Examining the relationship between alcohol consumption, psychological distress and COVID-19 related circumstances: An Australian longitudinal study in the first year of the pandemic

Yvette Mojica-Perez [a,*], Michael Livingston [a,b,c], Amy Pennay [a], Sarah Callinan [a]

[a] *Centre for Alcohol Policy Research, La Trobe University, Melbourne, Australia*
[b] *National Drug Research Institute and enAble Institute, Faculty of Health Sciences, Curtin University, Perth, Australia*
[c] *Karolinska Institutet, Department of Clinical Neuroscience, Stockholm, Sweden*

ABSTRACT

Objective: The aim of this study is to examine the relationship between alcohol consumption, psychological distress and COVID-19 related circumstances (being in lockdown, working from home, providing home-schooling and being furloughed) over the first eight months of the pandemic in Australia.

Method: A longitudinal study with six survey waves over eight months with a convenience sample of 770 participants. Participants were aged 18 or over, lived in Australia and consumed alcohol at least monthly. Demographic data was obtained in the first wave. Data on alcohol consumption, psychological distress (Kessler 10), and COVID-19 related circumstances (being in lockdown, working from home, providing home-schooling and being furloughed) were obtained in each survey wave.

Results: Results from the fixed-effect bivariate regression analyses show that participants reported greater alcohol consumption when they had high psychological distress compared to when they had low psychological distress. Meanwhile, participants reported greater alcohol consumption when they worked from home compared to when they did not work from home. Participants also reported greater alcohol consumption when they provided home-schooling compared with when they did not provide home-schooling. The fixed-effect panel multivariable regression analyses indicated a longitudinal relationship between higher psychological distress and providing home-schooling on increased alcohol consumption.

Conclusion: Broader drinking trends during the COVID-19 pandemic typically indicate increases and decreases in drinking among different members of the population. This study demonstrates that in Australia, it was those who experienced psychological distress and specific impacts of COVID-19 restrictions that were more likely to increase their drinking.

1. Introduction

The coronavirus (COVID-19) pandemic and the public health measures implemented to reduce the spread of the virus have impacted people financially, physically and psychologically (O'Sullivan et al., 2020; Pedrosa et al., 2020). Individuals experience and react differently to stress, with some relying on coping strategies such as drinking alcohol (Aldwin, 2007), and this can have lasting effects. While there is historical evidence that experiences of traumatic or stressful events can increase drinking (Boscarino et al., 2006; Wu et al., 2008), there is limited research on the relationship between alcohol consumption and psychological distress during the COVID-19 pandemic in Australia.

1.1. COVID-19, psychological distress and alcohol use.

Longitudinal studies during the COVID-19 pandemic have found increases in mental distress (Pierce et al., 2020), psychological distress (Biddle et al., 2020b), anxiety (Kwong et al., 2021; Upton et al., 2021), depression (Thorisdottir et al., 2021; Upton et al., 2021) and worsening mental wellbeing (Kwong et al., 2021; Thorisdottir et al., 2021) compared with pre-pandemic levels. Predominantly these studies captured the impact of COVID-19 on mental health within the first few months of the World Health Organisation (2020) declaring COVID-19 a pandemic, with some studies showing reductions in distress after the early stages of the pandemic (Robinson & Daly, 2021; Stroud & Gutman, 2021). Ongoing longitudinal research is needed as it is unclear in what

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ways and for how long people will report changes in psychological distress due to pandemic conditions, and in what ways varying public health measures affect psychological wellbeing.

Unlike the studies on mental health, research on the impact of the COVID-19 pandemic on alcohol consumption have produced mixed results (Acuff et al., 2022; Bakaloudi et al., 2021; Schmidt et al., 2021). Using on and off-premise beer sales data from the Australian Tax Office, Vandenberg et al. (2021) found a reduction in on-premise beer per capita consumption per week during lockdown in 2020 but there was no change in off-premise beer consumption. Australian research with young and middle-aged adults found that one in five increased their alcohol consumption, whilst roughly a quarter of participants reduced their consumption during the pandemic (Clare et al., 2021; Stanton et al., 2020). Meanwhile, in a large European cross-sectional study, participants from nineteen of the twenty-one countries studied reported a significant reduction in alcohol consumption during the pandemic (Kilian et al., 2021). In a *meta*-analysis of European studies, Kilian et al. (2022) concluded that more people reported reducing their consumption during the pandemic than those who increased their consumption. Research has also found a reduction in the quantity (Clare et al., 2021; Kilian et al., 2022) and frequency of consumption (Kilian et al., 2022), frequency of binge drinking occasions (Clare et al., 2021), and frequency of heavy episodic drinking occasions (Kilian et al., 2022) during the pandemic. In contrast, a longitudinal study from the USA found greater alcohol frequency in April, May, June and July compared with March 2020 (Nordeck et al., 2021). There may be many reasons for the mixed results on alcohol consumption during the pandemic, including whether lockdown measures were in place. In the USA, participants in lockdown reported significantly greater AUDIT scores in June, July, August and September 2020 compared to those not in lockdown (Killgore et al., 2021).

