	0.8%
10	1.4%	1.7%	1.6%	1.4%	1.3%
11	1.9%	2.1%	2.0%	1.9%	1.8%
12	2.8%	2.8%	2.7%	2.4%	2.3%
13	3.6%	3.4%	3.3%	3.1%	3.1%
14	4.7%	4.5%	4.3%	4.1%	3.9%
15	5.8%	5.7%	5.5%	5.3%	5.2%
16	6.9%	6.8%	6.7%	6.7%	6.6%
17	9.2%	9.1%	8.9%	8.9%	8.6%
18	12.5%	12.5%	12.4%	12.5%	12.4%
19	16.6%	16.9%	17.3%	17.4%	17.9%
20	32.3%	31.9%	33.0%	34.5%	35.3%

These shifts have all been relatively small, but even small shifts in the heaviest consumption groups can be important.

The fact that the heaviest consumers have not reduced their consumption, during a period in which consumption in general is declining, raises some interesting questions about the link between per-capita consumption and rates of harm.

Abstention

Rates of lifetime, recent and total abstention are presented in Table 5.

Table 5. Abstention rates by gender, National Drug Strategy Household Survey, 2001-2010 (population aged 14 and over)

	2001	2004	2007	2010	2013	
Males						
Total	13.7% (13.0-14.5)	12.8% (12.1-13.5)	14.9% (14.0-15.9)	17.1% (16.2-18.0)	18.6% (17.6-19.6)	+
Lifetime	7.2% (6.6-7.8)	6.9% (6.3-7.5)	8.2% (7.4-8.9)	10.0% (9.2-10.8)	11.9% (11.1-12.8)	+
Recent	6.5% (6.0-7.0)	5.9% (5.4-6.4)	6.8% (6.2-7.4)	7.1% (6.5-7.7)	6.7% (6.1-7.2)	
Females						
Total	20.5% (19.7-21.3)	20.3% (19.5-21.1)	21.2% (20.3-22.0)	23.4% (22.5-24.2)	24.6% (23.6-25.5)	+
Lifetime	11.5% (10.8-12.1)	11.8% (11.1-12.4)	12.1% (11.4-12.8)	14.3% (13.6-15.1)	16.3% (15.4-17.1)	+
Recent	9.0% (8.5-9.6)	8.6% (8.0-9.1)	9.1% (8.5-9.7)	9.1% (8.5-9.6)	8.3% (7.7-8.9)	
Total						
Total	17.1% (16.6-17.7)	16.6% (16.1-17.1)	18.1% (17.5-18.7)	20.3% (19.6-20.9)	21.6% (20.9-22.3)	+
Lifetime	9.4% (8.9-9.8)	9.4% (8.9-9.8)	10.2% (9.6-10.7)	12.2% (11.6-12.7)	14.1% (13.5-14.7)	+
Recent	7.8% (7.4-8.2)	7.2% (6.9-7.6)	8.0% (7.5-8.4)	8.1% (7.7-8.5)	7.5% (7.1-7.9)	

* $p < 0.05$ (decreasing trend), + $p < 0.05$ (increasing trend)

Abstaining has increased significantly for both men and women between 2001 and 2013. This increase has been driven almost entirely by lifetime abstainers – in other words there are more people in 2013 who report never having had a full drink of alcohol than there were in 2001.

Once someone consumes a full serve of alcohol, they can no longer return to being a lifetime abstainer. Thus, for an increase in lifetime abstention to reflect a real change in the population, it must be driven either by young people or by new immigrants.

If five per cent of 50 year olds were lifetime abstainers in 2010 then (assuming no immigration), *at least five per cent* of 41 year olds were abstainers in 2001. To assess whether these assumptions hold in our data, abstention was examined by age group and by cultural background.

Table 6. Lifetime abstinence rates by age group, National Drug Strategy Household Survey, 2001-2010 (population aged 14+)

