

**Alcohol Consumption During COVID-19: A Quantitative Analysis of Middle-to-Older-Aged Men in South Australia**

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### Abstract

The impact of the SARS-CoV-2 (COVID-19) pandemic has had a significant impact on the world. In Australia, social restrictions and lockdowns have demonstrably affected drinking behaviours with the closure and extensive restrictions surrounding typical places of drinking, such as pubs, clubs, bars, and restaurants. This has led to increased drinking in homes.

Previous research and media articles have focused upon female experiences of alcohol consumption during COVID-19. The current study provided rationale for a focus upon the specific challenges that men have encountered concerning alcohol consumption during the pandemic. The current study derived data from the sixth wave (collected in 2020) of Men Androgen Inflammation Lifestyle Environment and Stress (MAILES) studies collected since 2002. The sample comprised 673 suburban, community-dwelling men with a mean age of 69.5 years. Hierarchical binary logistic regressions indicated that middle age, depression, and concern for oneself becoming sick with COVID-19 was associated an increase in alcohol consumption in men. Further, results indicated that middle age, and concern for oneself becoming sick with COVID-19 was associated with hazardous alcohol consumption in men. The study provided explanations for the findings and concluded that the current study has a number of limitations but has the potential to inform future research on the effects of COVID-19 upon male alcohol consumption. The current study is generalisable to other jurisdictions with similar sociodemographics and experiences of COVID-19.

### Declaration

This thesis contains no material which has been accepted for the award of any other degree of diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the University of Adelaide's digital thesis repository, the Library Search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

Signed: MEN

27 September 2021

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## 1. Introduction

**1.1 Overview of literature.** This literature review will examine the research that has been conducted upon alcohol consumption during COVID-19, with a specific focus on increased consumption, and hazardous consumption. Previous literature has demonstrated the considerable effects of largescale stressful events likened to the pandemic on alcohol consumption. Increased alcohol consumption and hazardous alcohol consumption can lead to poor health outcomes for the general population. The review provides understandings of the male-specific health effects from hazardous alcohol consumption and provides an up-to-date review of male alcohol use during the pandemic. Predictors of increased alcohol consumption and hazardous alcohol consumption were then rationalised. Such predictors include, mental health status (depression, and anxiety), resilient coping, age group, highest level of education, change in financial status during the pandemic, and concerns that oneself and family will become sick with COVID-19. Hypotheses rationalised by the literature review will then be outlined.

**1.2 COVID-19 globally & in South Australia.** Since the WHO (2020b) declared a global pandemic on January 30, 2020, there have been over 200 million cases and over 4.5 million deaths, globally, from SARS-CoV-2 (COVID-19) (World Health Organization, 2021). A large proportion of the world's population has been subject to stay-at-home orders and social restrictions to reduce contact between people, with the goal of lessening community transmission (Flaxman et al., 2020). Previous disease outbreaks and subsequent quarantine have been found to cause stress, confusion, and anger (Brooks et al., 2020) and that isolation, more generally, has a negative effect on the health of a person, socially and emotionally (Holt-Lunstad, Smith, Baker, Harris & Stephenson, 2015).

The pandemic has challenged jurisdictions across the globe and within Australia in differing ways as a result of fluctuating deaths, case numbers, vaccination rates, and

perceived threat due to the virus. To date, South Australia has had approximately 900 cases of COVID-19 with 4 losses of life since the onset of the pandemic. Restrictions have however been a mainstay of the past 18 months with fluctuations in severity occurring as cases have emerged from the hotel quarantine system (with returned international, interstate travellers, and staff of such hotels). State-wide lockdowns have occurred at three periods since the pandemic, with the latest occurring in July 2021. A mask mandate (Government of South Australia, 2021) was enacted in which persons in an indoor space or in densely populated areas are required to wear a mask, and QR check-ins are a requirement by law at almost every premise within South Australia. In comparison to other states in Australia, COVID-19 restrictions have been less stringent in duration of lockdowns and with easing of restrictions such as premise capacities in public spaces.

**1.3 Alcohol consumption during COVID-19.** In a non-pandemic context, literature demonstrates that stress leads people to use and misuse alcohol (Keyes et al., 2012). This phenomenon is demonstrated in previous studies of stressful largescale events likened to the COVID-19 pandemic, indicating short and long-term increases in alcohol consumption. Such events include 9/11 (Vlahov et al. 2006), natural disasters (Cerdeira et al., 2011) and, most similarly, during the SARS outbreak in China during 2003 (Wu et al., 2008). A study of high middle-aged drinking during the COVID-19 pandemic in the United Kingdom (Daly & Robinson, 2021) indicated that high risk drinking increased from 19.4% pre-pandemic, to 24.6% in May 2020. Although this study suggests that a short-term increase in alcohol consumption, further study of alcohol at specific time points throughout COVID-19 is required in order to better understand long term alcohol consumption trends. In response to concerns about increasing alcohol consumption during COVID-19, the WHO (2020a) published advice guiding people to avoid alcohol use and misuse during the pandemic.

Despite concerns and subsequent advice guidelines from the WHO and through understandings of the effects of stressful events on alcohol use and misuse, Rehm et al. (2020) predicted that specific groups of people will report an increase in alcohol consumption during the pandemic, and others will report a decrease or that their consumption remained the same during the pandemic. It was noted (McPhee, Keough, Rundle, Heath, Wardell & Hendershot, 2020) that such a prediction provides rationale for further analysis of factors that are associated with negative alcohol behaviours such as increased consumption and hazardous drinking.

**1.4 Health impacts of alcohol use.** As reported by the Australian Institute of Health and Welfare (AIHW) (2015), it is estimated that 4.5% of the total burden of diseases and injury are attributable to alcohol consumption. Current guidelines (National Health and Medical Research Council, 2020) recommend that no more than 4 standard drinks of alcohol should be consumed per day to reduce the risk of short-term harm injury and both short and long-term harm from disease and injury. Disease or injuries include, but are not exhaustive to, specific types of cancer such as mouth, throat, oesophagus, liver (American Cancer Society, 2020; Praud et al., 2016), infertility (Van Heertum & Rossi, 2017), HIV (Baliunas, Rehm, Irving & Shuper, 2010), damage to organs such as the liver (Roerecke et al., 2019), kidneys (Fan, Yun, Yu, Yang & Song, 2019), increased risk of cardiovascular disease (Roerecke & Rehm, 2010; Roerecke & Rehm, 2014), and dementia (Rehm, Hasan, Black, Shield & Schwarzinger, 2019). Further, excessive alcohol consumption is associated with an increased risk of contracting bacterial and viral lung infections including COVID-19 (Barr et al., 2016; Szabo & Saha, 2015; Testino 2020).

**1.5 Men, alcohol, & health impacts.** In addition to the general health impacts of alcohol consumption, it is understood that there are specific health impacts from the use of alcohol that are unique to men.

First, it is understood that men drink more standard drinks of alcohol than women (Ritter et al., 2020), and are more likely than females to drink at levels exceeding the single occasion risk guideline (NHMRC, 2020). The latter finding is consistent with a study that examined the drinking behaviours of over 65,000 persons over the age of 50 in Europe, identifying that the proportion of hazardous drinking behaviour was higher in men than in women (Bosque-Prous et al., 2017), and a study indicating that men are two times more likely to binge drink than women (Kanny, Naimi, Liu, Lu & Brewer, 2018). Other findings include that males have higher rates of hospitalisation caused by alcohol, and that men are more likely to have a blood alcohol concentration of  $>0.08\%$ , as a driver in a fatal motor vehicle incident, than females. As such, gender specific health impacts of alcohol consumption have demonstrated a strong evidence base concerning alcohol use and higher risk of colon and rectal cancer in men (American Cancer Society, 2020). Further, a systematic review and meta-analysis identified that a higher alcohol consumption was associated with a higher risk of prostate cancer in men (Zhao, Stockwell, Roemer, Chikritzhs, 2016). Excessive alcohol consumption by men is also associated with an increased risk of erectile dysfunction and infertility (Rachdaoui & Sarkar, 2017). These health impacts demonstrate the need for a focus upon male alcohol consumption.

