RESEARCH REPORT

# Examining how the first year of the COVID-19 pandemic affected alcohol use in different socio-demographic groups in an Australian representative longitudinal sample

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## Abstract

**Background and aims:** Research examining how alcohol consumption changed across different socio-demographic groups during the pandemic has largely relied upon convenience samples recruited after the onset of the COVID-19 pandemic. The aim of this study was to measure whether the pandemic shifted alcohol consumption in different gender, age and income groups in Australia.

**Design, setting and participants:** This was a longitudinal study using four waves (2017–20) of the annual Household, Income and Labour Dynamics in Australia (HILDA) Survey to compare pre-pandemic consumption (2017–19) with consumption in 2020. A total of 11 636 participants in Australia aged 15 years and older took part.

**Measurements:** Participants were asked annually about their alcohol consumption, demographics and income.

**Findings:** There was a statistically significant increase in alcohol consumption during the first year of the pandemic [incident rate ratio (IRR) = 1.1, 95% confidence interval (CI) = 1.1, 1.1], largely driven by changes in drinking frequency. We found a significant difference in consumption change from pre-COVID-19 to during COVID-19 for participants aged under 55 years compared with those aged over 55 years. In addition, participants aged 15–34 reported less alcohol consumption during the pandemic than those aged 35 years and older. No significant differences were identified across gender and income groups.

**Conclusions:** Alcohol consumption in Australia increased during the first year of the COVID-19 pandemic. Survey participants aged 55 years and over seemed to be the least impacted by the public health measures introduced during the pandemic, such as the closure of licensed premises.

**KEYWORDS**
Alcohol consumption, Australia, COVID-19, HILDA, longitudinal study, socio-demographic groups

# INTRODUCTION

The COVID-19 pandemic impacted the lives of people throughout the world. In Australia, during the first year of the pandemic, some people transitioned to work and study from home, some were furloughed and some lost their jobs due to the public health measures introduced. There is evidence that the COVID-19 restrictions impacted some socio-demographic groups more than others; for example, people in low socio-economic areas in Australia experienced negative impacts on their wellbeing compared to those in high socio-economic areas, due to challenges with food security and housing issues during the pandemic [1].

The COVID-19 pandemic may have also impacted alcohol consumption. There were some concerns early in the pandemic that alcohol consumption would increase due to stress [2], while others speculated that the closure of licensed premises would drive consumption down [3]. These issues could also impact socio-demographic groups in different ways, meaning that studies examining the overall impacts of the pandemic on drinking may be missing key subgroup differences. To date, most studies examining whether the impacts of the COVID-19 pandemic on alcohol consumption varied between demographic groups have used cross-sectional designs and relied upon retrospective reports of pre-pandemic alcohol consumption [4]. Analyses of longitudinal research using representative samples is needed to more clearly understand how alcohol use changed in Australia in 2020 among different socio-demographic groups to understand whether particular socio-demographic groups require tailored support.

## COVID-19 in Australia

Australia introduced a range of public health measures to slow the spread of COVID-19, including the closure of licensed premises nationwide on 23 March 2020. A nation-wide lockdown was then introduced in late March 2020 that restricted movement outside the home to four essential reasons (essential shopping, work that could not be done from home, medical/health needs and exercise). During lockdown, takeaway liquor shops remained open and alcohol delivery services continued to operate as 'essential services' [5]. Lockdown restrictions started to ease from late April 2020 at different stages throughout the country. After the nation-wide lockdown, state and territory specific restrictions were introduced as COVID-19 cases rose (for a detailed time-line of restrictions see Miller and colleagues [5]). In Australia, pandemic-specific financial support was available from March 2020 until June 2022 [6].

Systematic reviews of the impact of the COVID-19 pandemic upon alcohol consumption globally have produced mixed findings, with some differences among jurisdictions [4, 7]. Research from Europe has found reductions in drinking frequency, quantity and heavy episodic drinking during the pandemic [8]. Meanwhile, in Australia, cross-sectional studies have reported no change in consumption overall since the start of the pandemic [9–14]. However, two cross-sectional Australian studies with convenience samples reported a reduction in consumption during the pandemic compared with pre-pandemic consumption [15, 16]. Similarly, two Australian longitudinal studies using convenience samples reported declines in alcohol consumption [17, 18] and one reported no change in AUDIT-C scores [19] during the pandemic. Overall, the evidence suggests that Australian alcohol consumption during the pandemic seems to have remained unchanged or slightly decreased; however, studies typically report different socio-demographic groups increasing and decreasing their drinking, and there is evidence that severe harms from alcohol increased [20]. Thus, understanding how drinking trends varied between subgroups based upon factors such as gender, age and income is crucial to understand the ongoing needs of groups whose drinking increased during the pandemic.

