PLOS ONE

Acute mental health responses during the COVID-19 pandemic in Australia

--Manuscript Draft--

Manuscript Number:	PONE-D-20-12728
Article Type:	Research Article
Full Title:	Acute mental health responses during the COVID-19 pandemic in Australia
Short Title:	Acute mental health responses during the COVID-19 pandemic in Australia
Corresponding Author:	Samantha Tang University of New South Wales Randwick, NSW AUSTRALIA
Keywords:	COVID-19; mental health; psychological distress; cross-sectional study; online survey; Australian population
Abstract:	The acute and long-term mental health impacts of the COVID-19 pandemic are unknown. The current study examined the acute mental health responses to the COVID-19 pandemic in 5070 adult participants in Australia, using an online survey administered during the peak of the outbreak in Australia (27 th March to 7 th April 2020). Self-report questionnaires examined COVID-19 fears and behavioural responses to COVID-19, as well as the severity of psychological distress (depression, anxiety and stress), health anxiety, contamination fears, alcohol use, and physical activity. 78% of respondents reported that their mental health had worsened since the outbreak, one quarter (25.9%) were very or extremely worried about contracting COVID-19, and half (52.7%) were worried about family and friends contracting COVID-19. Uncertainty, loneliness and financial worries (50%) were common. Rates of elevated psychological distress were higher than expected, with 62%, 50%, and 64% of respondents reporting elevated depression, anxiety and stress levels respectively, and one in four reporting elevated health anxiety in the past week. Participants with self-reported history of a mental health diagnosis had significantly higher distress, health anxiety, and COVID-19 fears than those without a prior mental health diagnosis. Demographic (e.g., non-binary or different gender identity; Aboriginal and Torres Strait Islander status), occupational (e.g., being a carer or stay at home parent), and psychological (e.g., perceived risk of contracting COVID-19) factors were associated with distress. Results revealed that precautionary behaviours (e.g., washing hands, using hand sanitiser, avoiding social events) were common, although in contrast to previous research, higher engagement in hygiene behaviours was associated with higher stress and anxiety levels. These results highlight the serious acute impact of COVID-19 on the mental health of respondents, and the need for proactive, accessible digital mental health services to address these mental health needs, particularly for those most vulnerable, including people with prior history of mental health problems. Longitudinal research is needed to explore long-term predictors of poor mental health from the COVID-19 pandemic.
Order of Authors:	Jill Maree Newby
	Kathleen O'Moore
	Samantha Tang
	Helen Christensen
	Kate Faasse
Additional Information:	
Question	**Response**
Financial Disclosure Enter a financial disclosure statement that describes the sources of funding for the work included in this submission. Review	This study was funded by a MRFF Career Development Fellowship to JMN. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

the submission guidelines for detailed requirements. View published research articles from *PLOS ONE* for specific examples. This statement is required for submission and **will appear in the published article** if the submission is accepted. Please make sure it is accurate. **Unfunded studies** Enter: *The author(s) received no specific funding for this work.* **Funded studies** Enter a statement with the following details: • Initials of the authors who received each award • Grant numbers awarded to each author • The full name of each funder • URL of each funder website • Did the sponsors or funders play any role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript? • **NO** - Include this sentence at the end of your statement: *The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.* • **YES** - Specify the role(s) played. * typeset	
Competing Interests Use the instructions below to enter a competing interest statement for this submission. On behalf of all authors, disclose any competing interests that could be perceived to bias this work—acknowledging all financial support and any other relevant financial or non-financial competing interests. This statement **will appear in the published article** if the submission is accepted. Please make sure it is accurate. View published research articles from *PLOS ONE* for specific examples.	The authors have declared that no competing interests exist.

NO authors have competing interests Enter: *The authors have declared that no competing interests exist.* **Authors with competing interests** Enter competing interest details beginning with this statement: *I have read the journal's policy and the authors of this manuscript have the following competing interests: [insert competing interests here]* * typeset	
Ethics Statement Enter an ethics statement for this submission. This statement is required if the study involved: • Human participants • Human specimens or tissue • Vertebrate animals or cephalopods • Vertebrate embryos or tissues • Field research Write "N/A" if the submission does not require an ethics statement. General guidance is provided below. Consult the submission guidelines for detailed instructions. **Make sure that all information entered here is included in the Methods section of the manuscript.**	The study was approved by the UNSW Human Research Ethics Advisory Panel and the UNSW Human Research Ethics Committee (approval number 3330). All respondents provided electronic informed consent before participating.

Format for specific study types **Human Subject Research (involving human participants and/or tissue)** • Give the name of the institutional review board or ethics committee that approved the study • Include the approval number and/or a statement indicating approval of this research • Indicate the form of consent obtained (written/oral) or the reason that consent was not obtained (e.g. the data were analyzed anonymously) **Animal Research (involving vertebrate animals, embryos or tissues)** • Provide the name of the Institutional Animal Care and Use Committee (IACUC) or other relevant ethics board that reviewed the study protocol, and indicate whether they approved this research or granted a formal waiver of ethical approval • Include an approval number if one was obtained • If the study involved *non-human primates*, add *additional details* about animal welfare and steps taken to ameliorate suffering • If anesthesia, euthanasia, or any kind of animal sacrifice is part of the study, include briefly which substances and/or methods were applied **Field Research** Include the following details if this study involves the collection of plant, animal, or other materials from a natural setting: • Field permit number • Name of the institution or relevant body that granted permission	
Data Availability Authors are required to make all data underlying the findings described fully available, without restriction, and from the time of publication. PLOS allows rare exceptions to address legal and ethical concerns. See the PLOS Data Policy and FAQ for detailed information.	No - some restrictions will apply