**1.6 Men's alcohol use during COVID-19.** To date, a single study (Lunnay et al., 2021) of middle-aged persons in South Australia and alcohol consumption during COVID-19 has been conducted. However, this study was concerned with women. Studies concerning female alcohol consumption during COVID-19, such as that of Lunnay et al. (2021) have been rationalised by the finding that women have been more likely to report an increase in alcohol consumption during the COVID-19 pandemic, than men (Bramness et al., 2021; Winstock et al., 2020). Further, women are more vulnerable to experiencing psychological distress and subsequently report coping as a motivation for drinking (Brooks et al., 2020; Taylor, 2019).

Although the rationale for a focus on female alcohol consumption during the pandemic is clear, it is important not to disregard men. The following literature demonstrates rationale for a focus of research on male alcohol use during the COVID-19 pandemic.

Literature indicates that males reported greater increases in solitary drinking relative to females, during the COVID-19 pandemic (Wardell et al., 2020). Solitary drinking behaviour was further identified to be associated with alcohol problems.

Moreover, multiple sources have noted concerns about an increase in intimate partner violence (IPV), more complex forms of violence, and the effects of social distancing measures that prevent help-seeking opportunities for victims of such crimes (Morton, 2020; Nanacarrow, 2020; Pfitzner, Fitz-Gibbon & True, 2020). Previously noted disasters in Australia, such as the Black Saturday bushfires (Parkinson, 2019) increased the prevalence of domestic violence, causing policy to increase focus upon the concerns of IPV. An increase in IPV incidence during the pandemic may be explained by two findings coupled together. First, Foran and O'Leary (2008) detail that alcohol is considered as a large contributor to violent crime and domestic violence. Second, due to suggestions that alcohol consumption has shifted to home (Finlay & Gilmore, 2020), instead of at licensed premises, thus increasing IPV incidence during the pandemic. In a systematic review including 39 quantitative studies of domestic violence (DV) within Australia, Hulme, Morgan & Boxall (2019) identified that men accounted for between 75 and 94 percent of all DV perpetrators and that between 19 and 66 percent of DV incidents were alcohol related. Foran and O'Leary (2008) further detail that males disproportionately perpetrating acts of IPV. A further concern that has been raised about increased IPV prevalence is the understanding that due to social restrictions and lockdowns, there have been a reduction and loss in drug and alcohol services. This is understood to be an important factor for men regressing in alcohol dependence (Finlay & Gilmore, 2020).

Further, a survey (Women's Safety NSW and FARE, 2020) of 53 frontline specialist domestic and family violence workers in New South Wales, Australia, reported a 51% increase in the involvement of alcohol in family violence situations since restrictions were introduced with no reports of decreased involvement. Anecdotally, a specialist reported: "Clients have said *he* has more time to drink now as *he* isn't working, also heard clients say they are self-medicating with alcohol as they are bored or numbing *his* abuse" (Women's Safety NSW and FARE, 2020). Stanton (et al., 2020) notes an investment over \$6 million by the Australian Government in funding towards drug-and-alcohol services with the intention of reducing the risk of substance abuse and related harms (including domestic violence).

Concerns about IPV are not localised to Australia, it has been reported that there was a 60% increase in emergency calls from women who were subject to IPV, throughout Europe (Mahase, 2020). Further, the WHO have reported that enquires to IPV support hotlines have increased fivefold.

In addition to the rationale for a focus on male alcohol consumption during the COVID-19 pandemic, it is worth noting that males and females both reported spending more time at home during the pandemic as the most common reason for increased alcohol consumption (Biddle, Edwards, Gray & Sollis, 2020). Differences were identified across genders in the second highest proportion of reasons with men reporting 'boredom, nothing else to do' and women reporting 'increased stress' as the reason for an increase in alcohol consumption.

## **1.7 Prevalence of men's alcohol consumption during COVID-19.**

**1.7.1 Global.** Literature from around the world has indicated self-reported increases in alcohol consumption ranging between 17% (Jacob et al., 2021) and 36% (Winstock et al., 2020), amongst men. Findings from Winstock et al. (2020) further reported that 22% of men indicated hazardous drinking of 5 or more standard drinks per day of drinking.

**1.7.2 Australia.** Studies from Australia have indicated that males self-reported increases in alcohol consumption at rates ranging from 10% (Australian Bureau of Statistics, 2020) to 36.2% (Ritter et al., 2020), with Winstock et al. (2020) reporting that 36% of men drank 5 or more standard drinks per drinking day. Further studies measuring a self-reported increase in alcohol consumption ranged between 20.9% (Tran et al., 2020), to 70% (Foundation for Alcohol Research and Education, 2020). However, it is important to note such studies did not stratify by gender when reporting prevalence.

**1.8 Male mental health & alcohol consumption during the pandemic.** The COVID-19 pandemic has had a significant effect on mental health, worldwide (Ellison, Semlow, Jaeger & Griffith, 2021). A systematic review (Xiong et al., 2020) indicated that higher symptoms of depression ranged between 14.6% to 48.3%, and higher symptoms of anxiety ranged between 6.33% to 50.9%. In Australia since the pandemic, a 30% increase in calls to Beyond Blue has been recorded. Additionally, calls to Lifeline Australia (2021) have reached record daily numbers on multiple occasions with the latest record, of 3,505 calls, on the 19<sup>th</sup> of August 2021. This statistic was found to be 40% higher than that of the same time in 2019.

Media representations of the impact of the COVID-19 pandemic on mental health have had a significant focus upon women and the social and economic setbacks that women have experienced during the pandemic (Alamo 2020; Ellingrud & Segel; Parker et al., 2020), However there is significant rationale and scope for further study of male mental health and alcohol consumption, especially since the outset of the pandemic.

First, the social impacts of the COVID-19 pandemic upon men includes the finding that men spent less time than women conversing with family and friends over the phone or video call (47% vs 59%) (Fancourt et al., 2020), leading to further isolation in times of lockdown and restrictions limiting contact with other persons. Coupled with this finding,

male friendships are commonly activity-based and males are understood to have fewer friendships compared to women (Riggio, 2014). As a result of COVID-19 restrictions and lockdowns which have been previously discussed, this finding is of importance as long-term isolation stress is a major risk for depressive and anxiety disorders (Han et al., 2018).

Second, less men are diagnosed and are treated for depression than women, a finding that has been suggested as being explained by the understanding that men are more likely to externalise their own difficulties through anger, alcohol and substance abuse, avoidance, and increased risk taking, in comparison to women (White, 2020; Martin, Neighbors & Griffith, 2013).

Third, concerns about suicide during the pandemic have been consistent across research and the media. Notably, males account for over three-quarters of death by suicide in Australia (Australian Bureau of Statistics, 2020a) and were found to be more likely to use alcohol prior to suicide (Chong, Buckley, Schumann & Chitty, 2020). Previous studies of financially straining circumstances similar to that of the COVID-19 have led to suicidality (Antonakakis & Collins, 2014; Coope et al. 2014; Corcoran, Griffin, Arensman, Fitzgerald & Perry, 2015)). However, to date, little data is available indicating an increase in suicidality in men during the pandemic. Intuitively, significant risk factors for suicide include depression and anxiety (Beyond Blue, n.d.).