Other significant changes in people's lives, such as the challenges and responsibilities of working from home and/or home-schooling contributed to stress during lockdown (Cook et al., 2021). Research on working from home and alcohol consumption have been mixed, with some studies indicating that working from home was associated with greater alcohol consumption (Acuff et al., 2022; Alpers et al., 2021; Szajnoga et al., 2020), a decrease in alcohol consumption (Sato et al., 2021), and others did not find a significant association (Boschuetz et al., 2020; Wardell et al., 2020). Meanwhile, having children at home was found to be associated with an increase in alcohol consumption during the pandemic (Acuff et al., 2022; Boschuetz et al., 2020; Rodriguez et al., 2020). An increase in alcohol consumption was also reported by participants who were temporarily laid off (Alpers et al., 2021), lost a job due to COVID-19 (Acuff et al., 2022; Neill et al., 2020) or reported income loss (Acuff et al., 2022; Wardell et al., 2020). The results from these studies help shape the hypotheses of the current paper.

Research conducted early in the pandemic found that participants who reported an increase in alcohol consumption indicated that stress, anxiety and boredom were key reasons for their increase in drinking (Biddle et al., 2020a; Clare et al., 2021). In addition, cross-sectional Australian studies have found that increased alcohol consumption during the pandemic was associated with more psychological distress (Biddle et al., 2020a), depression (Neill et al., 2020; Stanton et al., 2020; Tran et al., 2020), anxiety (Stanton et al., 2020; Tran et al., 2020) and stress symptoms (Callinan et al., 2021; Neill et al., 2020; Stanton et al., 2020). Meanwhile, in a Canadian study, depression was not directly associated with alcohol consumption but greater depression symptoms were associated with increased drinking to cope which was then associated with an increase in alcohol consumption during the pandemic (Wardell et al., 2020).

While cross-sectional studies provide useful information and insight into the association between alcohol consumption and psychological distress at one time point, they cannot explore longer term impacts or variations within individuals based on changing circumstances. Therefore, it is unclear if these relationships remained as the strict public

health measures introduced at the start of the pandemic were eased. Longitudinal studies examining the relationship between alcohol use and psychological distress during the pandemic are limited. In the UK, alcohol consumption and smoking were associated with worsening mental health symptoms between April and November 2020 among young adults (Stroud & Gutman, 2021). Meanwhile, young Canadian adults reported a significant reduction in alcohol consumption, and an increase in depression and anxiety symptoms during the pandemic (Minhas et al., 2021). Similarly, a study of Portuguese college students found that regular binge drinkers reported less alcohol consumption during lockdown and post-lockdown compared with pre-lockdown (Vasconcelos et al., 2021). In both studies, the changes in alcohol consumption were not associated with anxiety, depression (Minhas et al., 2021; Vasconcelos et al., 2021) and stress (Vasconcelos et al., 2021) symptoms. Given the uncertainty of the COVID-19 pandemic, including how long public health measures are needed to slow the spread of the virus, longitudinal studies are imperative to examine and capture any within participant changes in the relationship between COVID-19 related circumstances, psychological distress and alcohol consumption.

1.2. Restrictions in Australia

Australia has experienced relatively low rates of infection and death from COVID-19 to date (World Health Organization, 2021), partly due to strict and prolonged lockdowns. In response to spreading COVID-19 cases in Australia, licensed premises and non-essential businesses were closed nationwide on the 23rd of March 2020. Lockdown restrictions were then introduced on the 30th of March 2020, with only four reasons to leave the house: essential shopping, essential work, medical/health needs, and exercise. During this time, takeaway liquor shops remained open and alcohol delivery services could operate (Miller et al., 2021).