Age group	2001	2004	2007	2010	2013	
14-17 years	28.0% (25.2-30.8)	34.5% (31.8-37.3)	35.0% (31.8-38.3)	45.0% (41.5-48.4)	57.3% (53.4-61.1)	+
18-24 years	7.5% (6.2-8.8)	6.8% (5.5-8.1)	9.7% (7.8-11.6)	11.6% (9.6-13.5)	13.7% (11.6-15.7)	+
25-29 years	4.1% (3.1-5.1)	6.4% (5.0-7.8)	7.3% (5.5-9.0)	10.2% (8.4-12.0)	10.8% (8.9-12.6)	+
30-39 years	5.8% (5.0-6.6)	5.3% (4.5-6.1)	6.3% (5.4-7.3)	8.9% (7.8-10.0)	11.2% (10.0-12.4)	+
40-49 years	6.2% (5.3-7.0)	5.0% (4.2-5.7)	6.4% (5.5-7.4)	7.4% (6.4-8.5)	9.6% (8.4-10.7)	+
50-59 years	7.3% (6.3-8.3)	7.0% (6.0-7.9)	7.0% (5.9-8.1)	7.3% (6.2-8.3)	8.5% (7.4-9.6)	
60-69 years	11.5% (10.1-12.9)	10.5% (9.3-11.6)	9.0% (7.8-10.1)	9.2% (8.1-10.2)	9.4% (8.3-10.6)	*
70+	17.5% (15.8-19.1)	16.3% (14.8-17.8)	16.5% (14.9-18.1)	17.8% (16.3-19.3)	17.9% (16.2-19.6)	

* p < 0.05 (decreasing trend), + p < 0.05 (increasing trend)

Increases in abstinence have been sharpest among young people, with much higher proportions of those aged less than 30 abstaining in 2013 than in 2001.

Significant increases were also evident for those aged 30-49, although they were not as large.

As expected, there was no increase in lifetime abstinence among the older age groups (in fact, there was a decline in the 60-69 year olds as the heavier drinking baby boomer cohort aged).

One potential explanation for the increases in abstinence among younger populations is the ongoing cultural diversification of the Australian population, with increasingly large populations of people from cultural backgrounds in which alcohol plays a less central role. As an illustrative example, the proportion of the population reporting Indian, Chinese, Vietnamese or Lebanese ancestry increased from 5.5 per cent in 2001 to 7.8 per cent in 2011 (ABS, 2012). These population shifts are reflected in the makeup of the NDSHS sample, with the proportion of respondents living in a household where a language other than English was the main language spoken increasing from seven per cent in 2001 to 11.8 per cent in 2010. The survey is likely to under-represent culturally and linguistically diverse respondents, but this shift in the demographic makeup of the sample is likely to have had some impact on abstinence rates.

Furthermore, abstinence rates have increased significantly among respondents living in a household where a language other than English is spoken. In 2013, 41.3 per cent of NESB respondents were lifetime abstainers, a significant increase from 31.6 per cent in 2001. There were also significant increases in abstinence rates among respondents whose main household language was English, but these were not as sharp (Table 7).

These results suggest that the change in abstinence rates seen in the NDSHS is being driven, at least partly, by the combination of an increase in the proportion of respondents from non-English speaking backgrounds and an increase in abstinence among this particular group, although there appears to be a broader increase in abstinence occurring as well. A more detailed exploration of this data is presented in Table 7, with the incorporation of age groups into the analysis.

Table 7. Lifetime abstinence rates by cultural background, National Drug Strategy Household Survey, 2001-2010 (population aged 14+)

Cultural background	2001	2004	2007	2010	2013
English speaking	7.6% (7.2-8.0)	7.7% (7.3-8.0)	7.7% (7.3-8.1)	8.8% (8.3-9.3)	10.0% (9.4-10.5)
Non-English speaking	31.6% (28.7-34.6)	30.5% (27.5-33.5)	35.4% (32.0-38.8)	41.7% (38.8-44.5)	41.3% (38.8-43.9)