Studies of alcohol consumption during COVID-19 have indicated that depression and anxiety are both positively associated with an increase in alcohol consumption (Capasso et al. 2021; Stanton et al. 2020; Tran et al., 2020). However, in both Jacob et al. (2021) and Neill et al. (2020), only clinically significant depression was identified as a predictor of increased alcohol consumption. Research also indicated that clinically significant depression was associated with hazardous drinking in men, however this was finding was not within the



context of a pandemic (Bosque-Prous, Brugal, Lima, Villalbi, Bartroli & Espelt, 2017; Nolen-Hoeksema, 2004).

These studies were not conducted within the same context as the South Australian experience of COVID-19, as such, further analysis is warranted. Based upon the previous literature, it was expected that clinically significant depression and more severe anxiety will predict increased alcohol consumption, and hazardous alcohol consumption in men.

**1.9 Resilient coping & alcohol consumption during the pandemic.** Resilient coping refers to the possession of creative, adaptive problem-solving abilities to promote positive adaption in the face of adversity whilst relying upon dispositional traits of self-efficacy, optimism, and self-reliance to solve problems (Sinclair & Wallston, 2004). The application of the Brief Resilient Coping Scale (Sinclair & Wallston, 2004) within the context of COVID-19 demonstrated that it can be used within the current study (Rahman et al., 2020). However, there were no findings of significance to the current study.

Coping motivations and strategies have been studied within the context of the COVID-19 pandemic. Findings from the Foundation for Alcohol Research and Education (FARE)(2020) indicated that 28% of respondents were drinking alcohol to cope with anxiety and stress. Further, Wardell et al. (2020), identified an association between coping motives, as per, the Coping Motives Scale of the Drinking Motives Questionnaire-Revised Short Form (Kuntsche & Kuntsche, 2009), and an increase in past-30-day alcohol use.

The inclusion of the BRCS in the current study is for exploratory purposes in that, intuitively, adaptive problem solving skills and subsequent higher resilient coping scores could potentially predict alcohol consumption during COVID-19.

**1.10 Age & alcohol consumption during the COVID-19 pandemic.** A wastewater analysis study (Bade et al., 2020) indicated that alcohol consumption decreased after restrictions were enforced at the beginning of the pandemic. The analysis reported lower

levels of consumption within bars, clubs, restaurants, and higher consumption of alcohol within homes. Concurrent to this finding, a significant 43% decrease in alcohol consumption was reported amongst 18-24-year old's (Ritter et al., 2020). These findings suggest that a change in drinking behaviours has occurred as a result of social restrictions and lockdowns in Australia, with the reduction and cessation of venue based alcohol consumption. Older age groups of 25+ have indicated larger proportions of either alcohol consumption remaining the same or increasing.

Literature has demonstrated that alcohol intake amongst middle and older age groups has been increasing since the 1990's (Knott, Coombs, Stamatakis & Biddulph, 2015). Findings have also indicated that risky drinking patterns such as binge drinking and at-risk use of alcohol are common among adults over the age of 50, with a U.S. national sample identifying that 19.6% of men, and 6.3% of women consumed five or more drinks on the same occasion on at least one day within the past 30 days.

Within the context of COVID-19, literature has identified that middle age is a predictor of increased alcohol consumption and hazardous alcohol consumption. First, in an Australian study (Neill et al., 2020), an age group ranging between 50-64 years was identified to be more likely to report an increase in alcohol consumption than the 65 and older age group. This finding was attributed to greater socioeconomic pressures (childcare, rent/mortgage repayments) amongst middle aged persons compared with older aged persons. It was further added that older age groups may have experienced less socioeconomic disruption in their daily lives as a result of the pandemic, due to higher proportions of older-aged persons being retired, and not having dependent children to provide for.

Second, a cross-sectional study (Bosque-Prous, Brugal, Lima, Villalbi, Bartroli & Espelt, 2017) of hazardous drinking across Europe indicated that the proportion of hazardous drinking was higher in middle aged people than older aged people. However, this study was

not conducted within a pandemic context, and that study whether such a finding is consistent in a pandemic context is warranted.

Based upon previous literature, it was expected that middle age would be a significant predictor of increased alcohol consumption, and hazardous alcohol consumption, in men.

**1.11 Education level & alcohol consumption during the COVID-19 pandemic.** Within a non-pandemic context, a US study identified a positive association between education level and alcohol use (Assari & Lankarani, 2016). This was also identified within a COVID-19 context, in a Norwegian study (Bramness et al., 2021) which identified an association between university level education and an increase in alcohol consumption, compared to an education below university level. Although these findings suggest an association between education level and alcohol, studies that were male-specific, identified no association between education level and alcohol consumption (Bosque-Prous, Brugal, Lima, Villalbi, Bartroli & Espelt, 2017; Trias-Llimós et al., 2020). It is however, noteworthy to detail that the aforementioned male-specific studies were not conducted within a COVID-19 pandemic context, and that further study is warranted. It was expected that a higher education level would be associated with increased alcohol consumption, in men.

**1.12 Economic stressors & alcohol consumption during the COVID-19 pandemic.**

Periods of economic crises, in which job loss occurs, such as 2007 Great Recession in the US (Blau et al., 2013, Brown and Richman, 2012 and Kalousova and Burgard, 2014, as cited in De Goej, Suhrcke, Toffolutti, Van De Mheen, Schoenmakers & Kunst, 2015), the Czech transformation (Hraba et al., 2000, as cited in De Goej, Suhrcke, Toffolutti, Van De Mheen, Schoenmakers & Kunst, 2015) and the transition from Soviet Russia (Bobak et al., 1999, as cited in De Goej, Suhrcke, Toffolutti, Van De Mheen, Schoenmakers & Kunst, 2015) are demonstrated to increase alcohol consumption among affected individuals as indicated in a systematic review (De Goej, Suhrcke, Toffolutti, Van De Mheen, Schoenmakers & Kunst,

2015). The review further details that it has conversely been demonstrated that financial constraints lead to a decrease in overall alcohol consumption. The COVID-19 pandemic has impacted upon the financial position of individuals and families, with Australian unemployment rates of 16.8% in the onset of the pandemic in late March 2020.

Unemployment rates remained significantly higher than pre pandemic levels, at >12%, for the remainder of 2020 (Roy Morgan, n.d.).

To date, literature has indicated that in men, a reduction in work hours between February (pre-pandemic) and April (during COVID-19 restrictions) was positively associated with an increase in alcohol consumption (Australian National University, 2020). Further, Neill et al. (2020), identified that job loss was positively associated with increased alcohol consumption. A Canadian study by Wardell et al. (2020) identified that income loss and not working was associated with a combined quantity/frequency (QF) score of past 30-day alcohol consumption. However, this study did not identify a significant difference between pre-COVID-19 QF alcohol consumptions score and QF scores in the past 30 days during the pandemic. This finding was explained by participants potentially experiencing less financial strain during the pandemic due to relatively high median annual income of participants and further relief funding provided by the Canadian government to citizens. Similarly, the Federal Government of Australia has also provided welfare funding support during the pandemic. In a qualitative study of frontline specialists in domestic and family violence (Women's Safety NSW and FARE, 2020), financial strain, changes in work situation and income, due to the pandemic, were commonly noted by specialists as contributing factors to an increase in alcohol consumption during the pandemic.

Overall, the literature indicates that a change in financial position due to the COVID-19 pandemic may result in higher stress which could lead to the use of alcohol in order to cope with such stress. As such, it was expected that self-reported worse financial position

would be associated with an increase in alcohol consumption in men, during the COVID-19 pandemic.

**1.13 Concerns about COVID-19.** Barzilay et al. (2020) indicated that participants significantly endorsed more distress about family contracting COVID-19 (48.5%) and unknowingly infecting others (36%), than getting COVID-19 themselves (19.9%). However, identified literature did not indicate whether such concern for family and oneself was associated with alcohol consumption, warranting inclusion of such a measure and analysis for exploratory purposes.