National lockdown restrictions started to ease from late-April 2020 at different rates across the country. Then, in July 2020, the Victorian State Government reinstated lockdown restrictions due to an outbreak in Melbourne, the capital city of Victoria. The Melbourne lockdown was stricter than the first, with a curfew introduced (8 pm-5am) and a 5 km travel limit imposed on essential shopping and exercise. The lockdown ended in late-October 2020 and licenced premises re-opened in Melbourne alongside the easing of other restrictions (see Miller et al. (2021) for a detailed timeline of Australian restrictions). The differences in restrictions throughout Australia, specifically the second lockdown in Melbourne, provides a valuable opportunity to explore the relationship between alcohol consumption, COVID-19 related circumstances and psychological distress.

1.3. The present study

The aim of this study is to examine the relationship between alcohol consumption, psychological distress and COVID-19 related circumstances (being in lockdown, working from home, providing home-schooling and being furloughed) over the course of the first eight months of the pandemic in Australia. We hypothesise that: (1) alcohol consumption will be positively linked with psychological distress and (2) alcohol consumption will be positively linked with being in lockdown, working from home, providing home-schooling and being furloughed.

2. Method

2.1. Participants and procedure

This study was approved by the La Trobe University Human Research Ethics Committee (HEC20123). Participants were recruited via paid advertisements on Facebook and Instagram that appeared in the newsfeeds and stories of Australians aged 18 and over. After respondents provided consent, they were screened for the inclusion criteria: aged

over 18 years, lived in Australia and consumed alcohol at least monthly. Respondents completed the survey via the Qualtrics survey platform and could enter a draw to win a $50 grocery voucher. At the conclusion of the first survey, respondents were given the opportunity to continue to be part of the study. A total of 1,260 participants agreed to be contacted for the follow-up surveys and provided their email address. The emails, sent out every-six weeks, included a personalised link to complete the follow-up survey. Table 1 displays the survey dates, lockdown restriction dates and the number of participants in each wave.

As seen in Table 1, the number of participants in each survey wave declined over time. We limited the analytical sample to participants who completed three or more surveys. This threshold provided the best balance between minimising missing data and maximising the number of respondents included, so 490 participants (38.9 %) who responded to two or fewer waves were excluded from the analyses. This left a final sample of 770 participants. We used multiple imputation to address missing data. Sample demographics are shown in Table 2. Participants ranged from 18 to 80 years old (M_{age} = 49.8, SD = 14.7, 57.3 % of women) and most lived in Victoria (44.0 %) or New South Wales (22.5 %).

In Table 2 we compare our sample with monthly drinkers aged 18 and over from the 2019 National Drug Strategy Household Survey (NDSHS), which relies on random sampling methods and is broadly representative of the general Australian population (Australian Institute of Health and Welfare, 2020). Compared with the NDSHS, our sample were more likely to be female and to be from Victoria.

2.2. Measures

2.2.1. Alcohol consumption

Past month alcohol consumption was obtained via location-based loops, modified from Casswell et al.'s (2002) work, for four different locations: at the respondent's own home, at someone else's home, at a licensed premise, and in public spaces. Respondents were asked about the frequency of weekend (Friday-Sunday) and weekday (Monday-Thursday) drinking for each location, with the following response options: never, about once a month, about once a fortnight, about once each weekend/week, about twice each weekend/about 2–3 times a week and every weekend day/weekday, respectively.

For each location that a respondent indicated consuming alcohol, they were then asked about how much alcohol, in standard drinks (10 g pure alcohol), they would drink in a usual weekend and/or weekday occasion. An annual estimate of consumption at each location was calculated for both weekends and weekdays by multiplying quantity and frequency. The weekend and weekday location-based consumption total were summed to get total location-based consumption. Lastly, adding

Table 1
The Dates for Each of the Survey Waves with An Indication of When Restrictions Were in Place, and the Number of Participants.

Survey Wave	Survey dates	Lockdown Restrictions	Number of participants
T1	28th of April – 29th of May	Yes (All of Australia)	1,260
T2	15th of June – 2nd of July	None	809
T3	27th of July – 10th of August	Yes (Only Victoria*)	732
T4	7th of September – 21st of September	Yes (Only Victoria*)	625
T5	19th of October – 2nd of November	Yes (Only Victoria*)	574
T6	30th of November – 14th of December	None	502

*Victoria was the only state/territory in lockdown between Time 3–5, with the rest of the country only experiencing some capacity limits in homes and businesses. During lockdown restrictions in Victoria, home-schooling and working from home was mandatory except for essential service workers.