A Data Availability Statement describing where the data can be found is required at submission. Your answers to this question constitute the Data Availability Statement and **will be published in the article**, if accepted. **Important:** Stating 'data available on request from the author' is not sufficient. If your data are only available upon request, select 'No' for the first question and explain your exceptional situation in the text box. Do the authors confirm that all data underlying the findings described in their manuscript are fully available without restriction?	
Describe where the data may be found in full sentences. If you are copying our sample text, replace any instances of XXX with the appropriate details. • If the data are **held or will be held in a public repository**, include URLs, accession numbers or DOIs. If this information will only be available after acceptance, indicate this by ticking the box below. For example: *All XXX files are available from the XXX database (accession number(s) XXX, XXX.*). • If the data are all contained **within the manuscript and/or Supporting Information files**, enter the following: *All relevant data are within the manuscript and its Supporting Information files.* • If neither of these applies but you are able to provide **details of access elsewhere**, with or without limitations, please do so. For example: *Data cannot be shared publicly because of [XXX]. Data are available from the XXX Institutional Data Access / Ethics Committee (contact via XXX) for researchers who meet the criteria for access to confidential data.* *The data underlying the results presented in the study are available from (include the name of the third party*	Data will be available on request from the author as we do not have consent for the data to be made available in a public repository.

and contact information or URL). • This text is appropriate if the data are owned by a third party and authors do not have permission to share the data. * typeset	
Additional data availability information:	

Acute mental health responses during the COVID-19 pandemic in Australia

Authors:

Jill M. Newby[1,2], Kathleen O'Moore[2], Samantha Tang [2] , Helen Christensen[2], & Kate Faasse[1]

[1]School of Psychology, UNSW Sydney, NSW, Australia

[2]Black Dog Institute, UNSW Sydney, NSW, Australia

Corresponding author:
Jill M Newby
Black Dog Institute
UNSW Sydney
E: j.newby@unsw.edu.au

Abstract

The acute and long-term mental health impacts of the COVID-19 pandemic are unknown. The current study examined the acute mental health responses to the COVID-19 pandemic in 5070 adult participants in Australia, using an online survey administered during the peak of the outbreak in Australia (27th March to 7th April 2020). Self-report questionnaires examined COVID-19 fears and behavioural responses to COVID-19, as well as the severity of psychological distress (depression, anxiety and stress), health anxiety, contamination fears, alcohol use, and physical activity. 78% of respondents reported that their mental health had worsened since the outbreak, one quarter (25.9%) were very or extremely worried about contracting COVID-19, and half (52.7%) were worried about family and friends contracting COVID-19. Uncertainty, loneliness and financial worries (50%) were common. Rates of elevated psychological distress were higher than expected, with 62%, 50%, and 64% of respondents reporting elevated depression, anxiety and stress levels respectively, and one in four reporting elevated health anxiety in the past week. Participants with self-reported history of a mental health diagnosis had significantly higher distress, health anxiety, and COVID-19 fears than those without a prior mental health diagnosis. Demographic (e.g., non-binary or different gender identity; Aboriginal and Torres Strait Islander status), occupational (e.g., being a carer or stay at home parent), and psychological (e.g., perceived risk of contracting COVID-19) factors were associated with distress. Results revealed that precautionary behaviours (e.g., washing hands, using hand sanitiser, avoiding social events) were common, although in contrast to previous research, higher engagement in hygiene behaviours was associated with higher stress and anxiety levels. These results highlight the serious acute impact of COVID-19 on the mental health of respondents, and the need for proactive, accessible digital mental health services to address these mental health needs, particularly for those most vulnerable, including people with prior history of mental health problems. Longitudinal research is needed to explore long-term predictors of poor mental health from the COVID-19 pandemic.

The novel Coronavirus (COVID-19) first emerged in Wuhan, China in December 2019, and has since evolved into a global pandemic. As of April 27th 2020, there are more than 2.87 million confirmed cases and 198,668 deaths globally with 6,720 confirmed cases, and 83 deaths from COVID-19 in Australia (1). The COVID-19 pandemic has caused unprecedented disruption to the way most people live, work, study, socialise, and access health care; with widespread travel bans, border closures, lockdowns, social distancing, isolation and quarantine measures enforced by many countries. These changes and their ramifications (e.g., unemployment, social isolation), along with fears of COVID-19 are likely to have significant and long-term impacts on the mental health of the community. Research into past pandemics, such as the 2003 outbreak of Severe Acute Respiratory Syndrome (SARS), has shown higher rates of illness fears, psychological distress (e.g., depression, anxiety, stress), insomnia and other mental health problems (e.g., posttraumatic stress) in people with pre-existing mental illness, front-line health care workers (2), and survivors of severe and life-threatening cases of the disease (3-6).

High quality research into the mental health impacts of COVID-19 is urgently needed (7) to inform evidence-based policy decisions, prevention efforts, treatment programs and community support systems, particularly for those who are most vulnerable and those who are at risk of experiencing poor mental health outcomes during and after this pandemic. In marked contrast to the rapidly growing literature into the physical health consequences of COVID-19, there is currently limited information about the mental health impacts of the COVID-19 outbreak in the general population. However, some recent research has emerged from China with community participants (8-10), and health care worker samples (11). In a cross-sectional survey of 52,730 participants in China conducted between the 31st January to the 10th February 2020 (10), 29.3% of respondents experienced mild to moderate psychological distress, and 5.1% experienced severe distress. In another survey of 1210 members of the general public (half of whom were students) conducted between 31st January to 2nd February 2020, Wang et al. (8) found that over half (53.8%) of participants rated the psychological impact of the COVID-19 outbreak as moderate to severe, three quarters were worried about their family members contracting COVID-19, and rates of moderate to severe depression, anxiety and stress were 16.5%, 28.8%, and 8.1% respectively. In a follow-up survey four weeks later, rates of depression, anxiety and stress remained unchanged (12). In another survey of 7236 self-selected volunteers

from 3rd to 17th February 2020, Huang & Zhao (13) found that 20.1%, 35.1%, and 18.2% of respondents reported symptoms of depression, generalised anxiety disorder (GAD), and insomnia on self-report measures.

Together these studies demonstrate the elevated psychological distress in the general community during the initial COVID-19 outbreak in China. These studies also give some early insights into factors that may increase a person's vulnerability to experiencing poor mental health during the pandemic. Preliminary evidence suggests that i) demographic factors (younger participants, females, college students, and those with low educational attainment), ii) occupational factors (migrant workers, nurses), iii) health-related factors (history of chronic illness, poor self-rated health (8)), and iv) greater exposure to COVID-19 and the worst affected regions of the outbreak (10), are associated with higher distress levels. In contrast, engaging in precautionary behaviours (e.g., hand hygiene, wearing a mask) have been associated with lower distress (8, 12). As COVID-19 has spread to communities outside of China, more research is urgently needed to explore the mental health impacts of the outbreak, and to identify groups who are vulnerable to poorer mental health in other countries.