**1.14 The present study.** The aim of the present study was to determine demographic, theoretical, and exploratory predictors associated with an increase in self-reported alcohol consumption and hazardous alcohol consumption in middle-to-older aged suburban community-dwelling men. The proposed thesis has the potential to broaden understanding concerning the impact of the COVID-19 pandemic on alcohol consumption, and to inform mental health and health interventions (including E-Health) targeted at males in middle to older age. The findings are expected to be generalisable to countries and jurisdictions with similar socio-demographics and in higher income countries such as Australia, and with similar rates of COVID-19 transmission and deaths.

Based upon the aforementioned literature and understandings, the following hypotheses were posed:

H<sub>1</sub> - An increase in age group will be negatively associated with an increase in self-reported alcohol consumption since COVID-19.

H<sub>2</sub> - A higher education level will be positively associated with a self-reported increase in alcohol consumption since COVID-19.

H<sub>3</sub> - Clinically significant depression will be positively associated with a self-reported increase in alcohol consumption since COVID-19.

H<sub>4</sub> – An increase in severity of anxiety will be positively associated with a self-reported increase in alcohol consumption since COVID-19.

H<sub>5</sub> – Change in financial position will be negatively associated with an increase in alcohol consumption since COVID-19.

H<sub>6</sub> – An increase in age group will be negatively associated with hazardous drinking of  $\geq 5$  standard drinks on an occasion of drinking.

## 2. Method

### 2.1 Participants

**2.1.1 The MAILES longitudinal study.** Participants for this study derive from the longitudinal Men Androgen Inflammation Lifestyle Environment and Stress (MAILES) study. Established in 2009, MAILES harmonised two cohort studies – the Florey Adelaide Male Ageing Study (FAMAS) and a sub-set of age-matched male participants from the North-West Adelaide Health Study (NWAHS). Prior to harmonisation, FAMAS and NWAHS had separately collected data at similar time points. Following harmonisation, six waves of data at similar time points were established- 2002-06, 2007-10, 2010, 2011-12, 2015-16 and in 2020-21. Throughout the previous five waves of MAILES, data collected has included demographics such as age, income, marital status, and housing. Further, physical activity, sleep, chronic conditions, health risk factors such as smoking and alcohol consumption, body measurements, sleep, nutrition, mental health (including the BDI, CES-D, and GAD-7), medications, social issues, health service usage, and surgeries. The sixth wave of data collection specifically focused upon the impact and participant experiences of the COVID-19 pandemic.

**2.1.2 The present study.** This study utilised specific variables from Wave 6 of the MAILES study, conducted in 2020-21. The wave largely focused on participant experiences during COVID-19. Of the 2563 participants from Wave 1 of the MAILES study, a response rate of 29.11% ( $N = 746$ ) was recorded for MAILES Wave 6 - with 54.69% of participants deriving from NWAHS and 45.31% from FAMAS.

**2.1.3 Inclusion/exclusion criteria.** Inclusion criteria for the present study were participants in Wave 6 of the MAILES study. Exclusion criteria for the present study were participants identifying other than male. FAMAS did not collect data on persons identifying other than male. However, NWAHS collected data on participants identifying other than male. As such, persons identifying other than male (female, non-binary/other) were excluded from the present study. MAILES participants in wave 6 were suburban, community-dwelling men from Northern and Western regions of Adelaide, ranging from 50 to 94 years of age.

**2.2 Procedure.** Participants responded to a questionnaire either via mail or online, in which a link to a website containing the survey was provided. If participants did not provide an email address, the questionnaire was sent via mail with a reply-paid envelope included. Along with the survey, a consent form was attached in which the participant provided informed consent for their responses to be used for research purposes. Collection of data via online response began on 6 October-2020, with the mailed packages sent soon after that date. Completed questionnaires were accepted until 31 March 2021. Non-respondents in both NWAHS and FAMAS were followed up via email for participants who were sent the questionnaire via email – however, non-respondents to the mailed questionnaire were not followed up due to a lack of resources. The questionnaire was piloted at 25 minutes.

## 2.3 Measures

### 2.3.1 Dependent variables

#### 2.3.1.1 Change in alcohol consumption during the COVID-19 pandemic. A

change in alcohol consumption since the COVID-19 pandemic was assessed via the question: ‘Since the coronavirus/COVID-19 pandemic began in March have you increased or decreased your overall alcohol consumption?’. Possible responses were (1) increased, (2) decreased, (3) stayed the same, and (4) refused/don’t know. Responses were dichotomised for the analysis into (0) increased or (1) decreased/stayed the same. Refused/don’t know responses were removed for the purposes of the analysis.

#### 2.3.1.2 Hazardous alcohol consumption during the COVID-19 pandemic. The

number of standard drinks consumed was assessed via the question: ‘On a day that you have an alcoholic drink, how many standard drinks do you usually have?’. Possible responses were as follows: (1) 9 or more drinks per day, (2) 5 to 8 drinks per day, (3) 3 to 4 drinks per day, (4) 2 drinks per day, and (5) 1 drink per day. As per the National Health and Medical Research Council (2020) guideline of no more than 4 standard drinks should be consumed per occasion of drinking- hazardous alcohol consumption was defined as  $\geq 5$  standard alcohol drinks per day. As per the AIHW (2019), a standard drink was defined as a drink that contains 10 gram (or 12.5 millilitres) of alcohol. For the purposes of analysis, responses were formatted as the following binary outcome variable: (1)  $< 5$  standard alcoholic drinks per day; and (2)  $\geq 5$  standard alcohol drinks per day.

### 2.3.2 Independent predictor variables

#### 2.3.2.1 Demographic variables. Participants provided their date of birth at time of

first participation in a FAMAS or NWAHS. Age at the time of questionnaire completion was calculated. For the purposes of the current study, age was grouped by 10-year categories i.e., 50-59, 60-69, 70-79, 80+. Highest educational qualification responses were categorised into 5



groups: (0) primary school, (1) high school, (2) TAFE/apprenticeship, (3) trade certificate/diploma, (4) bachelor's degree or above.

**2.3.2.2 Depression.** Depressive symptom burden was measured in NWAHS men using the 20-item Centre for Epidemiological Studies Depression Scale (CES-D) (Randloff, 1977), and FAMAS men with the 21-item Beck Depression Inventory (BDI) (Beck et al., 1961). A meta-analysis (Shafer, 2006) of the factor structures of such depression questionnaires indicated that both scales demonstrate robust agreement in the detection of major clinical depression. Due to 54.7% of MAILES participants deriving from NWAHS and 45.3% from FAMAS, scores were categorised into a binary outcome of (0 = no, 1 = yes), in which a minimum of mild/moderate symptom severity indicated clinically significant depressive symptoms. The cut-off scores for the CES-D and BDI were  $\geq 16$  and  $\geq 10$ , respectively. Internal consistency for both scales was established based upon the current dataset, with the CES-D indicating good internal consistency ( $\alpha = .85$ ), and the BDI indicating excellent internal consistency ( $\alpha = .94$ ).

**2.3.2.3 Anxiety.** Symptoms of anxiety were assessed using the 7-item Generalised Anxiety Disorder-7 (GAD-7) (Spitzer et al., 2006). The measure asked respondents to identify if 7 indicators of anxiety had bothered them in the past 2 weeks. Items included: feeling anxious nervous or on edge; not being able to stop or control worrying; trouble relaxing; feeling afraid as if something awful might happen. Responses were measured on a 5-point Likert scale ranging from: (1) 'not at all sure'; (2) 'several days'; (3) 'over half the days'; (4) 'nearly every day'; and (5) 'don't know'. As per previous studies using the GAD-7 within the context of alcohol consumption during COVID-19 (Tran et al., 2020), the sum of the 7 items were calculated and categorised into 3 clinical cut-off groups: none (score 0-4); mild (score 5-9); moderate to severe (score  $\geq 10$ ). Internal consistency was established based upon the current dataset, indicating good internal consistency ( $\alpha = .79$ ).