Table 2
Demographic Comparison of Respondents from the Current COVID-19 Study and the 2019 NDSHS.

		COVID-19 study (95 % CIs)	NDSHS (95 % CIs)
Gender (%)	Men	41.7 (38.2, 45.2)	52.9 (51.8, 53.9)
	Women	57.3 (53.7, 60.7)	47.1 (46.1, 48.2)
	Gender not listed	1.0 (0.5, 0.5)	–
Age	Mean	49.8 (48.7, 50.8)	48.4 (48.0, 48.8)
	25th percentile	38	36
	75th percentile	62	65
State/Territory (%)	NSW	22.5 (19.7, 25.6)	31.0 (30.5, 31.4)
	VIC	44.0 (40.5, 47.6)	26.4 (26.0, 26.8)
	QLD	13.4 (11.1, 16.0)	20.3 (19.9, 20.7)
	SA	6.4 (4.8, 8.3)	7.4 (7.2, 7.6)
	WA	5.7 (4.3, 7.6)	9.9 (9.7, 10.2)
	NT	0.5 (0.2, 1.4)	0.9 (0.9, 1.0)
	ACT	2.3 (1.5, 3.7)	1.8 (1.7, 1.8)
	TAS	5.2 (3.8, 7.0)	2.2 (2.2, 2.3)
Total sample	n	770	13,840

Note: New South Wales (NSW), Victoria (VIC), Queensland (QLD), Western Australia (WA), Northern Territory (NT), Australian Capital Territory (ACT) and Tasmania (TAS).

the four location-based consumption totals together resulted in the annual total alcohol consumption. A respondent's number of standard drinks per day was calculated by dividing the annual total alcohol consumption by 365. Respondents who reported consuming an average of more than 30 standard drinks per day were capped at 30 (Jiang et al., 2014).

2.2.2. Psychological distress

The Kessler 10 Psychological Distress Scale (K10) was used to examine psychological distress (Kessler et al., 2002) in the past four weeks. The K10 consists of 10 items and scores range from 10 to 50, with a higher score indicating greater distress. The K10 has good validity and reliability (Furukawa et al., 2003; Kessler et al., 2002). Prior to the multiple imputation, the Cronbach's alpha for the K10 subscales were excellent in all study waves (ranged from 0.91 in T1 and 0.94 in T6). Respondents were grouped into three groups per wave, based on the categories used by the Australian Bureau of Statistics (2012): low (10–15), moderate (16–21) and high (22–50).

2.2.3. COVID-19 related circumstances

In each wave, respondents were asked if they had experienced any of the following as a consequence of COVID-19: working from home, providing home-schooling, and currently furloughed (unpaid leave). There were three response categories: yes, no and missing (respondents with missing data were placed into this category). A lockdown variable was created, to identify respondents who were in lockdown during each of the six waves based on the survey timing and state of residence.

2.2.4. Demographic variables

Age, gender and state of residence were collected in the first survey.

2.3. Missing data

Multiple imputation was used to handle the missing data on our key measures: alcohol consumption and K10 score. Details on the multiple imputation are available in the Supplementary Material including a comparison between the pre and post multiple imputation mean standard drinks per day for the total sample and the three psychological

distress groups in Table S1. In addition, a multiple imputation diagnostic plot for psychological distress was conducted using Stata and is included in the Supplementary Material (Figure S1). There were also missing data in three of the COVID-19 related circumstances: working from home, providing home-schooling and furloughed. We chose not to use multiple imputation on these variables as they are binary and more likely to be influenced by external factors (e.g. pandemic restrictions) than by respondent characteristics. In order to include all participants in the regression analyses, a separate missing category was created for each of these COVID-19 related circumstances.