To our knowledge there are no published findings on the mental health of the general community during the COVID-19 pandemic in Australia. However, we conducted a previous online survey of the knowledge, attitudes, behaviours and risk perceptions of 2174 people from the general community, shortly after the first death occurred from COVID-19 and when confirmed COVID-19 cases were low in Australia (March 2nd -9th 2020) (14). In that study, we found one in three participants were very or extremely concerned about an outbreak, and that participants perceived their risk of personally contracting COVID-19 as relatively high (rated as 70% likelihood of contracting the virus). Moreover, most participants (61%) expected that they would experience moderate to severe symptoms of COVID-19 if they contracted the virus. We did not measure mental health outcomes, or how afraid individuals were of personally contracting COVID-19. Therefore, the current study extended our previous survey and investigated the mental health of Australian residents during a 12-day period from 27th March to 7th April 2020, which is now considered to be the time of the peak in new cases, and the steady decline in new cases. Three days prior to recruitment, an international travel ban had been implemented in Australia, and from 28th March 2020, all travellers arriving

in Australia from overseas were required to undergo a mandatory 14-day quarantine in designated accommodation. On the first day (27th March) of the study recruitment period, there was a total of 3378 confirmed cases and 13 deaths related to COVID-19 in Australia, with 328 new cases diagnosed on the 27th March. Over the next two days, there was an increase of 785 new cases in Australia. Finally, over the remaining days of the study, the number of daily new cases steadily declined, with 93 new cases reported on the last day of recruitment (7th April 2020). There was a total of 5988 confirmed cases (including 3392 active cases) and 49 deaths at the end of the survey period.

Drawing from past research (8, 10, 12) we assessed demographic characteristics, fears of COVID-19, risk perceptions and behavioural responses to the outbreak, psychological distress (depression, anxiety, stress), and alcohol use. We included measures of health anxiety and contamination fears due to their potential role in influencing behaviour, health service use, and anxious reactions to viral outbreaks (15-18), as well as physical activity levels, and loneliness, due to the expected negative impacts of social distancing measures on these variables, and due to their important role in mental and physical health (19, 20). Finally, we assessed financial worries, as we expected unemployment, and financial insecurity, which have already resulted from this outbreak, to have significant, negative impacts on mental health (7, 21). Our primary aim was to provide the first snapshot of the mental health of the general community during the initial COVID-19 outbreak (and enforcement of social distancing laws) in Australia. The second aim was to explore the relationship between specific demographic and sample characteristics with depression, anxiety and stress, to identify factors that are associated with increased vulnerability for poorer mental health during the COVID-19 pandemic. While we acknowledge that the data from an online survey may not be representative of the entire population, they provide an important opportunity to (i) identify vulnerable groups who are risk of poorer mental health during COVID-19, (ii) determine the socio-demographic and psychological factors that predict psychological distress, and (iii) examine whether the findings from past pandemics, and from China, apply to the Australian context during the COVID-19 pandemic. Based on research from past pandemics, and Chinese research, we expected that between 20-35% would worry about contracting COVID-19 and experience elevated psychological distress, and that specific demographic variables including younger age, being a student, unemployed, female, or with lower educational attainment would predict higher distress

levels in the current cohort. We also expected people with lived experience of prior mental health diagnoses would have higher rates of distress and would be vulnerable to poorer mental health during the current pandemic. Finally, we predicted that engaging in precautionary hygiene behaviours would be associated with lower distress.

Methods

Recruitment

Participants were recruited for the online survey via social media posts, with Facebook advertisements targeting all users with i) current country of residence as Australia, and ii) age listed as 18 or above. Data was collected for 12 days from Friday 27th March to April 7th, 2020. The survey was administered via the Qualtrics survey platform. Each response came from a unique IP address to minimise duplicate entries.

Ethics approval and consent

The study was approved by the UNSW Human Research Ethics Advisory Panel and the UNSW Human Research Ethics Committee (approval number 3330). All respondents provided electronic informed consent before participating.

Participants

In total, 5,971 people viewed the participant information page and consent form. Of these, 579 did not complete the consent form, and a further 323 completed only some of the survey questions before discontinuing. This resulted in a final sample of 5071 participants with sufficient data (>70% complete) to include in the analysis. The structured questionnaire took approximately 15 minutes to complete.

Measures

Demographics

Information was collected on participants' age group, gender, ethnicity, Aboriginal and Torres Strait Islander status, their highest level of education, carer status (for children, and/or someone with a disability, illness or frail aged) and state of residence within Australia. We also assessed participants' employment

status (including whether they had recently lost their job due to COVID-19), the industry of their main job, and the frequency at which they had worked from home during the past week (*not at all, a little, sometimes, most of the time, all of the time*).

General Health and Mental Health

Participants were asked whether they had a chronic illness (*Yes, No, Unsure, Prefer not to say*), and completed a single-item measure assessing their *self-rated heath* (Idler & Benyamini, 1997), with responses on a 5-point scale from *Poor* to *Excellent*. Participants were asked whether they had ever been diagnosed with a mental health problem such as depression and anxiety (*Yes, No, Unsure, Prefer not to say*), and whether they were currently receiving treatment for a mental health problem including medications, counselling, or psychological therapy (*Yes, No, Unsure, Prefer not to say*).

Mental Health

Participants were asked to complete single item measures of i) how lonely they were feeling, ii) how worried they were about their financial situation, and iii) how uncertain they were feeling about the future, on a 5-point scale (*not at all, a little, moderately, very, extremely*). They were then asked to rate how the COVID-19 outbreak had impacted their mental health. "*Since the COVID-19 outbreak, my mental health has been…",* and choose between 5 response options: *A lot worse, A little worse, Stayed the same, A little better, A lot better*.