**2.3.2.4 Change in financial position.** Financial position change was measured via the question, ‘As a result of COVID-19, has your financial position changed?’. Responses were measured on a 5-point Likert scale ranging from: (1) ‘yes, a lot worse’; (2) ‘yes, slightly worse’; (3) yes, slightly better; (4) yes, a lot better; (5) no, stayed the same. For the present study, the response of interest was worse financial position due to COVID-19. As such, responses 1-2 were categorised into (0) ‘worse financial position’; and 3-5 into (1) ‘better financial position/ stayed the same’.

**2.3.2.5 Concern about COVID-19.** Participants were posed two questions: (1) ‘since the COVID-19 outbreak began in January, how concerned have you been that you would get sick with COVID-19?’ (2) since the COVID-19 outbreak began in January, how concerned have you been that a family member will be infected with coronavirus/COVID-19?’ Responses were measured on a 5-point Likert scale ranging from (1) ‘not at all’ to (5) ‘extremely’ concerned.

**2.3.2.6 Resilient coping.** Resilient coping was measured using the 4-item Brief Resilient Coping Scale (Sinclair & Wallston, 2004). The measure, originally developed for use within a clinical context of rheumatoid arthritis patients, has also been validated in a non-clinical community sample of middle-aged adults (Kocalevent et al., 2017). Response to each item was measured on a five-point Likert scale ranging from: (1) ‘does not describe me at all’; (2) ‘Does not describe me’; (3) ‘Neutral’; (4) ‘Describes me’; and (5) ‘Describes me very well’. As per previous literature (Rahman et al., 2020; Tsehay, Belete & Necho, 2020), the current study calculated the sum of responses to each of the items and categorised total scores into: low resilient coping (score 4-13); medium resilient coping (score 14-16); and high resilient coping (score 17-20) for the purposes of analysis. The BRCS’ internal consistency was established based upon the current dataset, demonstrating good internal consistency ( $\alpha = .84$ ).

**2.4 Missing data.** Upon initial analysis, 14.3% of data from the dependent variable ‘change in alcohol consumption since COVID-19’ was missing. Similarly, 15.1% of data from the dependent variable ‘hazardous alcohol consumption’ was missing. Missing data from the independent predictor variables was identified in all but ‘age group’, and were as follows: education level – 3.1%; depression according to CES-D or BDI – 2.1%; anxiety according to the GAD-7 – 3.8%; Change in financial position since COVID-19 – 3.2%; concern for oneself getting sick with COVID-19 – 1.2%; concern that a family member will be infected with COVID-19 – 1.5%; resilient coping via the BRCS – 4.0%. With a considerable percentage of data missing for both dependent variables, deletion in the form of listwise (removal of all data for an observation with one or more missing values), pairwise (removal of specific missing values, retaining non-missing values for analysis) and deleting entire variables, or columns, with missing data was considered inappropriate. Another technique of managing missing data is mean/median substitution, however, this technique causes bias by decreasing variance in the data. As >5% of data was missing for both dependent variables, and the data could not be assumed to be missing completely at random, missing data was considered to be missing at random. As such, MI was deemed appropriate as per (Little and Rubin, 2002). As such, MICE (Van Buuren, 2018) was conducted upon the dataset. This method of multiple imputation is one of the most commonly used techniques to manage missing data. MICE works by way of the distribution of observed data estimating plausible values, taking into account the uncertainty of the true value of missing data points, identifying approximate unbiased estimates. A given number of regression models with imputed data points are then produced and pooled results from the number of regression models run then replace the missing values in the dataset. In the current study, 50 regression models were produced and then pooled to generate a dataset including imputed values.

Descriptive statistics of dependent variables and independent variables with imputed values can be found in Appendix 1, and Appendix 2.

**2.5 Analytic plan.** Statistical analysis was conducted using R version 4.1.1. Descriptive statistics of dependent and independent variables, including frequencies and percentages, means and standard deviations were conducted. An assessment of multicollinearity was conducted via a correlation matrix (Appendix 3) and further assumption testing (homogeneity of variance, influential observation testing, and variance inflation factor [VIF] testing) for independent predictor variables was conducted. Two hierarchical logistic regressions were then conducted. The first regression analysed predictors of a change in alcohol consumption since the beginning of restrictions, in which three hierarchically structured models were added. Demographic predictor variables (age group, and highest level of education) were added in block 1, theoretical predictor variables (depression, anxiety, and change in financial position) were added in block 2, and exploratory predictors variables (concern for oneself getting sick with COVID-19, concern for family getting sick with COVID-19, and resilient coping) were added in block 3. In the second logistic regression, analysis of predictors of hazardous alcohol consumption was conducted by adding demographic predictor variables (age group, highest level of education) in block 1, adding the remaining exploratory predictor variables in block 2.  $P < 0.05$  were considered statistically significant.

**2.6 Ethical considerations.** Ethics approval was obtained from the Human Research Ethics Committees (HRECs) of the Queen Elizabeth HREC for the North West Adelaide Health Study (approval number: 2010054) and the Royal Adelaide Hospital HREC for the Florey Adelaide Male Ageing Study (approval number: 020305). Written informed consent was obtained from all participants in Wave 6 of the MAILES study.

### 3. Results

**3.1 Participant demographics.** Demographic information concerning the 746 male participants can be seen in Table 1. The calculation of means and standard deviations indicated a mean age of 69.5 years. The largest proportions were aged 60-69 (33.4%), and 70-79 (34.0%). Highest level of education attained by the participant indicated that 4.3% of participants had a primary school education, and a third indicated high school as their highest level of education (33.4%). 5.8% of participants indicated TAFE/apprenticeship as their highest level of educational attainment, and over a third (35.4%) of participants indicated a trade certificate or diploma. Finally, 18.1% of participants indicated attainment of a bachelor's degree or higher.

**Table 1**  
*Participant Demographics (N=746)*

Measure	<i>n</i>	%	<i>M</i>	<i>Range</i>
Sex				
Male	746	100		
Age (groups)			69.47	50-94
50-59 years	128	17.2		
60-69 years	249	33.4		
70-79 years	254	34.0		
80+ years	115	15.4		
Education level				
Primary school	32	4.3		
High school	249	33.4		
TAFE/apprenticeship	43	5.8		
Trade certificate or diploma	264	35.4		
Bachelor's degree or higher	135	18.1		
Missing	23	3.1		

**3.2 Descriptive statistics of dependent variables.** Frequencies and percentages were calculated for dependent variables. Sixty participants (8%) indicated that they had increased their alcohol consumption since the beginning of COVID-19 restrictions. Sixty-two (8.3%) said they had consumed hazardous levels of (>5 standard drinks) on a single occasion of drinking (Table 2).

**3.3 Descriptive statistics of independent variables.** Frequencies and percentages were calculated for the remaining theoretical and exploratory variables (Table 2). One-hundred and twenty participants (16.1%) indicated clinically significant depression symptoms. Five-hundred and seventy-eight participants (77.5%) indicated no anxiety symptoms. Ninety participants (12.1%) indicated mild symptoms of anxiety, and 50 participants (6.7%) indicated moderate to severe symptoms of anxiety. A mean score ( $M = 2.42$ ) and standard deviation ( $SD = 4.06$ ) was also calculated for symptoms of anxiety. One-hundred and eighty-one participants (24.3%) indicated a worse financial position during COVID-19. One-hundred and fifty-one participants (20.2%) indicated moderate concern for oneself getting sick with COVID-19. Fifty-two participants (7.0%) indicated that they were very concerned that they would get sick with COVID-19. Seventeen participants (2.3%) indicated that they were extremely concerned that they would get sick with COVID-19. One-hundred and eighty participants (24.1%) indicated moderate concern that a family member would get sick with COVID-19. Ninety participants (12.1%) indicated being very concerned that a family member would get sick with COVID-19, and twenty-five participants (3.4%) indicated being extremely concerned that a family member would get sick with COVID-19. Three-hundred and five participants (40.9%) indicated low resilient coping. A similar proportion of participants ( $n = 329, 44.1%$ ) indicated moderate resilient coping, and eighty-two participants (11.0%) indicated high resilient coping. The mean resilient coping score was 13.85, and the standard deviation was 2.93.