2.4. Analysis

Descriptive statistics and regression analyses were conducted using Stata version 15.1 (StataCorp, 2017). The mean standard drinks per day stratified by psychological distress and the COVID-19 related circumstances were displayed in Table 4 for each survey wave to demonstrate the between group differences. Five bivariate fixed-effects regression analyses were conducted, one for each predictor variable (psychological distress, lockdown, working from home, providing home-schooling and furloughed) to explore their relationship with alcohol consumption separately. Then two multivariable fixed-effects regression analysis were conducted with and without psychological distress, and all COVID-19 related circumstances to predict the log of the total alcohol

Table 3
Psychological Distress and Pandemic Related Circumstances Across the Six Waves with the 95% Confidence Intervals.

	T1	T2	T3	T4	T5	T6
Psychological distress (n)	770	661	665	586	535	472
Low (%)	47.5 (44.0, 51.1)	52.2 (48.4, 56.0)	53.1 (49.3, 56.9)	50.9 (46.8, 54.9)	52.5 (48.3, 56.7)	56.6 (52.0, 61.0)
Moderate (%)	23.0 (20.1, 26.1)	21.0 (18.1, 24.3)	19.8 (17.0, 23.1)	22.4 (19.2, 25.9)	22.2 (18.9, 26.0)	19.1 (15.8, 22.9)
High (%)	29.5 (20.1, 32.8)	26.8 (23.5, 30.3)	27.1 (23.8, 30.6)	26.8 (23.4, 30.5)	25.2 (21.7, 29.1)	24.4 (20.7, 28.5)
Lockdown (n)	770	662	664	586	535	472
No (%)	0 (-)	100 (-)	56.0 (52.4, 59.4)	56.0 (52.4, 59.4)	56.0 (52.4, 59.4)	100 (-)
Yes (%)	100 (-)	0 (-)	44.0 (40.6, 47.6)	44.0 (40.6, 47.6)	44.0 (40.6, 47.6)	0 (-)
Work from home (n)	714	671	669	591	540	483
No (%)	59.4 (55.7, 62.9)	44.7 (41.0, 48.5)	70.7 (67.1, 74.0)	70.9 (67.1, 74.4)	75.2 (71.4, 78.7)	76.4 (72.4, 80)
Yes (%)	40.6 (37.1, 44.3)	55.3 (51.5, 59.0)	29.3 (26, 32.9)	29.1 (25.6, 32.9)	24.8 (21.3, 28.6)	23.6 (20.0, 27.6)
Home-schooling (n)	770	676	671	595	544	487
No (%)	79.2 (76.2, 81.9)	83.4 (80.4, 86.1)	89.4 (86.9, 91.5)	90.6 (88, 92.7)	91.5 (88.9, 93.6)	96.7 (94.7, 98.0)
Yes (%)	20.8 (18.1, 23.8)	16.6 (13.9, 19.6)	10.6 (8.5, 13.1)	9.4 (7.3, 12.0)	8.5 (6.4, 11.1)	3.3 (2.0, 5.3)
Furloughed (n)	770	673	670	592	542	485
No (%)	91.8 (89.7, 93.6)	93.5 (91.3, 95.1)	96.4 (94.7, 97.6)	97 (95.2, 98.1)	97.2 (95.5, 98.3)	98.4 (96.7, 99.2)
Yes (%)	8.2 (6.4, 10.3)	6.5 (4.9, 8.7)	3.6 (2.4, 5.3)	3.0 (1.9, 4.8)	2.8 (1.7, 4.5)	1.7 (0.8, 3.3)

Note: The figures presented for psychological distress are before the multiple imputation was conducted. There were no lockdown restrictions in T2 and T6.

consumption (outcome variable). Fixed-effect regression was used to identify the within-person changes in circumstances and their relationship with alcohol consumption across the study period whilst keeping individual differences and survey wave constant. In all the fixed-effects regression analyses the robust estimate of variance via Stata's vce (robust) option was used to account for the nesting of responses within respondents.

3. Results

3.1. Descriptive statistics

The number and proportion of participants in each psychological distress category and COVID-19 related circumstances are shown in Table 3. The proportion of participants in the high psychological distress group in the final wave (T6) decreased by 10 % compared to the first wave (T1). The proportion of participants who worked from home, provided home-schooling and were furloughed reduced as lockdown restrictions eased.