Cultural background	Age group	2001	2004	2007	2010	2013
English speaking	14-17 years	25.1% (22.4-27.9%)	31.7% (28.9%-34.4%)	32.4% (29.0-35.8)	42.4% (38.8-46.0)	54.0% (49.7-58.3)
	18-24 years	4.5% (3.5-5.5%)	5.0% (3.8%-6.1%)	5.0% (3.7-6.2)	6.0% (4.2-7.7)	7.3% (5.7-8.9)
	25-29 years	2.3% (1.6-3.0%)	3.8% (2.7%-4.9%)	2.5% (1.6-3.5)	4.2% (2.9-5.5)	3.9% (2.7-5.1)
	30-39 years	3.3% (2.7%-3.9%)	3.2% (2.6%-3.9%)	3.3% (2.5-4.0)	3.9% (3.2-4.8)	5.3% (4.3-6.2)
	40-49 years	4.8% (4.1%-5.6%)	3.4% (2.8%-4.1%)	3.9% (3.2-4.7)	4.3% (3.5-5.2)	5.4% (4.5-6.3)
	50-59 years	6.0% (5.1%-6.8%)	5.3% (4.5%-6.0%)	6.0% (5.0-7.0)	4.6% (3.8-5.4)	5.4% (4.5-6.4)
	60-69 years	10.7% (9.4%-12.1%)	9.4% (8.3%-10.6%)	7.9% (6.8-8.9)	7.7% (6.7-8.6)	7.1% (6.1-8.0)
Non-English speaking	70+	17.0% (15.4%-18.6%)	15.9% (14.3%-17.4%)	15.4% (13.9-16.9)	16.5% (15.0-18.0)	16.7% (14.9-18.5)
	14-17 years	55.5% (44.0%-67.0%)	61.3% (49.6%-73.0%)	75.3% (63.8-86.8)	69.5% (56.6-82.3)	76.9% (68.2-85.7)
	18-24 years	30.1% (23.3%-36.8%)	23.9% (16.5%-31.2%)	37.0% (27.8-46.1)	43.8% (36.0-51.6)	43.8% (36.0-51.6)
	25-29 years	22.8% (14.1%-31.6%)	28.8% (19.9%-37.6%)	32.6% (23.4-41.8)	38.8% (31.2-46.4)	35.5% (28.7-42.3)
	30-39 years	34.3% (27.9%-40.8%)	31.9% (25.5%-38.4%)	36.8% (29.8-43.8)	39.6% (34.0-45.3)	39.1% (34.5-43.8)
	40-49 years	28.1% (21.0-35.1)	27.1% (20.0%-34.2%)	36.7% (29.1-44.4)	41.7% (34.4-49.0)	38.5% (32.8-44.3)
	50-59 years	34.2% (25.2-43.3)	33.0% (24.4-41.6)	23.9% (15.8-32.0)	42.8% (34.4-51.3)	37.4% (30.4-44.4)
60-69 years	22.0% (13.8-30.2)	25.4% (16.7-34.1)	25.0% (16.9-33.1)	31.9% (23.7-40.2)	37.3% (28.6-46.0)	
70+	26.8% (15.9-37.7)	24.5% (15.1-33.8)	31.3% (17.7-45.0)	29.8% (20.5-39.1)	30.3% (21.3-39.3)	

* p < 0.05 (decreasing trend), + p < 0.05 (increasing trend)

* p < 0.05 (decreasing trend), + p < 0.05 (increasing trend)

The results point to similar patterns between NESB respondents and those from households whose main language was English. Abstinence rates had increased significantly for respondents under the age of 30 in both groups. The most marked changes were among teenagers, with rates of abstinence among mainly English speaking 14-17 year olds more than doubling over the study period.

Discussion

Changes in abstinence rates

The NDSHS data analysed here suggest significant recent increases in lifetime abstaining among young people. The analyses undertaken highlight that these recent increases are being driven by two factors: increased abstinence among teenagers and young people broadly, combined with increases in culturally diverse populations in the survey sample and increases in abstinence among this group.

Rates of abstinence in English-speaking households have increased among respondents aged up to 40, but the increases for those aged over 25 were relatively small. The proportion of respondents from households where a language other than English was spoken who had never consumed alcohol had increased sharply overall, from 32 per cent in 2001 to 41 per cent in 2013. This was again driven largely by young people, although there were significant increases in abstinence for those aged 40-49 and 60-69.

These findings may represent a true shift in the underlying drinking rates of culturally and linguistically diverse groups in Australia, but they may also represent changes in survey methodology. The NDSHS is conducted in English, which inherently limits the representativeness of the data. Further, changes to field methodologies or recruiting practices may result in different culturally and linguistically diverse groups being highly represented in the sample. Unfortunately, detailed data on ethnicity or language spoken at home are not provided in the unit record data of the NDSHS, so further analyses to explore the shifts in the sample structure was not possible. Thus, until further work is conducted, the recently noted increases in abstinence among adults should be treated with caution, as they are at least partly driven by changes in the cultural make-up of the survey sample (which may, of course, reflect changes in the population).