**Table 2***Summary of Dependent and Independent Predictor Variables with Missing Data*

Measure	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>Range</i>
<b>Dependent Variables</b>					
Self-reported change in alcohol consumption during COVID-19					
Decreased or stayed the same	566	75.9			
Increased	60	8.0			
Missing	107	14.3			
Standard drinks on an occasion of drinking					
<5	571	76.5			
≥5	62	8.3			
Missing	113	15.1			
<b>Independent Variables</b>					
Clinically significant depression symptoms					
No	610	81.8			
Yes	120	16.1			
Missing	16	2.1			
Anxiety symptoms					
None	578	77.5	2.42	4.06	0-21
Mild	90	12.1			
Moderate to severe	50	6.7			
Missing	28	3.8			
Financial position during COVID-19					
Worse	181	24.3			
Better or stayed the same	541	72.5			
Missing	24	3.2			
Concern for oneself getting sick with COVID-19					
Not at all	169	22.7			
A little	348	46.6			
Moderately	151	20.2			
Very	52	7.0			
Extremely	17	2.3			
Missing	9	1.2			
Concern for family getting sick with COVID-19					
Not at all	135	18.1			
A little	305	40.9			
Moderately	180	24.1			
Very	90	12.1			
Extremely	25	3.4			
Missing	11	1.5			
Resilient coping					
Low	305	40.9	13.85	2.93	4-20
Moderate	329	44.1			
High	82	11.0			
Missing	30	4.0			

**3.4 Factors associated with self-reported increase in alcohol consumption.** Table 3 illustrates the results of the regression, exploring predictors of self-reported increase in alcohol consumption. The AIC for each of the models indicated that Model C3 demonstrated the best balance of model fit (AIC = 425.79). Results indicated multiple statistically significant predictors of an increase in alcohol consumption. First, a statistically significant negative association between age group and a self-reported increase in alcohol consumption (OR = 0.46, 95% CI: 0.33–0.62,  $p < 0.001$ ). Results indicated that as age group increased, men were 54% less likely to report an increase in alcohol consumption. Second, a statistically significant positive relationship between an indication of clinically significant depression and a self-reported increase in alcohol consumption since COVID-19 (OR = 2.39, 95% CI: 1.10–5.05,  $p < 0.05$ ). As such, men with clinically significant depression were 139% more likely to also report increasing their alcohol consumption since COVID-19. Thirdly, a statistically significant positive relationship was also identified between concern for oneself contracting COVID-19 and an indication of an increase in alcohol consumption (OR = 1.52, 95% CI: 1.03–2.28,  $p < 0.05$ ). Results indicated that as concern for oneself getting sick with COVID-19 increased, men were 52% more likely to report an increase in alcohol consumption since COVID-19.



**Table 3**  
*Hierarchical binary logistic regression predicting participants' self-reported increase in alcohol consumption since COVID-19 (N = 746)*

Predictor	Model C1		Model C2		Model C3	
	<i>b</i> (SE)	<i>OR</i> (95% CI)	<i>b</i> (SE)	<i>OR</i> (95% CI)	<i>b</i> (SE)	<i>OR</i> (95% CI)
<b>Demographic variables</b>						
Age group	-0.72 (0.15)	0.49*** (0.36, 0.65)	-0.72 (0.15)	0.49*** (0.36, 0.65)	-0.78 (0.16)	0.46*** (0.33, 0.62)
Highest education level	0.07 (0.11)	1.07 (0.87, 1.34)	0.05 (0.11)	1.05 (0.84, 1.32)	0.05 (0.12)	1.05 (0.84, 1.32)
<b>Theoretical variables</b>						
Clinically significant depression symptoms			0.92 (0.38)	2.50* (1.18, 5.19)	0.87 (0.39)	2.39* (1.10, 5.05)
Anxiety symptoms			0.15 (0.24)	1.16 (0.71, 1.84)	0.07 (0.25)	1.07 (0.65, 1.73)
Change in financial position			0.02 (0.30)	1.02 (0.58, 1.88)	0.16 (0.31)	1.17 (0.65, 2.20)
<b>Exploratory variables</b>						
Concern for self					0.42 (0.20)	1.52* (1.03, 2.28)
Concern for family					-0.06 (0.19)	0.94 (0.65, 1.34)
Resilient coping (BRCS)					0.01 (0.21)	1.01 (0.67, 1.52)
<b>Model summary</b>						
	R <sup>2</sup> = 0.08 R <sup>2</sup> Change = 0.08 AIC = 433.39		R <sup>2</sup> = 0.12 R <sup>2</sup> Change = 0.04 AIC = 427.08		R <sup>2</sup> = 0.14 R <sup>2</sup> Change = 0.02 AIC = 425.79	

95% CI 95% confidence interval, AIC Akaike information criteria, *OR* odds ratio, R<sup>2</sup> Nagelkerke's Pseudo R<sup>2</sup> \**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

### 3.5 Factors associated with self-reported hazardous alcohol consumption. Table 4

illustrates the results of the regression, exploring predictors of self-reported hazardous alcohol consumption. The AIC for each of the models indicated that Model H2 was the best balance of model fit (AIC = 444.46). Results indicated two statistically significant predictors of hazardous alcohol consumption. First, a statistically significant negative association between age group and hazardous alcohol consumption was identified (OR = 0.46, 95% CI: 0.34–0.62, *p* < 0.001). Results indicated that as age group increased, men were 54% less

likely to report an increase in alcohol consumption. Second, a statistically significant positive association was identified between concern for oneself contracting COVID-19 and self-reported hazardous alcohol consumption (OR = 1.67, 95% CI: 1.13–2.51,  $p < 0.05$ ). The results indicated that as concern for oneself getting sick with COVID-19 increased, men were 67% more likely to report hazardous alcohol consumption.

**Table 4**

*Hierarchical binary logistic regression predicting participants' self-reported hazardous alcohol consumption (N = 746)*

Predictor	Model H1		Model H2	
	<i>b</i> (SE)	<i>OR</i> (95% CI)	<i>b</i> (SE)	<i>OR</i> (95% CI)
Demographic variables				
Age group	-0.70 (0.34)	0.50*** (0.17, 0.65)	-0.77 (0.16)	0.46*** (0.34, 0.62)
Education level	-0.14 (0.11)	0.87 (0.71, 1.08)	-0.15 (0.11)	0.86 (0.69, 1.07)
Exploratory variables				
Depression (BDI/CES-D)			0.39 (0.41)	1.48 (0.65, 3.27)
Anxiety (GAD-7)			0.11 (0.26)	1.11 (0.66, 1.82)
Financial position			0.58 (0.33)	1.79 (0.96, 3.56)
Concern for self			0.51 (0.20)	1.67* (1.13, 2.51)
Concern for family			-0.19 (0.19)	0.83 (0.57, 1.19)
Resilient coping (BRCS)			0.19 (0.20)	1.21 (0.81, 1.79)
Model summary		R <sup>2</sup> = 0.07 R <sup>2</sup> Change = 0.07 AIC = 446.3		R <sup>2</sup> = 0.11 R <sup>2</sup> Change = 0.04 AIC = 444.46

95% CI 95% confidence interval, AIC Akaike information criteria, *OR* odds ratio, R<sup>2</sup> Nagelkerke's Pseudo R<sup>2</sup> \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

## 4. Discussion

Previous literature demonstrated a gap in knowledge concerning male alcohol use during the COVID-19 pandemic. A large concentration of research has focused upon female experience due to findings that females are more likely to report an increase in alcohol consumption. Research does however note specific factors that are associated with alcohol consumption within a male population. These factors were explored within the context of a population of males between the ages of 50 and 94 within South Australia, a jurisdiction that has not experienced lockdowns like that of Sydney, Melbourne and other jurisdictions around the world. The aim of the study was to explore factors associated with an increase in alcohol consumption during the pandemic and further to explore factors associated with hazardous alcohol consumption.