To explore the difference between groups, Table 4 displays the mean number of standard drinks consumed per day in each wave for psychological distress and the COVID-19 circumstances. Differences between groups were identified via non-overlapping confidence intervals. Following the first lockdown (T1), the mean number of drinks reported by participants decreased until T3. From T4 to T6 there was an increase in the mean number of drinks, with the reported mean in T6 greater than during T1. Participants in the high psychological distress group reported a greater mean number of standard drinks compared to participants in the low and moderate groups throughout the study period. Participants who were in lockdown between T3-T5, working from home, and providing home-schooling reported lower mean drinks per day compared with those who did not indicate any of these three COVID-19 related circumstances. Lastly, participants who reported they were furloughed reported higher consumption across all the waves except for the last wave when they reported fewer drinks per day compared with participants who were not furloughed.

3.2. Regression analyses

In order to test both hypotheses, Table 5 shows the results from the fixed-effect panel bivariate and multivariable regression analyses predicting the log of the total alcohol consumption. As the outcome variable was logged the results will be interpreted in terms of the relationship between the predictor variables on the outcome variable during the study period. The results from the five bivariate regression analyses demonstrated that participants with high psychological distress, working from home and providing home-schooling reported greater alcohol consumption during the study period. In the first multivariable regression analysis examining the COVID-19 related circumstances, only home-schooling was positively associated with alcohol consumption. Working from home was no longer significant in the multivariable regression analysis. In the second multivariable regression analysis, where psychological distress was also included, alcohol consumption was positively associated with high psychological distress and home-schooling. Adding psychological distress to the multivariate regression analysis did not change the results for the COVID-19 related circumstances suggesting that the effect of the COVID-19 related circumstances on alcohol consumption appeared to be independent to psychological distress.

4. Discussion

This study examined the relationship between alcohol consumption, psychological distress and COVID-19 related circumstances (being in lockdown, working from home, providing home-schooling and being furloughed) in the first year of the pandemic when restrictions were in

Table 4

The Between Group Differences in the Mean Standard Drinks Per Day with 95% Confidence Intervals Stratified by COVID-Related Circumstances Across All Survey Waves.

		T1	T2	T3	T4	T5	T6
Psychological distress	Low	3.24 (2.79, 3.68)	2.98 (2.59, 3.37)	2.46 (2.13, 2.78)	2.86 (2.37, 3.35)	2.85 (2.42, 3.29)	3.06 (2.61, 3.51)
	Moderate	3.09 (2.49, 3.69)	2.96 (2.25, 3.67)	3.07 (2.28, 3.87)	3.03 (2.36, 3.70)	3.06 (2.40, 3.72)	3.86 (2.90, 4.82)
	High	3.72 (3.06, 4.39)	3.95 (3.21, 4.68)	3.61 (2.88, 4.35)	3.32 (2.65, 3.99)	3.87 (3.09, 4.65)	4.15 (3.26, 5.03)
Lockdown	No	–	3.23 (2.91, 3.56)	3.17 (2.73, 3.61)	3.36 (2.87, 3.85)	3.50 (3.02, 3.98)	3.51 (3.12, 3.90)
	Yes	3.35 (3.03, 3.67)	–	2.60 (2.15, 3.05)	2.61 (2.16, 3.07)	2.77 (2.30, 3.25)	–
Working from home	No	3.57 (3.11, 4.03)	3.11 (2.63, 3.59)	2.71 (2.38, 3.05)	3.14 (2.68, 3.60)	2.86 (2.49, 3.22)	3.06 (2.61, 3.51)
	Yes	3.03 (2.58, 3.49)	3.01 (2.59, 3.43)	2.61 (2.03, 3.19)	2.39 (1.89, 2.89)	2.30 (1.81, 2.78)	2.28 (1.83, 2.73)
Home-schooling	No	3.45 (3.08, 3.82)	3.26 (2.90, 3.62)	2.74 (2.43, 3.05)	3.05 (2.66, 3.44)	2.83 (2.51, 3.16)	2.94 (2.56, 3.31)
	Yes	2.96 (2.38, 3.53)	2.23 (1.61, 2.84)	2.18 (1.43, 2.93)	1.70 (1.21, 2.19)	1.48 (1.08, 1.88)	1.60 (0.91, 2.30)
Furloughed	No	3.30 (2.97, 3.63)	3.05 (2.72, 3.37)	2.65 (2.36, 2.95)	2.90 (2.54, 3.26)	2.65 (2.36, 2.94)	2.88 (2.52, 3.24)
	Yes	3.85 (2.51, 5.19)	3.49 (2.23, 4.75)	3.53 (1.84, 5.21)	3.62 (1.38, 5.86)	4.92 (1.72, 8.12)	2.60 (-0.73, 5.93)
Drinks per day		3.35 (3.03, 3.67)	3.23 (2.91, 3.56)	2.92 (2.60, 3.23)	3.03 (2.69, 3.37)	3.18 (2.84, 3.52)	3.51 (3.12, 3.9)

Note: There were no lockdown restrictions in T2 and T6.