The survey included several validated self-report screening instruments including i) the 21-item Depression Anxiety Stress Scales (22), a validated measure of depression, anxiety and stress symptoms, ii) the Whiteley-6 (23) a brief validated measure of health anxiety severity, iii) the Contamination Obsessions and Washing Compulsions subscale of the revised version of Padua Inventory of Obsessions and Compulsion (24), and iv) a specific measure of behavioural responses to the pandemic based on our prior study (14), and past research investigating behavioural responses to pandemics (25, 26). Finally, we assessed physical activity levels using the Physical Activity Vital Sign (27) which assessed i) the number of days in the past week they engaged in moderate to strenuous activity, and ii) the average number of minutes they exercised at this level, and screened for hazardous alcohol use using the Modified Alcohol Use Disorders

Identification Test (AUDIT-C; 28). All questionnaire responses were anchored to the past week, except for the AUDIT-C (past month), and the Padua contamination subscale (general). The mental health and lifestyle questionnaires were administered in randomised in order to minimise responding biases.

COVID-19 Variables, Fears and Perceived Risk

Participants were asked about their own COVID-19 status (*I have caught COVID-19 in the past and am now recovered, I currently have COVID-19 [confirmed with a diagnostic test], I suspect I have COVID-19, I do not have COVID-19 and have not experienced it, Unsure, or Other (open text*)). They also indicated whether they were in self isolation (*Yes – I am in voluntary self-isolation, Yes – I am in forced self-isolation, No*). Participants were also asked i) whether any of their family or friends had contracted COVID-19 (*Yes, No, Unsure*), and ii) how concerned or worried they were that their friends or family members would contract COVID-19 (*not at all, a little concerned, moderately concerned, very concerned, extremely concerned*).

Participants were asked five questions relating to their perceived risk from, and worry about, COVID-19. The first question assessed how concerned or worried respondents were about catching COVID-19 on a 5-point scale (*not at all concerned, a little concerned, moderately concerned, very concerned, extremely concerned*). They then rated how likely they thought it was that they would catch the virus on a visual analogue scale (VAS) from 0 (*not at all likely*) to 100 (*extremely likely*). They were asked how much they thought they could do personally to protect themselves from catching the virus (perceived behavioural control), on a 0 (*couldn't do anything*) to 100 (*could do a lot*) visual analogue scale. Perceived illness severity was assessed by asking respondents how severe they thought their symptoms would be if they did catch COVID-19 (response options were: *no symptoms, mild symptoms, moderate symptoms, severe symptoms, severe symptoms requiring hospitalisation*, and *severe symptoms leading to death)*. Finally, participants were asked about how much information they had seen, read or heard about coronavirus (nothing at all, a little, a moderate amount, a lot).

Health-Protective Behaviours

To assess social distancing, hygiene and buying behaviours, participants were asked whether they had engaged in a total of 16 behaviours during the previous week (see Table 2). Response options for each item were *not at all*, *a little*, *some of the time*, *most of the time*, *all of the time*, and *not applicable*. Items were generated based on our previous study of COVID-19 (14) and from previous research examining health-protective behaviours in response to influenza, SARS and Middle East Respiratory Syndrome (MERS) outbreaks (e.g., 26).

Results

Demographics

Demographic characteristics of the sample are depicted in Table 1. Overall, the sample was mostly female (86%), identified as being Caucasian (75%), mainly spoke English at home (91%), and ranged in age from 18 to over 75. Participants were from various states and territories of Australia, with the majority living in the most populated states of New South Wales, Victoria or Queensland. Sixty five percent were working in a paid job, and approximately one third were carers (for children, or people with a disability, illness, or the elderly). Respondents' self-rated health was measured on a scale from poor (1) to excellent (5), with a mean of 3.0 (*SD* = 0.97). The majority of participants rated their health as 'fair' (24.4%), 'good' (37.7%), or 'very good' (24.4%); relatively few participants rated their health as 'poor' (5.3%)' or 'excellent' (5.3%).

Health-Related Information

Only eight participants (0.2%) reported that they themselves currently have or have had COVID-19, 9.2% were unsure, and 1.2% suspected they had COVID-19. Approximately 4.8% reported their family or friends had caught COVID-19, and 8.2% were unsure. Almost half (48.8%) reported being in voluntary self-isolation, 2.4% reported being in 'forced self-isolation' and 48.8% were not self-isolating.

Table 1. Demographic characteristics of the sample

Demographic Variables	N (%)
Gender	
Male	656 (12.94)
Female	4348 (85.78)
Non-binary	42 (0.83)
Different identity	8 (0.16)
Prefer not to say	15 (0.28)
State	
New South Wales	1669 (32.93)
Victoria	1236 (24.38)
Queensland	878 (17.32)
South Australia	407 (8.03)
Western Australia	490 (9.67)
Tasmania	215 (4.24)
Australian Capital Territory	141 (2.78)
Northern Territory	31 (0.61)
Age Group	
18-24	268 (5.29)
25-34	773 (15.25)
35-44	1016 (20.04)
45-54	1190 (23.48)
55-64	1207 (23.81)
65-74	497 (9.80)
75+	51 (1.01)
Not stated	67 (1.32)
Ethnicity	
Caucasian (White / European)	3812 (75.20)
Aboriginal and/or Torres Strait Islander	77 (1.52)
Asian	79 (1.56)
Mixed ethnicity or other	307 (6.06)
Prefer not to say or missing	794 (15.66)
Highest Education	
Less than High school (Year 12 or equivalent)	275 (5.43)
High school only: completed (Year 12)	419 (8.27)
Certificate, or diploma	1485 (29.30)
Bachelor's degree or higher	2888 (56.97)
Not stated	2 (0.04)
English main language spoken at home	
Yes	4628 (91.30)
Employment (tick all that apply)	
I am a permanent employee	2194 (43.3)
I am working on a fixed term contract	362 (7.1)
I have a casual job	432 (8.5)
I am self-employed	388 (7.7)
I am an independent contractor	118 (2.3)
I am an at home parent	221 (4.4)
I am a student	395 (7.8)
I am a carer	129 (2.5)
I am retired	646 (12.7)