Research on gender differences thus far suggest that the pandemic differentially affected men's and women's alcohol consumption patterns. In a systematic review and meta-analysis of the global literature, Acuff and colleagues [4] reported that women had greater changes in quantity and frequency of consumption during the pandemic. However, men reported greater increases in risky drinking during the pandemic [4]. This is consistent with an Australian cross-sectional study, where men reported a higher shift in harmful consumption during the pandemic than women [16]. Meanwhile, an Australian longitudinal convenience sample study, which used data from three survey waves (2017–20), found that young adult women reported a reduction in consumption during the pandemic compared with pre-pandemic consumption, but found no significant change among young adult men [17]. There are shortcomings regarding how alcohol consumption data were collected in many studies. For example, in Clare and colleagues' [17] study, participants were asked about their pre-pandemic (February 2020) consumption and their consumption during pandemic (May–June 2020) in the same survey wave. This may have led to recall issues, and underscores the importance of utilizing longitudinal data.

Age is another factor that may have impacted consumption during the pandemic. Young people (aged 18–24 years) generally consume more of their alcohol at licensed venues and special events than other age groups [21]. Therefore, the restrictions on licensed premises during the pandemic may have disproportionately impacted young people's consumption. This was found to be the case in Acuff and colleagues' systematic review and meta-analysis, where they found that increased drinking during the pandemic among young to middle-aged adults [4]. However, Australian researchers, using cross-sectional convenience samples, have reported that participants in older age groups were more likely to increase their consumption during the first Australian lockdown than the youngest age group [16, 22, 23]. Neill and colleagues [23] also found that participants aged 18–24 years were more likely to self-report that they were 'drinking a lot more than normal' compared with those aged 65 years and over. In contrast, in their longitudinal Australian study (using a convenience sample), Greenwood and colleagues [18] reported that older age was associated with more frequent alcohol use during the pandemic. However, this study only asked about how often they drank (frequency) and not about how much they drank per occasion (quantity). Studies

that utilize more comprehensive measures of alcohol consumption are needed to reliably examine the relationship between age and alcohol consumption during the pandemic.

Given the impacts of the COVID-19 pandemic upon employment and income, socio-economic differences in drinking during the pandemic are likely. Australian studies suggest that higher income groups increased their drinking [23, 24] while lower income groups decreased [18] during the pandemic, but these studies relied upon convenience samples. In contrast, in their systematic review and meta-analysis of the global literature, Acuff and colleagues [4] found no significant association between pre-pandemic income and changes in consumption during the pandemic. However, as noted by Acuff and colleagues [4], most of the papers included in their systematic review and meta-analysis were cross-sectional and relied upon retrospective data. Currently, there is limited research using longitudinal representative samples that measured pre-pandemic consumption before the pandemic and have focused upon examining the association between income and alcohol consumption.

## The present study

The aim of this study is to examine whether the effects of the COVID-19 pandemic on alcohol consumption differed by gender, age and income groups prior to and in 2020. Four research questions are explored: (1) how did alcohol consumption change in Australia in 2020 compared with pre-pandemic consumption? Did the changes in consumption in 2020 compared with pre-pandemic consumption differ by: (2) gender, (3) age and (4) income groups?

## METHOD

### Participants and procedure

Data were obtained from four waves (2017–20) of the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA survey is a representative household-based longitudinal survey on employment, education and finances that has been conducted annually since 2001 [25]. Households were initially selected for the HILDA survey via a stratified multi-stage approach, with 22–34 dwellings selected across 488 Census Collection Districts, and up to three households were selected for each dwelling [25]. Following the first survey wave, participants and their household members were contacted again in subsequent waves; this included extending the sample to new members of the household (e.g. babies or adopted children), new household members entering a sampled household and new household members when an originally surveyed individual moves to another household [25]. In wave 11, a top-up sample was introduced, increasing the number of responding households to 9543, to continue to make the sample representative of the Australian population [25].