Table 5

The Within-Person Results from the Fixed-Effect Panel Bivariate Regression and Multivariable Regression Analyses Predicting the Log of the Total Alcohol Consumption.

		Bivariate model		Multivariable model		Multivariable model	
		B (CI)	p-value	B (CI)	p-value	B (CI)	p-value
Psychological distress	Low	0 (Ref)	–	–	–	0 (Ref)	–
	Moderate	0.01 (-0.13, 0.16)	0.874	–	–	0.002 (-0.14, 0.15)	0.975
	High	0.21 (0.02, 0.40)*	0.030	–	–	0.21 (0.01, 0.40)*	0.036
Lockdown	No	0 (Ref)	–	0 (Ref)	–	0 (Ref)	–
	Yes	−0.02 (-0.11, 0.07)	0.624	−0.05 (-0.14, 0.04)	0.254	−0.06 (-0.15, 0.03)	0.191
Working from home	No	0 (Ref)	–	0 (Ref)	–	0 (Ref)	–
	Yes	0.17 (0.03, 0.32)*	0.021	0.15 (-0.001, 0.30)	0.052	0.15 (-0.004, 0.29)	0.056
	Missing	0.11 (-0.06, 0.27)	0.191	0.23 (-0.13, 0.58)	0.209	0.23 (-0.13, 0.58)	0.207
Home-schooling	No	0 (Ref)	–	0 (Ref)	–	0 (Ref)	–
	Yes	0.32 (0.14, 0.50)***	0.001	0.30 (0.11, 0.50)***	0.002	0.31 (0.11, 0.50)**	0.002
	Missing	0.08 (-0.08, 0.24)	0.317	−0.21 (-1.23, 0.80)	0.674	−0.21 (-1.22, 0.80)	0.675
Furloughed	No	0 (Ref)	–	0 (Ref)	–	0 (Ref)	–
	Yes	0.08 (-0.23, 0.39)	0.596	0.11 (-0.19, 0.42)	0.473	0.10 (-0.21, 0.41)	0.529
	Missing	0.03 (-0.13, 0.19)	0.727	0.12 (-0.94, 1.18)	0.817	0.12 (-0.93, 1.17)	0.816

N = 770. Note. B = unstandardized Beta; CI = confidence interval. * p <.05; ** p <.01; ***p < 0.001.

place in Australia. Two hypotheses were tested: (1) alcohol consumption will be positively linked with psychological distress and (2) alcohol consumption will be positively linked with being in lockdown, working from home, providing home-schooling and being furloughed.

The first hypothesis was supported as there was a positive relationship between alcohol consumption and psychological distress over our six survey waves in 2020. Participants with high psychological distress reported greater alcohol consumption compared to when they reported low psychological distress. Our findings are consistent with work from the UK (Stroud & Gutman, 2021) and provide further evidence that psychological distress during the pandemic was a key risk factor for increased alcohol consumption. This potentially reflects the use of alcohol as a coping strategy.

The second hypothesis was partially supported, with a positive relationship identified between alcohol consumption and working from home (only in the bivariate regression analysis) and providing home-schooling. In addition, the association between alcohol consumption and the COVID-19 related circumstances appeared to be independent from psychological distress with minimal changes in the second multivariable regression analysis results when psychological distress was added. Therefore, we were able to establish that home-schooling was a predictor of alcohol consumption even after controlling for psychological distress. Previous research has found that working from home was associated with greater alcohol consumption (Acuff et al., 2022; Alpers et al., 2021; Szajnoga et al., 2020) as did having children at home during the pandemic (Acuff et al., 2022; Boschuetz et al., 2020; Rodriguez et al., 2020). Individuals who shifted to working from home and/or providing home-schooling during lockdown may have had more time to consume

alcohol due to the removal of the daily work and/or school commute. Research has found that the most common reasons for increasing alcohol consumption during the pandemic were spending more time at home and boredom (Biddle et al., 2020a; Clare et al., 2021).