I am seeking work	203 (4.0)
I am not working and on disability benefits	258 (5.1)
I am not working as I have lost my job due to COVID19	314 (6.2)
I am not working for other reasons	341 (6.7)
Industry of main job	
Health care or social assistance	1039 (32.2)
Education and training	613 (19.0)
Administration and social support	168 (5.5)
Professional, scientific and technical services	242 (7.5)
Retail trade	137 (4.2)
Other	1109 (31.6)
Carer status	
Carer for children	1196 (23.6)
Carer for person with disability, illness or who is frail aged	772 (15.2)
Isolation	
No	2475 (48.8)
Yes -voluntary self- isolation	2472 (48.8)
Yes – forced self-isolation	120 (2.4)
COVID-19 diagnosis	
No/Never	4534 (89.4)
Unsure/Other	462 (9.2)
Current diagnosis (confirmed with diagnostic test)	5 (0.10)
Suspect I have COVID-19	63 (1.2)
I have had COVID-19 in the past and now recovered	3 (0.10)
Family/friends diagnosed with COVID-19	
Yes	242 (4.8)
No	4411 (87.0)
Unsure	414 (8.2)
Mental health diagnosis	
Yes	3581 (70.65)
No	1351 (26.65)
Unsure	99 (1.95)
Prefer not to say	38 (0.75)
Current mental health treatment	
Yes	2288 (45.14)
No	2747 (54.19)
Unsure	13 (0.26)
Prefer not to say	21 (0.41)
Chronic illness	
Yes	1941 (38.29)
No	2584 (50.98)
Unsure	362 (7.14)
Prefer not to say	34 (0.67)
Missing	148 (2.92)
Self-rated health[a]	
Excellent	269 (5.3)
Very good	1236 (24.4)
Good	1910 (37.7)
Fair	1235 (24.4)
Poor	270 (5.3)

Note. a. *n*=4920

COVID-19 Fears and Perceived Risk

Level of concern and worry about the possibility of contracting COVID-19 was moderate (*M* = 2.84, *SD* = 1.07, range 1-5, where 1 = *not at all*, 5 = *extremely concerned*). A small proportion reported being '*not at all concerned*' (7.6%), 35% reported being '*a little*' concerned, 31.4% were '*moderately concerned*', 17.2% were '*very concerned*', and 8.5% were '*extremely concerned*' about contracting COVID-19. Respondents' ratings of the perceived likelihood of contracting COVID-19 was moderate (*M* = 48.25, *SD* = 24.84; scale from 0 to 100). Perceived behavioural control, or the belief that personal protective behaviours could help prevent infection, had a mean score of 71.64 (*SD* = 19.69). With regard to perceived severity of symptoms if they caught coronavirus, only 0.3% of respondents indicated that they would experience no symptoms; with mild (19.6%) and moderate (43.9%) symptoms most commonly expected. However, one in three respondents perceived the illness severity to be high: with 20.1% indicating they thought they would experience severe symptoms, severe symptoms requiring hospitalisation (12.0%), or severe symptoms leading to death (4.1%). In terms of the amount of information participants had been exposed to about the coronavirus in the past week, most participants (75%) reported having 'a lot' of exposure to information, 21.6% reported a 'moderate amount', whereas very few reported a little (3.3%) or no information at all (0.1%).

COVID-19 Fears (Others)

Participants' overall level of concern and worry about friends and loved ones contracting COVID-19 was moderate (*M* = 3.53, *SD* = 1.03, range 1-5, where 1 = *not at all*, 5 = *extremely concerned*). A small proportion reported that they were '*not at all concerned*' (1.6%), 16.5% reported being '*a little*' concerned, 29.2% were '*moderately concerned*', 33.1% were '*very concerned*', and 19.6% '*extremely concerned*' about their friends or family members contracting COVID-19.

Health-Protective Behaviours

The percentage of respondents who reported having engaged in a range of distancing and hygiene behaviours during the past week is presented in Table 2. During the previous week, handwashing and social distancing (avoiding social events and gatherings) were the most common behaviours.

Table 2. Frequency of health-protective behaviours during the past week

	N/A	Not at all	A little	Some of the time	Most of the time	All of the time
Avoided going to work or university	1702 (33.58)	1120 (22.10)	170 (3.35)	197 (3.89)	306 (6.04)	1567 (30.91)
Avoided using public transport	1828 (36.06)	142 (2.80)	70 (1.38)	75 (1.48)	199 (3.93)	2748 (54.21)
Avoided flying domestically or internationally	2323 (45.83)	113 (2.23)	22 (0.43)	19 (0.37)	34 (0.67)	2549 (50.29)
Avoided social events or public gatherings	234 (4.62)	47 (0.93)	58 (1.14)	62 (1.22)	492 (9.71)	4168 (82.23)
Avoiding socialising (in person) with anyone outside of your household	82 (1.62)	90 (1.78)	170 (3.35)	225 (4.44)	1495 (29.49)	2997 (59.12)
Avoided going to hospitals or going to the doctor unless absolutely necessary	1015 (20.02)	280 (5.52)	167 (3.29)	155 (3.06)	561 (11.07)	2881 (56.84)
Avoided going into shops	35 (0.69)	275 (5.43)	493 (9.73)	1017 (20.06)	2533 (49.97)	706 (13.93)
Avoided staying in hotels, hostels, or Airbnb's	2572 (50.74)	108 (2.13)	13 (0.26)	14 (0.28)	37 (0.73)	2315 (45.67)
Avoided sending your children to school or childcare	3745 (73.88)	217 (4.28)	42 (0.83)	67 (1.32)	123 (2.43)	865 (17.06)
Stayed at home as much as possible	38 (0.75)	31 (0.61)	56 (1.10)	219 (4.32)	2310 (45.57)	2406 (47.46)
Cleaned or disinfected things you touch (such as doorknobs or hard surfaces)	31 (0.61)	592 (11.68)	697 (13.75)	1387 (27.36)	1390 (27.42)	964 (19.02)
Used sanitising hand gel to clean your hands	92 (1.81)	441 (8.70)	428 (8.44)	1153 (22.75)	1286 (25.37)	1661 (32.77)
Washed your hands thoroughly	10 (0.20)	7 (0.14)	34 (0.67)	150 (2.96)	1382 (27.26)	3475 (68.55)
Worn a face mask when going out in public	261 (5.15)	4067 (80.23)	193 (3.81)	223 (4.40)	148 (2.92)	169 (3.33)
Avoided touching objects or surfaces knowing they have been touched by other people	77 (1.52)	188 (3.71)	416 (8.21)	881 (17.38)	2005 (39.55)	1493 (29.45)
Purchased significantly more than you normally would when grocery shopping	73 (1.44)	2008 (39.61)	1406 (27.74)	927 (18.29)	398 (7.85)	248 (4.89)

Note. Numbers represent n and proportion (%) in brackets.