**4.1 Increased and hazardous alcohol consumption amongst males.** The results of the current study indicated that a smaller proportion of participants reported an increase in alcohol consumption and hazardous alcohol consumption than that of other studies conducted in jurisdictions around Australia and around the world. This finding is important to note as it could potentially reflect the number of cases, severity of restrictions, lack of an extended period of time in total isolation/lockdown, and perceived threat of COVID-19 in South Australia.

### 4.2 Predictors of increased alcohol consumption.

**4.2.1 Demographic factors.** Results indicated that H<sub>1</sub> was supported. This was consistent with previous literature demonstrating a negative association between age group and increased alcohol consumption (Neill et al., 2020). Such literature explained this finding by positing that greater socioeconomic pressures in middle age groups, like working full-time, and having dependent children, are more prevalent than in older age groups, and may

lead to increased alcohol consumption in stressful contexts such as the COVID-19 pandemic. It is further noted by Neill et al. (2020) that as older age groups are more likely to be retired, and not to have dependent children, older age groups of men may experience less socioeconomic disruption as a result the pandemic, thus not increasing alcohol consumption during stressful events, such as the COVID-19 pandemic.

The results of the current study did not support H<sub>2</sub>, in that a level of education was not found to predict a self-reported increase in alcohol consumption. This finding did not support previous literature from (Assari & Lankarani, 2016; Bramness et al. 2021). Further, this could be explained by the low case numbers, deaths and shorter lockdowns experienced within South Australia, comparatively with other jurisdictions within Australia and the world- indicating that the pandemic may have had less of an effect on males in South Australia. Conversely, the results were consistent with that of previous studies (Bosque-Prous, Brugal, Lima, Villalbi, Bartroli & Espelt, 2017; Trias-Llimós et al., 2020), indicating that education level may not be a significant predictor of increased alcohol consumption in males.

**4.2.2 Theoretical factors.** Results of the current study indicated that H<sub>3</sub> supported findings in previous literature (Capasso et al. 2021; Stanton et al. 2020; Tran et al., 2020; Jacob et al., 2021; Neill et al., 2020) that clinically significant depression was associated with a self-reported increase in alcohol consumption. This finding suggests that men may use alcohol in order to cope with more clinically significant symptoms of depression. This finding could be explained in terms of Self-Medication Hypothesis which posits that a person will drink alcohol in order to cope with negative affect.

Contrary to expectations and H<sub>4</sub>, findings indicated that an increase in severity of anxiety was not associated with an increase in alcohol consumption, thus H<sub>4</sub> was rejected. This finding was also demonstrated by Jacob et al. (2021) and Neill et al. (2020).

Results of the current study did not support H<sub>5</sub>, the explanation for this finding could be similar to that of Wardell et al. (2020), in that participants experienced less financial strain during the pandemic due to Government welfare support to citizens and high median annual income. It is noted that in Canada, the federal government has provided considerable amounts of financial support for citizens and businesses throughout the pandemic, this is consistent with the Australian Federal Government, through financial support in the form of the JobKeeper initiative (ABS, 2020b). As a result of less financial strain due to financial support provided by the Federal Government, men may be less likely to increase alcohol consumption in order to cope with stress caused by financial strain. Conversely, the low case numbers, deaths and shorter lockdowns experienced within South Australia, comparatively with other jurisdictions within Australia and the world- may indicate that the pandemic has had less of an effect on job-status and subsequent financial strain, amongst males in South Australia.

**4.2.3 Exploratory factors.** Interestingly, an unexpected finding that was not hypothesised, identified that concern for oneself becoming sick with COVID-19 was positively associated with an increase in alcohol consumption. This finding could potentially be explained by the Self-Medication Hypothesis- understood as the use of substances to acutely relieve psychological suffering (Khantzian, 1997). In this specific finding, men may use alcohol in order to cope with the perceived threat (Boschi et al., 2000; Stewart, 1996), i.e. becoming concerned for oneself potentially contracting COVID-19, subsequently drinking alcohol in order to cope. Further, it is important to note that concerns for oneself may be influenced and perceived threat may be higher due to the understanding that has been reported in the media (Rebuli, 2020), that men are more likely to get infected and have worse outcomes than women (Pijls et al., 2021).

Interestingly, the finding that concern for a family member becoming sick with COVID-19 was not a significant predictor of increased alcohol consumption cannot be explained, thus warranting further analysis.

### **4.3 Predictors of hazardous alcohol consumption.**

**4.3.1 Demographic factors.** Similarly, to the association between age and an increase in alcohol consumption during COVID-19, results supported H<sub>6</sub> and the finding of Bosque- Prous et al. (2017), that an increase in age group was negatively associated with hazardous alcohol consumption. The current finding could be explained by the reduction or cessation of alcohol consumption due to hazards associated with simultaneous use of alcohol with medications for the treatment of concomitant diseases (Weathermon & Crabb, 1999), and the vulnerability to adverse effects of alcohol use (Sacco et al., 2009; Wang et al., 2014), resulting in a possible survivor effect due to individuals consuming alcohol in a hazardous way and subsequently dying. It is worth noting that this explanation requires further analysis to corroborate.

**4.3.2 Exploratory factors.** An unexpected finding was also identified in an increase in concern that oneself will become sick with COVID-19 hazardous alcohol consumption in males. Intuitively, the same rationale that was provided for concern for oneself becoming sick with COVID-19 The same rationale for the explanation of concern that oneself will becoming sick with COVID-19 and increased alcohol consumption can be applied in the analysis current exploratory factor.

**4.4 Research implications.** The current study identified numerous predictors of self-reported increases in alcohol consumption and hazardous alcohol consumption amongst middle-to-older age males. It can be argued that this research has the potential to inform mental health and health interventions that are targeted towards a male audience. Based on the current study, rationale for a specific focus on males that are middle aged, who have indicated

clinically significant depressive symptoms, and who have concerns that they will become infected with COVID-19, can inform strategies and interventions that target use of alcohol in middle-aged men during the pandemic. It is noted that such interventions should focus on virtual or e-health interventions due to the nature of social restrictions and lockdowns during the pandemic (Ellison, Semlow, Jaeger & Griffith, 2021). Due to the finding that increased concern for oneself becoming sick with COVID-19 predicts increased and hazardous alcohol consumption, it is understood that social support and close relationships can buffer fear of an external threat like COVID-19 (Hornstein & Eisenberger, 2017). This finding can aid in tailoring interventions promoting social support and developing relationships amongst men, during the pandemic.

Another implication of this research is that it is also considered to be generalisable to jurisdictions around the world and other Australian states with similar sociodemographic populations, such as that of South Australia.

**4.5 Limitations.** The current study is understood to have numerous limitations that must be considered during interpretation of the results. First, the data was a cross-sectional study that is descriptive research, thus cause and effect relationships cannot be inferred. In the current study, a comparison between pre-COVID hazardous alcohol consumption and hazardous alcohol consumption during the COVID-19 pandemic would enable me to detect changes in hazardous alcohol consumption. Without such data, the prevalence of hazardous alcohol consumption can not be fully understood in relation to potential changes from pre-pandemic to during the pandemic.