The HILDA survey consists of four instruments: the Household Form (HF), the Household Questionnaire (HQ), the Person

Questionnaire (PQ) and the Self-Completion Questionnaire (SCQ). For this study, the relevant instrument is the SCQ, which is completed by participants aged 15 years and over. The SCQ contains more sensitive and personal questions, such as alcohol consumption and wellbeing items. Prior to the pandemic participants completed the SCQs via hardcopy, but during the pandemic (2020) a mixture of on-line (82%) and hardcopy (18%) options were used [26]. Despite the differences in data collection in 2020, the data collected during the pandemic is of similar quality to previous waves [26]. For example, the wave-on-wave response rate (proportion of participants who completed both the previous and current survey wave) in 2020 of 95.2% was similar with the pre-pandemic survey waves used in this paper, ranging between 96.2% (2018) to 96.7% (2019) [25]. The fieldwork for the HILDA survey took place between July and February for each survey wave except for 2020, when fieldwork began in August 2020 and concluded in February 2021. Most interviews took place in August and September throughout the study period. Further information regarding the HILDA survey methodology can be accessed via the HILDA User Manual [25].

The number of participants who completed a SCQ between 2017 and 2020 ranged from 15 676 (2020) to 16 140 (2017). To be eligible for this study, participants had to be aged 15 years and older in 2017 and had to complete the consumption items in all four waves (2017–20). There were 11 636 participants (51% women) who met these criteria, with a total of 46 544 consumption data observations during the study period. As such, there were no missing data in this study. This study used the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) reporting, and the checklist is available in Supporting information, Table S1.

### Measures

Participants were asked: 'Do you drink alcohol?'. There were eight response options, with the first two options: (a) no, I have never drunk alcohol and (b) no, I no longer drink alcohol. Participants who selected either of these responses were non-drinkers and coded as having 0 for their total number of standard drinks per year. The remaining six response options were drinking alcohol: every day, 5 or 6 days per week, 3 or 4 days per week, 1 or 2 days per week, 2 or 3 days per month and only rarely. Each frequency was recoded into an annual frequency at the mid-point of the range (e.g. drinking alcohol 3 or 4 days per week was recoded as $3.5 \times 52 = 182$ occasions per year). Participants who indicated that they do drink alcohol were then asked: 'On a day that you have an alcoholic drink, how many standard drinks do you usually have?', with response options ranging from '13 or more standard drinks' to '1 to 2 standard drinks'. Participants were informed that 'A standard drink is a small glass of wine, a 285-ml glass of regular beer, a nip of spirits or a mixed drink'. In Australia, a standard drink is a beverage with 10 g of alcohol. Participants' usual quantity was also recoded into a specific volume at the mid-point of the response range (e.g. one to two standard drinks is recoded as 1.5 standard drinks). The total number of standard drinks per year was

then calculated by multiplying the mid-point of the frequency and quantity items.

The socio-demographic variables used in this study were gender (men and women), age group (15–24, 25–34, 35–44, 45–54 or 55+ years) and income group (annual disposable income in AUD: less than $25 999, $26 000–51 999, $52 000–90 999, $91 000–155 999 and $156000+) as reported in 2020. Disposable income is the participants' gross income after tax and includes Australian government income support such as the pandemic-specific financial support available during the pandemic. Lastly, a binary variable, survey wave, was created to distinguish between the three pre-COVID-19 survey waves (2017–19) and the COVID-19 survey wave (2020).

## Analysis

Data were analysed using Stata version 18 [27]. Survey weights provided by the survey custodians were used in all the results presented in this paper. Four population-averaged negative binomial regression models were conducted with all models including, gender, age, income and survey wave to predict alcohol consumption. In addition, each model included 'vce (robust)' to adjust for the clustering in the sample. As seen in Figure 1c, consumption remained relatively stable between 2017 and 2019. We ran a population-averaged negative binomial regression model with the pre-pandemic survey waves predicting alcohol consumption to assess if there was a significant relationship between pre-pandemic survey wave and alcohol consumption. There was no significant trend in alcohol consumption prior to the pandemic [incidence rate ratio (IRR) = 1.00, 95% confidence interval (CI) = 0.98, 1.01, P-value = 0.631]. Therefore, for the four population-averaged negative binomial regression model we used a binary variable (survey wave) to distinguish the three pre-pandemic survey waves (2017–19) and the pandemic survey wave (2020). The survey wave variable was used to examine if the average pre-pandemic consumption over three survey waves (2017–19) changed during the COVID-19 survey wave (2020) as a function of gender, age and income via the interaction effects.