In contrast, we did not find a positive association between alcohol consumption and being in lockdown or being furloughed in either bivariate or multivariable models. These results were unexpected as previous research from the USA found that participants in lockdown reported greater AUDIT scores compared to non-lockdown participants during June to September 2020 (Killgore et al., 2021). Furthermore, previous research has found that being temporarily laid off (Alpers et al., 2021) or losing income (Acuff et al., 2022; Wardell et al., 2020) was associated with increases in alcohol consumption during the COVID-19 pandemic. In contrast with Killgore et al. (2021), Callinan et al. (2021) did not find an increase in AUDIT scores during lockdown in Australia. These differing results may be due to differences in alcohol measures used, as Killgore et al. (2021) and Callinan et al. (2021) both used the AUDIT whilst we utilised a more detailed alcohol consumption measure. In addition, the contrasting results may reflect differences in financial support and the length of lockdown between countries.

Our findings help provide some clarity in the ongoing debates about the impact of COVID-19 on drinking. They suggest that focussing on overall consumption effects likely misses key subpopulations whose drinking has been most affected and who may be at most risk of harm during and after the pandemic. Focussing public health interventions on reducing psychological distress and supporting people who are working from home or providing home-schooling to manage their drinking is likely to be effective at reducing the longer-term impacts of the

pandemic on drinking within these at-risk groups.

4.1. Strengths and limitations

The strengths of our study include the use of location-based loops to measure alcohol consumption, which provide more detailed and accurate consumption data. In addition, the use of six survey waves allowed us to collect data as restrictions were being eased throughout Australia and then tightened in Victoria during the second lockdown. This provided a unique opportunity to explore the relationship between alcohol consumption and restrictions imposed as part of being in lockdown. Lastly, the use of multiple imputation for the missing data in the alcohol and psychological distress variables allowed us to maintain a large sample to explore our hypotheses. It is worth noting that multiple imputation is a simulation-based statistical technique that utilises completed data to handle missing values (StataCorp, 2019), therefore the more data that is available, the less reliant it is on multiple imputation. In this study, there were more participants who reported low psychological distress compared to participants in the moderate or high group. Whilst not ideal, the post-multiple imputation mean standard drinks per day for participants with moderate and high psychological distress was higher than the pre-multiple imputation data, particularly in the later survey waves (please see Table S1). With this in mind, the use of multiple imputation was beneficial to minimise any bias which may occur when using other methods use to deal with missing values (e.g. listwise deletion).

A number of limitations may have influenced our findings. Firstly, this study used a convenience sample who were more likely to be female and from Victoria compared with an Australian representative sample from the NDSHS. This may be due to the survey methods utilised as research has found that a larger proportion of women compared to men use Facebook and Instagram (Duggan, 2015) and women are more likely to complete surveys compared to men (Cheung et al., 2017; Kypri et al., 2004; Maclennan et al., 2012; Porter & Whitcomb, 2005), including when recruitment occurs via Facebook (Thornton et al., 2016). In addition, a large proportion of the participants were from Victoria, this may be due to this study originating from Victoria, or due to participants in lockdown being more likely to be interested in, or have time for, this study. Therefore, the results from this study cannot be generalised to the Australian population. Another limitation in this study was that the surveys did not include within-session response consistency items (Wood et al., 2017) or attention checks. However, participants completed the follow-up surveys via personalised links sent by email which would have minimised the risk of external interference such as bot responses. Lastly, to be eligible to participate in this study, participants had to report drinking at least monthly during the first survey wave. Therefore, this study did not capture abstinent or low drinking individuals who may have increased their consumption or started drinking during the pandemic.

5. Conclusion

This study adds to the limited longitudinal research investigating the association between alcohol consumption, psychological distress, and a number of COVID-19 related circumstances (being in lockdown, working from home, providing home-schooling and being furloughed). Participants with high psychological distress reported greater alcohol consumption during the pandemic compared to participants with low psychological distress. Working from home and providing home-schooling were also associated with an increase in alcohol consumption, with this association being independent from psychological distress. It is recommended that public heath interventions focus on reducing psychological distress and support people who work from home or provide home-schooling which has been found to be associated with an increase in alcohol consumption during the pandemic.

Author agreement

Declaration of Competing Interest

Data availability

The data that has been used is confidential.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.addbeh.2022.107439.

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