Second, the data was administered via a self-reported questionnaire. Although this method of data collection can be advantageous in accessibility and is relatively inexpensive compared to studies that require an observer or a clinician to administer the questionnaire, this method of collecting data presents challenges in assessing the validity of results. Self-

reported studies can be subject to limitations and biases including: social desirability bias-choosing socially acceptable answers instead of being truthful, introspective ability to accurately assess themselves, mis-reading or mis-interpretation of questions resulting in inaccurate results, and extreme responding- choosing only the most extreme options in Likert scales. It is noted that topics such as self-reported alcohol consumption (Davis, Thake & Vilhena, 2010; Devaux & Sassi, 2016; Embree & Whitehead, 1993) and mental illnesses, especially depression (Knäuper & Wittchen, 1994), are highly vulnerable to response biases such as social desirability, and introspective ability.

Third, hazardous alcohol consumption was measured based on quantity of alcohol consumed. In order to rigorously assess hazardous alcohol consumption, frequency of hazardous alcohol consumption should be measured.

Fourth, it could be argued that responses were not collected within a specific and more narrow time frame. As responses were collected between October 2020 and March 2021, participants may have answered the questionnaire at a time in which a respondents may be more likely to be stressed. For example, if a participant were to respond to questions pertaining to depressive symptoms during the two-week lockdown that was imposed in November, 2020, there would be an intuitively higher likelihood of the participant indicating more severe symptoms than if responding to the survey in a non-lockdown time-period.

Fifth, although the use of a single question to measure alcohol consumption has been used in numerous studies during the COVID-19 pandemic (Koopman, Georgiadou, Kiefer & Hillemaier, 2020; Stanton et al., 2020; Sun et al., 2020; Robinson, Gillespie & Jones, 2020), this measure of alcohol consumption is not validated, and relies heavily on retrospective recall of alcohol consumption since COVID-19 restrictions. Validated measures of alcohol consumption such as the AUDIT-C provide a validated understanding of heavy drinking and/or alcohol abuse or dependence (Bush, Kivlahan, McDonell, Fihn & Bradley, 1998).



Continuing on validated measures, 16.1% of participants in the current study indicated clinically significant depression according the validated measures of the BDI and CES-D, however it is worth noting that the actual prevalence may be higher due to the understanding that traditional diagnostic tools used to measure depression and anxiety have been found to be more associated with signs and symptoms presented by females (Martin, Neighbours & Griffith, 2013; Brownhill, Wilhelm, Barclay & Schmied, 2005).

As has been indicated throughout the study, coping motives have been a common theme. However, limitations as to the measures available in the dataset meant that coping motives could not be implemented in the analysis.

**4.6 Future directions.** There are a number of future research directions that can be conducted based upon the findings of the current study. First, longitudinal studies could ascertain pre-COVID hazardous alcohol consumption and hazardous alcohol consumption at a specific time point, for example, at the beginning of a strict lockdown or at the end of a lockdown. Subsequent analyses could be conducted on potential factors that predict a change from non-hazardous alcohol consumption pre-COVID to hazardous alcohol consumption during the pandemic. Further, comparisons of longitudinal results between alcohol consumption across Australian states may provide greater understanding of the impact of severity of restrictions and lockdowns upon alcohol consumption within a male population.

Second, it is evident from the literature that there is enough data, with similar methodology and questions, to justify conducting a systematic review and meta-analysis of the predictors associated with increased alcohol consumption and hazardous alcohol consumption during COVID-19.

Third, to date, it is notable that there has been a lack of qualitative research with a focus on male experience within the context of the pandemic. Thematic analyses or other qualitative methods have the potential to inform quantitative research concerning the predictors of

increased alcohol consumption and hazardous alcohol consumption during the COVID-19 pandemic. Specifically, Jacob et al. (2021) noted that as a result of identifying that anxiety was not a predictor of increased alcohol consumption (a finding also identified in the current research), qualitative research is required to provide a greater understanding of anxiety and alcohol during the COVID-19 pandemic.

As was discussed in the introduction, concerns about reports of increased intimate partner violence, coupled with the understanding that a considerable proportion of such crimes are committed with alcohol involved, provide rationale for future research. Such research should focus on the impacts of the pandemic on IPV. Further, qualitative or quantitative research could potentially be conducted to understand the way in which alcohol affects IPV incidents.

Finally, if replication of the current study were to occur, it would be recommended that a measure of coping motives be included in the analysis. Such a measure could potentially add attempt to identify moderation/mediation relationships, as per Wardell et al. (2020). Further, the use of a validated measure of fear of COVID-19, instead of single questions measuring concern, would provide greater accuracy and reliability of results. For instance, the Fear of the Coronavirus Questionnaire (FCQ) (Mertens, Gerritsen, Duijndam, Salemink & Engelhard, 2020) could be used.

**4.7 Conclusion.** The current study of middle-to-older aged males identified three predictors of self-reported increased alcohol consumption during COVID-19: middle age, clinically significant depression, and concern for oneself becoming sick with COVID-19. Similarly, middle age and concern for oneself becoming sick with COVID-19 were identified as predictors of hazardous alcohol consumption. Several limitations were identified, most notably the cross-sectional data, and the biases associated with self-reported measures. Future directions included longitudinal studies comparing pre-COVID alcohol consumption with

alcohol consumption during the pandemic, a systematic review and meta-analysis of increased alcohol consumption during COVID-19, and qualitative studies investigating experiences of male alcohol consumption during the pandemic. The current study can inform general health and mental health interventions of the predictors of increased alcohol consumption and hazardous alcohol consumption.

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**Appendix 1***Demographic predictors following multiple imputation*

Measure	<i>n</i>	%
Sex		
Male	746	100
Age (groups)		
50-59 years	128	17.2
60-69 years	249	33.4
70-79 years	254	34.0
80+ years	115	15.4
Education		
Primary school	32	4.3
High school	260	34.9
TAFE/apprenticeship	44	5.9
Trade certificate or diploma	272	36.5
Bachelor's degree or higher	138	18.5



**Appendix 2***Descriptive statistics of dependent and independent predictor variables**following multiple imputation*

Measure	<i>n</i>	%
Dependent Variables		
Self-report alcohol consumption during COVID-19		
Decrease/stayed the same	685	91.8
Increase	61	8.2
Standard drinks on single drinking occasion		
<5	681	91.2
≥5	65	8.7
Independent Variables		
Depression		
No	625	83.8
Yes (BDI = ≥10, CES-D = ≥16)	121	16.2
Anxiety (GAD-7 score)		
None (0-4)	602	80.7
Mild (5-9)	93	12.5
Moderate to Severe (≥10)	51	6.8
Financial position during COVID-19		
Worse	184	24.7
Better/stayed the same	562	75.3
Concern for oneself getting sick with COVID-19		
Not at all	172	23.1
A little	352	47.2
Moderately	152	20.4
Very	53	7.1
Extremely	17	2.3
Concern for family getting sick with COVID-19		
Not at all	135	18.1
A little	305	40.9
Moderately	180	24.1
Very	90	12.1
Extremely	25	3.4
Resilient coping (BRCS score)		
Low (4-13)	305	40.9
Moderate (14-16)	329	44.1
High (17-20)	82	11.0

**Appendix 3***Correlation Matrix of Predictor Variables*

Variable	1	2	3	4	5	6	7	8
1. Age	-	-.197**	.016	-.054	.068	-.002	-.072*	-.036
2. Education		-	.043	.010	-.075*	.018	.041	.116**
3. Depression			-	.585**	-.094*	.138**	.110**	-.141**
4. Anxiety				-	-.135**	.166**	.138**	-.130**
5. Financial position					-	-.159**	-.134**	.013
6. Concern for self						-	.743**	.010
7. Concern for family							-	.061
8. Resilient coping								-

\* $p < .05$  (two-tailed). \*\* $p < .01$  (two-tailed)