The first population-averaged negative binomial regression model (model 1) included gender, age, income and survey wave to predicting alcohol consumption. Then three population-averaged negative binomial regression models included an interaction effect (model 2: gender and survey wave; model 3: age and survey wave and model 4: income and survey wave). Figures showing the predictive estimated marginal means (via the *margins* and *marginplot* command in Stata) were included to explore any significant interactions from the population-averaged negative binomial regression models. The analysis plan for this study was not pre-registered, and the findings should be considered exploratory.

## RESULTS

Descriptive statistics on the prevalence and mean consumption of the sample is presented in Table 1. Based on the overlapping 95% CIs,
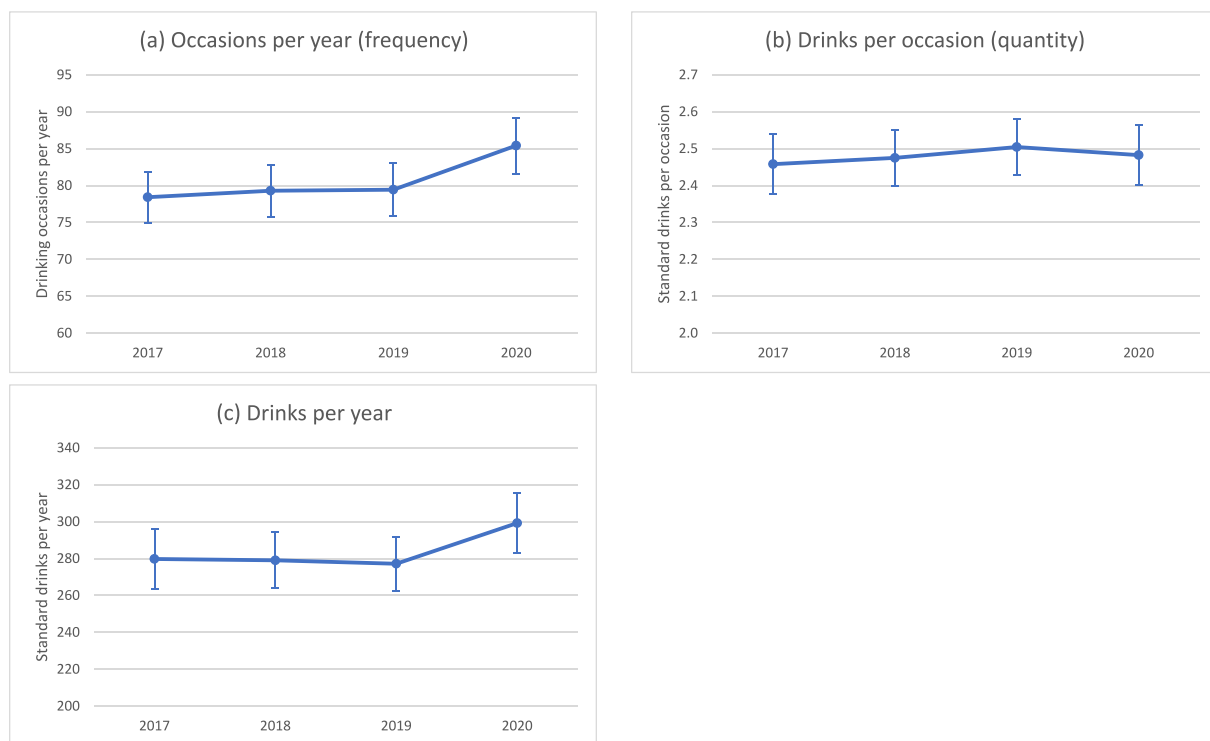