Mental Health

More than three quarters of participants reported that their mental health had been worse since the outbreak, with 55.1% selecting '*a little worse'*, and 22.9% selecting '*a lot worse'*. A small proportion reported improvements in their mental health since the outbreak (5.5%) (see Figure 1). A chi square analysis revealed that there was a significant difference in the impact of COVID-19 on mental health for participants with and without a prior mental health diagnosis (χ^2 (4) = 141.44, p <.001), with 26.6% of those with a prior mental health diagnosis saying their mental health had been 'a lot worse', relative to 13.4% in the group without a mental health diagnosis.

Figure 1. Proportion of participants reporting how their mental health has been since the start of the COVID-19 outbreak, in the Total Sample (Left), the sub-sample with a prior mental health diagnosis (middle) and no prior mental health diagnosis (right).

Figure 2. Proportion (% of total sample) of participants reporting worry about finances, uncertainty about the future and feelings of loneliness.

Almost 80% of individuals reported moderate to extreme levels of uncertainty about the future; half (50.1%) reported feeling moderately to extremely lonely, and half reported moderate to extreme worry about their financial situation (50.1%). See Figure 2 for results.

Table 3 shows the proportion of participants who scored across the severity categories of the DASS-21 subscales. Only 38.2% of respondents scored in the normal range for depression, 50.2% in the normal range for anxiety, and 45.5% for stress. In contrast, 37.1%, 29.1%, and 33.6% fell in the mild to moderate range for depression, anxiety, and stress respectively, whereas 24.1%, 20.3%, and 20.4% reported severe or extremely severe stress levels. On the Whiteley-6, 21.6% scored in the range indicating elevated health anxiety. Of the participants who had valid scores on the Physical Activity Vital Sign (N=4845), 42.7% met

national guidelines for 150 minutes of moderate to vigorous physical activity in the past week. On the AUDIT-C brief screener for alcohol use, approximately 52.7% showed hazardous drinking levels. Hazardous drinking levels were defined as an AUDIT-C score of 3 or more for women and other genders, and 4 or more for men (28, 29).

Table 3. Psychological distress, health anxiety, alcohol use, and physical activity

	Normal	Mild	Moderate	Severe	Extremely Severe
DASS-21	n (%)	n (%)	n (%)	n (%)	n (%)
Depression Subscale	1936 (38.19)	765 (15.09)	1124 (22.17)	533 (10.51)	691 (13.63)
Anxiety Subscale	2546 (50.23)	434 (8.56)	1039 (20.50)	397 (7.83)	633 (12.49)
Stress Subscale	2308 (45.53)	778 (15.35)	927 (18.29)	720 (14.20)	316 (6.23)

	M	SD
DASS-21 Total	40.19	25.07
DASS-21 Depression Subscale	14.14	10.56
DASS-21 Anxiety Subscale	8.98	8.21
DASS-21 Stress Subscale	17.07	9.49
Whiteley-6 Total (Health Anxiety)	13.18	5.61
Padua Contamination & Washing Subscale [a]	10.76	8.78
Physical activity vital sign [b]	186.86	369.39
AUDIT-C (alcohol) [c]	3.66	2.02

Note. DASS-21 = Depression Anxiety Stress 21-item scale. a. n=4928, b. n=4845. c. n=4828

Comparison between people with and without prior mental health diagnosis

People with and without a self-reported history of mental health diagnosis were compared in their severity of COVID-19 fears, mental health, distress, health anxiety, alcohol use, contamination fears, and physical activity. People with a previous self-reported mental health diagnosis reported higher uncertainty, loneliness, financial worries, COVID-19 fears (self and others), believed they were more likely to contract COVID-19, had lower perceived behavioural control, had higher rates of psychological distress, health anxiety and contamination fears, and lower physical activity than those without a self-reported mental health diagnosis history. There were no differences in alcohol use between these groups (see Table 4).

Table 4. Mental health in people with and without a prior self-reported mental health diagnosis.

	Prior mental health diagnosis			No prior mental health diagnosis			
	N	**Mean**	**SD**	**N**	**Mean**	**SD**	**Independent samples *t* test**
Uncertain: future	3581	3.57	1.07	1351	3.21	1.05	t (4930) = 10.63, p = 0.00
Lonely	3581	2.83	1.29	1351	2.23	1.16	t (4930) = 14.89, p = 0.00
Worry: finances	3581	2.83	1.26	1351	2.41	1.19	t (4930) = 10.68, p = 0.00
Worry: contracting COVID-19	3574	2.89	1.08	1344	2.71	1.03	t (4916) = 5.23, p = 0.00
Perceived likelihood	3575	49.04	24.88	1347	45.97	24.61	t (4920) = 3.87, p = 0.00
Perceived control	3574	71.05	19.79	1346	73.41	19.25	t (4918) = -3.76, p = 0.00
Severity of illness	3564	3.44	1.07	1341	3.16	1.02	t (4903) = 8.39, p = 0.00
Worry: loved ones contracting COVID-	3581	3.59	1.03	1351	3.38	1.02	t (4930) = 6.22, p = 0.00
Self-rated health	3481	2.85	0.94	1310	3.39	9.40	t (4789) = 17.73, p = 0.00
DASS-21 Total	3567	45.52	25.26	1345	26.57	18.93	t (4910) = 25.00, p = 0.00
DASS-21 Depression	3567	16.22	10.85	1345	8.87	7.70	t (4910) = 22.78, p = 0.00
DASS-21 Anxiety	3567	10.47	8.50	1345	5.12	5.98	t (4910) = 21.19, p = 0.00
DASS-21 Stress	3567	18.83	9.44	1345	12.58	8.12	t (4910) = 21.49, p = 0.00

Whiteley-6 (health anxiety)	3575	13.93	5.75	1351	11.19	4.74	t (4924) = 15.63, p = 0.00
Contamination Fears	3483	11.42	9.05	1319	9.12	7.87	t (4800) = 8.14, p = 0.00
AUDIT-C Total (alcohol)	3411	3.10	2.72	1289	3.23	2.44	t (4698) = -1.45, p = 0.15
PAVS Total (physical activity)	3429	170.90	360.41	1289	226.32	393.88	t (4716) = -4.59, p = 0.00

	n	**%**	**n**	**%**	
Whiteley-6 (elevated health anxiety)	923	25.8	146	10.8	χ^2 (1) = 130.03 p <.001
AUDIT-C (hazardous drinking)	1742	48.6	737	54.6	χ^2 (1) = 52.52 p <.001
PAVS (inactive)	1349	58.1	631	49.0	χ^2 (1) = 13.99 p <.001

Impact of self-isolation: Compared to people who were not in self isolation, people who self-reported being in self-isolation reported higher uncertainty, loneliness, financial worries, and COVID-19 fears (self and others), rated the symptoms of COVID-19 as more serious, but believed they were less likely to contract COVID-19, and perceived more behavioural control over COVID-19. They also had higher rates of psychological distress, health anxiety and contamination fears, and lower alcohol use than those not in isolation. There were no differences in physical activity between these groups (see Table 5).