In contrast, the evidence presented here that abstinence among teenagers and young adults has increased is broadly consistent with findings from other Australian studies (White & Bariola, 2012) and international school surveys (Hibell et al, 2012). These increases in abstinence are encouraging, given the range of harms associated with early initiation of drinking. However, there has been little attempt to determine what factors have driven these quite marked behavioural shifts among young people. Recent media analyses highlight the ongoing shift towards negatively framed public discourse about alcohol (Azar et al, In press), which may be contributing to a generational change in attitudes, but this is highly speculative and a more comprehensive analyses of the potential underlying factors is urgently required.

Shifts in drinking patterns

The results presented here provide no compelling evidence that consumption of alcohol in Australia has diverged over the last decade, although it does seem clear that the declines in consumption have been driven more by reductions among lighter than heavier drinkers. Rates of very heavy episodic drinking were stable, while lower threshold measures of risky drinking had dropped sharply, and the heaviest five per cent of drinkers were the only group not to reduce their consumption of the study period. This data provides some evidence that, despite declining per-capita consumption and declines in rates of risky drinking (as defined by the AIHW), the rates of very problematic drinking in the Australian population have remained relatively stable. This might provide some explanation for recent divergence between alcohol-related harm and alcohol consumption rates in Australian jurisdictions (Livingston et al, 2010; Livingston, 2008), although increasing consumption among heavy drinkers

would be a more compelling driver of increasing harm. Further, it is worth noting that the bulk of harm in the population tends to be accounted for by the large population of drinkers rather than clustered just in the heaviest drinking groups (Livingston, In press; Stockwell et al, 1996).

In terms of episodic drinking trends, there have been substantially different patterns observed by different age groups. These could be the result of cohort effects, although further studies that more closely examine this are needed. It could also be a result of income redistributions where younger age groups might have had a more disadvantaged income development than older age groups during the last couple of years. Previous studies have found that when population sub-groups have different income development this leads to diverging trends in alcohol consumption (Caetano et al, 1983). There also appears to be substantially different trends geographically, with regional and remote parts of Australia not seeing the declines in drinking observed elsewhere. Previous research has noted the disproportionate rates of heavy drinking and alcohol-related harm in regional Australia (Miller et al, 2010), and these findings suggest that the differential between city and country drinking may be widening.

The results on the total volume of consumption presented here have some implications for the theory of the collectivity of drinking cultures proposed by Skog (1985). That theory posits that consumption should vary proportionally across the drinking distribution. It is worth noting that even in Skog's formulation, the theory of collectivity of drinking allows for the potential that collectivity may break down at the heaviest end of the drinking spectrum, although the general argument put forward is that drinking groups will shift their consumption together. In other words if, for example, overall consumption increased by five per cent, each quantile of drinkers should see increases of about five per cent in consumption (which would mean much larger absolute changes at the top of the distribution). The findings presented here provide mixed evidence that this pattern has held in Australia over recent years, with declines coming from across the distribution, with the exception of the very heaviest drinkers.

The distributional shifts identified have led to an even greater concentration of alcohol consumption in Australia among the heaviest drinking groups. This is consistent with previous Swedish work on school age samples (Hallgren, 2012) and broadly similar to a recent study of the general Swedish population (Tryggvesson, 2013). In Tryggvesson's analysis of Swedish data general declines in consumption at the population level have disproportionately come from light and moderate drinkers, leading to a slight concentration of consumption in the heaviest drinking group.

Taken together, these studies raise the possibility that changes in heavy drinking can occur in ways that wouldn't be predicted based on population level consumption measures (such as per-capita consumption). However, the most recent wave of the survey suggests that drinking among the very heaviest drinkers is declining, and it may be that the broader changes seen in the population have just taken longer to manifest among the heaviest drinkers. Furthermore, as Mäkelä and Härkönen suggest (2013), significant caution needs to be shown in interpreting these types of analyses as data on the heaviest drinkers in society is limited in a number of important ways – in particular, typical population survey samples are likely to exclude the very heaviest drinkers and the data that are collected are highly influenced by outliers or incorrect/misleading survey responses.

The current study is further limited by its reliance on population survey data based on low response rates (~50 per cent) and low coverage of actual per-capita alcohol consumption (~55 per cent). The results of this study would potentially be biased if there have been differential changes in response or coverage across drinker types over the time period. There is good evidence that non-responders are likely to be heavier drinkers (Zhao et al, 2009), but the response rates here have been stable (if low).

In contrast, coverage has declined slightly suggesting, if anything, that the survey has under-estimated consumption levels. This may mean that the declines amongst the majority of drinkers are artefactual, or it may imply a decline in coverage of heavy drinkers, suggesting even greater divergence than that presented here.

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