**FIGURE 1** The mean (a) drinking occasions per year (frequency), (b) usual quantity per drinking occasion and (c) total volume of alcohol consumption per year during the study period, with 95% confidence intervals (*n* = 11 636). The vertical axis does not begin at zero to best illustrate the consumption trends

**TABLE 1** The socio-demographic statistics in 2020, and mean number of standard drinks in the past year across survey waves, with 95% confidence intervals.

| | | Frequency | Proportion using survey weights (%) | Mean number of standard drinks (95% CI) | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | 2017 | 2018 | 2019 | 2020 |
| Gender | Men | 5327 | 48.7 | 386 (361, 411) | 379 (356, 401) | 384 (359, 409) | 404 (379, 429) |
| | Women | 6309 | 51.3 | 179 (162, 195) | 181 (168, 194) | 179 (167, 192) | 199 (186, 213) |
| Age (years) | 15–24 | 1013 | 11.0 | 135 (116, 154) | 210 (184, 237) | 184 (151, 216) | 225 (199, 251) |
| | 25–34 | 2003 | 17.7 | 241 (201, 281) | 215 (185, 246) | 218 (186, 251) | 243 (207, 278) |
| | 35–44 | 1877 | 17.6 | 258 (226, 290) | 260 (229, 291) | 261 (229, 292) | 294 (259, 329) |
| | 45–54 | 1931 | 17.1 | 316 (285, 347) | 324 (292, 357) | 315 (282, 349) | 361 (325, 397) |
| | 55+ | 4812 | 36.6 | 335 (308, 362) | 314 (293, 334) | 329 (307, 350) | 322 (302, 343) |
| Income | Less than $25 999 | 678 | 5.2 | 261 (213, 310) | 262 (212, 312) | 284 (230, 337) | 273 (225, 320) |
| | $26 000–51 999 | 1823 | 14.3 | 294 (240, 349) | 283 (250, 317) | 289 (254, 324) | 298 (264, 331) |
| | $52 000–90 999 | 2833 | 23.3 | 289 (263, 314) | 267 (244, 290) | 278 (252, 304) | 297 (270, 323) |
| | $91 000–155 999 | 3826 | 33.3 | 274 (246, 301) | 282 (259, 305) | 271 (248, 294) | 301 (273, 329) |
| | $156 000+ | 2476 | 23.8 | 275 (246, 305) | 280 (253, 307) | 284 (255, 314) | 306 (277, 335) |
| Total sample | | 11 636 | 100 | 280 (264, 296) | 279 (264, 294) | 277 (262, 292) | 299 (283, 315) |

alcohol consumption did not significantly increase in 2020 compared with 2019 in any of the socio-demographic variables.

Figure 1 displays the mean quantity, frequency and total alcohol consumption for the entire sample during the study period. As shown in Figure 1a, the frequency of consumption was relatively stable between 2017 and 2019. However, in 2020 there was an increase in reported frequency of consumption compared with 2019. Meanwhile, Figure 1b shows that the usual quantity remained stable during the study period. Therefore, the increase in total volume in 2020 compared with 2019, as shown in Figure 1c, is probably attributed to the increase in drinking frequency in 2020.

Table 2 displays the results of the four population-averaged negative binomial regression models predicting alcohol consumption across the study period. In model 1 we included all the independent variables without an interaction to examine if consumption changed in 2020 compared with pre-pandemic consumption (first research question). As seen in model 1, participants reported more alcohol consumption during COVID-19 compared with pre-COVID-19 (2017–19; IRR = 1.1, 95% CI = 1.1, 1.1). Next, we ran a population-averaged negative binomial regression model predicting alcohol consumption with the interaction between gender and survey wave (second research question). As seen in model 2, there was no significant interaction between gender and survey wave.

In the third model (Table 2), we included the interaction between age and survey wave in the population-averaged negative binomial regression model predicting alcohol consumption (third research question). As seen in model 3, there was a significant positive interaction between age and survey wave. The predictive estimated marginal means for this interaction were plotted in Figure 2. As seen in Figure 2, there was no significant increase in consumption during COVID-19 compared with pre-pandemic consumption for those aged less than 55 years. However, the trajectory of consumption for those groups

aged less than 55 years is significantly different to those aged 55 and over. That is, while there are no significant changes in consumption in any of the age groups, there is a significant difference in the way in which consumption has changed between these groups from pre-COVID-19 to during COVID-19. In addition, participants aged 15–34 reported consuming significantly less alcohol both pre-COVID-19 and during COVID-19 than those aged over 35 (see Supporting information, Table S2). The last population-averaged negative binomial regression model predicting alcohol consumption included the interaction between income and survey wave (fourth research question). We found no significant interaction between income group and survey wave (Table 2, model 4).