Table 5. Comparison between those in self-isolation versus not in self isolation

	Not in self-isolation			**In self-isolation**			
	N	M	SD	N	M	SD	**Independent samples *t* test**
Uncertain: future	2475	3.41	1.06	2592	3.52	1.08	t (5065) = 3.63, p = 0.00
Lonely	2475	2.56	1.26	2592	2.76	1.29	t (5065) = 5.52, p = 0.00
Worry: finances	2475	2.64	1.22	2592	2.78	1.27	t (5065) = 4.09, p = 0.00
Worry: contracting COVID-19	2473	2.77	1.05	2580	2.91	1.08	t (5051) = 4.65, p = 0.00
Perceived likelihood	2473	49.27	25.26	2584	47.27	24.40	t (5055) = -2.86, p = 0.00
Perceived control	2473	70.16	20.36	2582	73.06	18.93	t (5053) = 5.26, p = 0.00
Severity of illness	2467	3.18	0.94	2573	3.53	1.14	t (5038) = 11.95, p = 0.00

Worry: loved ones contracting COVID-	2475	3.44	1.04	2592	3.60	1.02	t (5065) = 5.51, p = 0.00
Self-rated health	2339	3.10	0.94	2452	2.90	0.99	t (4789) = 6.92, p = 0.00
DASS-21 Total	2461	38.05	24.44	2586	42.26	25.48	t (5045) = 5.99, p = 0.00
DASS-21 Depression	2461	13.24	10.32	2586	15.01	10.72	t (5045) = 5.97, p = 0.00
DASS-21 Anxiety	2461	8.15	7.85	2586	9.78	8.47	t (5045) = 7.10, p = 0.00
DASS-21 Stress	2461	16.66	9.35	2586	17.47	9.60	t (5045) = 3.03, p = 0.00
Whiteley-6 (health anxiety)	2470	12.27	5.20	2591	14.06	5.85	t (5059) = 11.52, p = 0.00
Contamination Fears	2414	9.92	8.30	2514	11.56	9.14	t (4926) = 6.60, p = 0.00
AUDIT-C Total (alcohol)	2358	3.25	2.63	2470	3.02	2.65	t (4826) = -3.02, p = 0.00
PAVS Total (physical activity)	2362	190.10	296.41	2483	183.77	427.44	t (4843) = -0.60, p = 0.55

Predictors of Depression, Anxiety and Stress

Separate linear regression analyses were conducted to explore the demographic, occupational, and psychological predictors of DASS-21 depression, anxiety and stress severity (see final model in Table 8). We entered demographic predictor variables (gender, age, occupational status, education, Aboriginal and/or Torres Strait Islander and carer status) in the first step. In the second step, we entered general health variables including chronic illness, mental health diagnosis history, and self-rated health. In the third step, we entered uncertainty about the future, loneliness, worry about finances. In the final step, we added COVID-19 variables (whether they were in self-isolation, hygiene behaviours, exposure to COVID-19 information, risk perceptions including perceived likelihood, perceived control, and severity of illness, concern/worry about contracting COVID-19, and concern/worry about loved ones contracting COVID-19.

Depression. Demographic variables accounted for 10.8% of the variance (R^2_{change}=0.11, SE=10.02, F_{change} (18, 4971), = 33.32, p <.001). Entering the mental health diagnosis, chronic illness, and self-rated health variables accounted for 9.5% of additional variance (R^2_{change}=0.095, SE=9.47, F_{change} (3, 4788), = 191.73, p <.001). In the third step, entering mental health variables accounted for 27.5% unique variance (R^2

$_{change}$=0.28, SE=7.66, F $_{change}$ (3, 4785), = 845.35, p <.001). Finally, the COVID-19 variables accounted for 0.7% unique variance (R^2 $_{change}$=0.007, SE=7.61, F $_{change}$ (3, 4777), = 8.02, p <.001). The final model is presented in Table 8 and accounted for 48.5% of the variance in depression scores.

Controlling for the other variables in the model, being female, more well educated, older, and having better self-rated health were all associated with lower depression, whereas being unemployed, a student, retired, carer or stay at home parent were associated with higher depression. Mental health and chronic illness diagnoses were associated with higher depression, as were increased uncertainty about the future, loneliness, and financial worries. Of the COVID-19 variables, higher worry about COVID-19 and perceived behavioural control over COVID-19 infection were associated with lower depression, whereas perceiving higher illness severity was associated with higher depression.

Anxiety. In the first step, demographic variables accounted for 10.7% of the variance in anxiety scores (R^2 $_{change}$=0.11, SE=7.77, F_{change} (18, 4791), = 33.05, p <.001). Entering the health variables (mental health diagnosis, chronic illness, and self-rated health) accounted for 8.3% of additional variance (R^2 $_{change}$=0.083, SE=7.40, F $_{change}$ (3, 4788), = 163.28, p <.001). In the third step, entering mental health variables accounted for 15.3% unique variance (R^2 $_{change}$=0.15, SE=6.67, F $_{change}$ (3, 4785), = 372.11, p <.001). Finally, the COVID-19 variables accounted for 2.7% unique variance (R^2 $_{change}$=0.027, SE=6.53, F $_{change}$ (3, 4777), = 25.55, p <.001). The final model is presented in Table 8 and accounted for 36.5% of the variance in anxiety scores.