## DISCUSSION

To date, Australian research examining the relationship between socio-demographic groups and alcohol consumption during the pandemic has relied upon convenience samples, recruited after the onset of the pandemic. Using a representative longitudinal Australian sample, this study examined whether changes in alcohol consumption differed by gender, age and income groups in the first year of the pandemic in Australia. We examined four research questions: how did alcohol consumption change during the pandemic, and did it differ by gender, age and income?

Using the HILDA survey data, we found that alcohol consumption increased in 2020 from pre-pandemic consumption (2017–19). This is a novel result, and is in contrast with findings from a European meta-analysis that found reductions in drinking frequency, quantity and heavy episodic drinking during the pandemic [8]. In addition, Australian longitudinal studies using convenience samples found declines in alcohol consumption [17, 18] and no change in AUDIT-C

**TABLE 2**  Results from the four population-averaged negative binomial regression models predicting alcohol consumption.

| | | Model 1 IRR (95% CI) | Model 2 IRR (95% CI) | Model 3 IRR (95% CI) | Model 4 IRR (95% CI) |
|---|---|---|---|---|---|
| Gender | Men (ref) | 0 (ref ) | 0 (ref ) | 0 (ref ) | 0 (ref ) |
| | Women | 0.5 (0.4, 0.5)*** | 0.5 (0.4, 0.5)*** | 0.5 (0.4, 0.5)*** | 0.5 (0.4, 0.5)*** |
| Age (years) | 55+ | 0 (ref) | 0 (ref) | 0 (ref) | 0 (ref) |
| | 15–24 | 0.6 (0.5, 0.7)*** | 0.6 (0.5, 0.7)*** | 0.6 (0.5, 0.6)*** | 0.6 (0.5, 0.7)*** |
| | 25–34 | 0.7 (0.6, 0.8)*** | 0.7 (0.6, 0.8)*** | 0.7 (0.6, 0.7)*** | 0.7 (0.6, 0.8)*** |
| | 35–44 | 0.8 (0.7, 0.9)** | 0.8 (0.7, 0.9)** | 0.8 (0.7, 0.9)*** | 0.8 (0.7, 0.9)** |
| | 45–54 | 1.0 (0.9, 1.1) | 1.0 (0.9, 1.1) | 1.0 (0.9, 1.1) | 1.0 (0.9, 1.1) |
| Income | Less than $25 999 | 0 (ref) | 0 (ref) | 0 (ref) | 0 (ref) |
| | $26 000–51 999 | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) |
| | $52 000–90 999 | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) |
| | $91 000–155 999 | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) |
| | $156 000+ | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) | 1.1 (0.9, 1.3) |
| Survey wave | Pre-COVID-19 | 0 (ref) | 0 (ref) | 0 (ref) | 0 (ref) |
| | COVID-19 | 1.1 (1.1, 1.1)*** | 1.1 (1.0, 1.1)*** | 1.0 (1.0, 1.0) | 1 (0.9, 1.1) |
| Gender × survey wave | Men × COVID-19 | – | 0 (ref) | – | – |
| | Women × COVID-19 | – | 1.1 (1, 1.1) | – | – |
| Age × survey wave | 55+ × COVID-19 | – | – | 0 (ref) | – |
| | 15–24 × COVID-19 | – | – | 1.3 (1.1, 1.5)** | – |
| | 25–34 × COVID-19 | – | – | 1.1 (1.0, 1.2)** | – |
| | 35–44 × COVID-19 | – | – | 1.2 (1.1, 1.2)*** | – |
| | 45–54 × COVID-19 | – | – | 1.1 (1.1, 1.2)*** | – |
| Income × survey wave | Less than $25 999 × COVID-19 | – | – | – | 0 (ref) |
| | $26 000–51 999 × COVID-19 | – | – | – | 1.1 (0.9, 1.3) |
| | $52 000–90 999 × COVID-19 | – | – | – | 1.1 (1.0, 1.3) |
| | $91 000–155 999 × COVID-19 | – | – | – | 1.1 (1.0, 1.3) |
| | $156 000+ × COVID-19 | – | – | – | 1.1 (0.9, 1.3) |

*$P < 0.05$, **$P < 0.01$, and ***$P < 0.001$.
Number of observations for each of the four negative binomial models = 46 544. IRR = incidence rate ratios. Pre-COVID-19 = 2017–19; COVID-19 = 2020.

**FIGURE 2**  Predictive estimated marginal means of the number of standard drinks per year by age range and survey wave, with 95% confidence intervals (number of observations = 46 544)
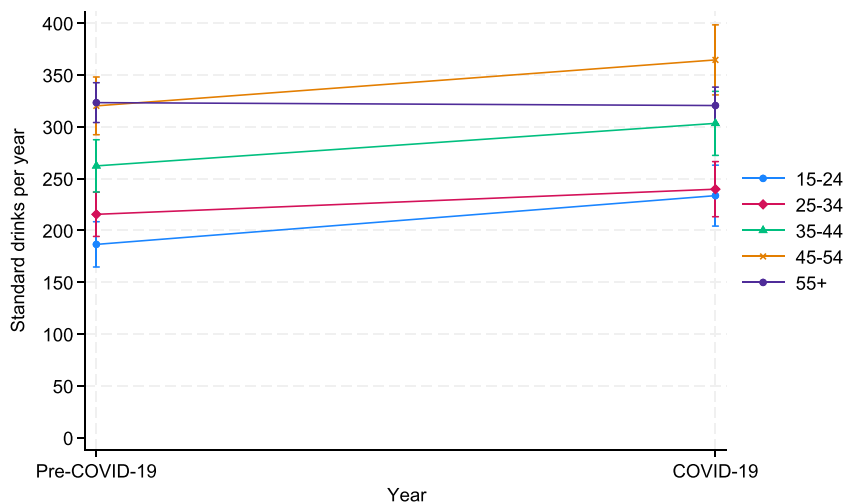
scores [19] during the pandemic. Unlike these studies and most previous Australian research examining alcohol consumption during the pandemic, our study used an established longitudinal representative sample, which is likely to have been more accurately able to capture changes in consumption than surveys using convenience samples. The increase in consumption we identified was driven by an increase in the frequency of consumption during the pandemic. This finding is consistent with one cross-sectional Australian study, using a convenience sample, that found increases in consumption frequency while quantities of alcohol consumed decreased during the pandemic [16]. That study also found a reduction in AUDIT-C scores during the pandemic compared with pre-pandemic. By using a longitudinal sample, we were able to provide a more accurate representation of the differences in consumption during the pandemic without having to rely upon participants retrospectively reporting their pre-pandemic and pandemic consumption at a single time-point. Our study also included both quantity and frequency measures, enabling a measure of annual total volume.

We did not find a significant interaction between gender and survey wave. Our results are in contrast with Acuff and colleagues' [4] systematic review and meta-analysis of the global literature, which found that women reported greater changes in quantity and frequency of consumption during the pandemic. In addition, our results are in contrast with an Australian longitudinal study that used a convenience sample which found that men and women both significantly reduced their typical quantity of alcohol consumption and the frequency of heavy episodic drinking (HED) during the pandemic (May–June 2020) compared with pre-pandemic (February 2020), but that only women reported a significant reduction in overall alcohol consumption during the past month during the pandemic compared with pre-pandemic consumption [17]. The discrepancy in results between our study and that of Clare and colleagues [17] may be due to their use of a retrospective measure to obtain pre-pandemic (February 2020) consumption data in the same wave that they collected pandemic consumption data (past month in May–June 2020). This may have led to recall bias. In addition, convenience samples are also inherently limited by self-selection bias. Although we did not find a significant interaction between gender and survey wave it is important to continue to monitor this relationship as it may have changed in the long term, as the COVID-19 public health measures continued post-2020 in many countries, including Australia.

For the third research question, we examined the interaction between age and survey wave in predicting alcohol consumption. We found a significant difference in consumption change from pre-COVID-19 to during COVID-19 for participants aged less than 55 years compared to those aged more than 55 years. In addition, those aged 15–34 years reported less alcohol consumption during both survey waves (pre-COVID-19 and COVID-19) than those aged 35 years and over. Our findings are consistent with Australian cross-sectional studies that have found that young participants reported less consumption during the pandemic than those in the oldest age group [16, 22]. The introduction of public health measures during the COVID-19 pandemic led to the closure of licensed premises, which

may have had a greater impact upon young people. However, we found that consumption among the youngest age groups (15–34 years) remained below their older counterparts during the study period. Research has found that consumption in different drinking locations such as licensed premises, someone else's home and public spaces temporarily reduce during lockdown periods compared with pre-pandemic consumption, but consumption reverted to pre-pandemic consumption levels once restrictions eased in November 2020 [28]. However, Australian research has found no significant change in drinking in the home during the pandemic [28], which is where people aged 55 and over report most of their alcohol consumption in Australia [21]. The results from this study demonstrate that participants aged 55 and over seemed to be the least impacted by the public health measures introduced during the pandemic, such as the closure of licensed premises.

Lastly, we examined the interaction between income and survey wave in predicting alcohol consumption. We did not find a significant interaction between income and survey wave, which is consistent with Acuff and colleagues' (2022) systematic review and meta-analysis results. However, our results are in contrast with Australian convenience sample studies, which found higher income to be associated with increases in consumption during the pandemic [18, 23, 24]. The discrepancy in results may be due to the differing sampling methods. In addition, Grieger and colleagues [24] used a cross-sectional study of Australian women and Greenwood and colleagues [18] examined Australian parents longitudinally. By using a representative sample of the whole population in the current study, with data collected pre- and post-onset of the pandemic, our results are likely to be more accurate.

## Strengths and limitations

The strength of our analyses includes the use of a representative Australian sample with four survey waves of alcohol consumption data. In addition, by using an established longitudinal survey data set which involved annual data collection, we limited some recall bias by not asking about pre-pandemic alcohol consumption in 2020. However, there are some limitations which may have influenced our results. First, we used the quantity and frequency items from the HILDA survey to calculate the total number of standard drinks per year, which has been shown to be an acceptable representation of alcohol consumption, but graduated frequency is a more apt estimate of per capita consumption in Australia [29]. The measures used here may not be sensitive to changes in drinking patterns—for example, changes in occasional risky drinking sessions may have been underreported by the use of usual quantity and frequency measures. In addition, the HILDA survey has been found to capture approximately one-third of the Australian per capita consumption [30], which suggests that participants are under-reporting their consumption and that the survey may be missing key groups of the population. Nevertheless, the HILDA survey consumption data have been found to broadly reflect trends in Australian per capita consumption [30].

# CONCLUSION

To the best of our knowledge, this study is the first to use a representative Australian sample to examine how different socio-demographic groups changed their consumption during the pandemic. In contrast to previous research, we found that alcohol consumption in Australia increased during the first year of the pandemic. There was also a significant difference in consumption change from pre-pandemic to during the pandemic for participants aged less than 55 years compared to those aged more than 55 years. The results of the present study provide some understanding of how people shift their consumption when restrictions are introduced that may impact upon their usual drinking patterns. Further research is needed, however, as the public health measures continued post-2020.

## AUTHOR CONTRIBUTIONS

**Yvette Mojica-Perez:** Conceptualization (equal); data curation (lead); formal analysis (lead); writing—original draft (lead); writing—review and editing (equal). **Michael Livingston:** Conceptualization (equal); supervision (equal); writing—review and editing (equal). **Amy Pennay:** Conceptualization (equal); supervision (equal); writing—review and editing (equal). **Sarah Callinan:** Conceptualization (equal); supervision (equal); writing—review and editing (equal).

## DECLARATION OF INTERESTS

None to declare.

## DATA AVAILABILITY STATEMENT

This paper uses unit record data from Household, Income and Labour Dynamics in Australia Survey [HILDA] conducted by the Australian Government Department of Social Services (DSS). Restrictions apply to the availability of these data, which were used under license for this study. Data are available at https://dataverse.ada.edu.au/dataset.xhtml?persistentId=doi:10.26193/KXNEBO with the permission of DSS.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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