Controlling for other variables in the model, being female, non-binary or different gender identity, and being Aboriginal and/or Torres Strait Islander were predictors of higher anxiety. Older age, and more well educated (certificate, degree or higher) were predictors of lower anxiety. In contrast to depression, only being a student predicted worse anxiety. Having a chronic illness, and prior history of mental health diagnosis were associated with higher anxiety, whereas better self-rated health was a predictor of lower anxiety. Similar to depression, increased uncertainty about the future, loneliness, and financial worries were also associated with higher anxiety. Of the COVID-19 variables, more hygiene behaviours, worry about COVID-19, worry about loved ones contracting COVID-19, and higher perceived illness severity were

predictors of higher anxiety, whereas increased exposure to COVID-19 information, and perceived control over COVID-19 predicted lower anxiety.

Stress. In the first step, demographic variables accounted for 10.8% of the variance in anxiety scores (R^2_{change}=0.11, SE=8.99, F_{change} (18, 4791), = 33.49, p <.001). Entering the health variables (mental health diagnosis, chronic illness, and self-rated health) accounted for 6.9% of additional variance (R^2_{change}=0.069, SE=8.63, F_{change} (3, 4788), = 135.07, p <.001). In the third step, entering mental health variables accounted for 19.4% unique variance (R^2_{change}=0.19, SE=7.54, F_{change} (3, 4785), = 496.74, p <.001). Finally, the COVID-19 variables accounted for 1.8% unique variance (R^2_{change}=0.018, SE=7.44, F_{change} (3, 4777), = 17.68, p <.001). The final model is presented in Table 8 and accounted for 38.9% of the variance in stress scores.

Controlling for other variables in the model, identifying as non-binary or different gender identity, Aboriginal and/or Torres Strait Islander, predicted higher stress. Being more well-educated with a trade certificate, and older age, were predictors of lower stress. Being a stay at home parent was a predictor of higher stress. Having a chronic illness, and prior history of mental health diagnosis were associated with higher stress, whereas better self-rated health was a predictor of lower stress. Increased uncertainty about the future, loneliness, and financial worries were also associated with higher stress. Of the COVID-19 variables, more hygiene behaviours, worry about loved ones contracting COVID-19, and higher perceived likelihood of contacting COVID 19 were predictors of higher stress. Higher perceived control over COVID-19 predicted lower stress.

Table 8. Predictors of depression, anxiety and stress severity (DASS-21 scores)

	DASS-21 Depression						***DASS-21 Anxiety***						***DASS-21 Stress***				
Variable	***B***	***SE***	***Exp(B)***	***t***	***p***		***B***	***SE***	***Exp(B)***	***t***	***p***		***B***	***SE***	***Exp(B)***	***t***	***p***
Constant	5.51	1.43		3.84	0.00		1.05	1.23		0.85	0.39		3.87	1.40		2.76	0.01
Gender																	
Male (RC)																	
Female	-1.08	0.33	-0.04	-3.27	**0.00**		0.60	0.28	0.03	2.10	**0.04**		0.36	0.32	0.01	1.11	0.27
Non-binary or different identity	0.57	1.16	0.01	0.49	0.62		1.71	1.00	0.02	1.71	**0.09**		3.69	1.14	0.04	3.25	**0.00**
Prefer not to say	-0.68	2.33	0.00	-0.29	0.77		4.60	2.00	0.03	2.30	**0.02**		3.42	2.27	0.02	1.50	0.13
Age																	
18 to 24 (RC)																	
25-34	-1.84	0.58	-0.06	-3.16	**0.00**		-2.17	0.50	-0.10	-4.34	**0.00**		-1.58	0.57	-0.06	-2.77	**0.01**
35-44	-2.39	0.58	-0.09	-4.12	**0.00**		-3.21	0.50	-0.16	-6.46	**0.00**		-1.69	0.57	-0.07	-2.98	**0.00**
45-54	-2.33	0.58	-0.09	-4.02	**0.00**		-4.06	0.50	-0.21	-8.16	**0.00**		-3.08	0.57	-0.14	-5.43	**0.00**
55-64	-2.34	0.59	-0.09	-3.98	**0.00**		-4.66	0.51	-0.24	-9.22	**0.00**		-4.47	0.57	-0.20	-7.77	**0.00**
65-74	-3.27	0.73	-0.09	-4.50	**0.00**		-5.41	0.62	-0.20	-8.67	**0.00**		-6.03	0.71	-0.19	-8.48	**0.00**
75 and older	-3.46	1.30	-0.03	-2.66	**0.01**		-4.82	1.12	-0.06	-4.31	**0.00**		-6.63	1.27	-0.07	-5.22	**0.00**
Aboriginal and/or Torres Strait Islander	1.46	0.90	0.02	1.62	0.11		1.63	0.77	0.02	2.11	**0.04**		1.94	0.88	0.02	2.21	**0.03**
Education																	
Less than high school (RC)																	
High school only	0.08	0.62	0.00	0.13	0.90		-0.75	0.53	-0.02	-1.41	0.16		-0.70	0.61	-0.02	-1.15	0.25
Trade certificate or diploma	-0.90	0.52	-0.04	-1.74	**0.08**		-0.98	0.44	-0.05	-2.20	**0.03**		-0.84	0.51	-0.04	-1.67	**0.09**
Bachelor's degree or higher	-1.46	0.51	-0.07	-2.87	**0.00**		-1.81	0.44	-0.11	-4.16	**0.00**		-0.71	0.50	-0.04	-1.43	0.15
Employment Status																	
Paid employment (RC)																	
Unemployed	0.04	0.55	0.00	0.07	0.94		-0.41	0.47	-0.01	-0.88	0.38		-0.68	0.54	-0.02	-1.26	0.21
Student	2.26	0.32	0.08	7.17	**0.00**		1.08	0.27	0.05	4.00	**0.00**		0.15	0.31	0.01	0.49	0.63
Retired	0.82	0.47	0.03	1.74	**0.08**		0.19	0.41	0.01	0.47	0.63		-0.23	0.46	-0.01	-0.50	0.62
At home parent	1.01	0.57	0.02	1.77	**0.08**		-0.34	0.49	-0.01	-0.69	0.49		1.22	0.56	0.03	2.19	**0.03**

Carer	1.54	0.71	0.02	2.18	**0.03**		0.36	0.61	0.01	0.59	0.56		0.59	0.69	0.01	0.85	0.39
Chronic illness	0.33	0.19	0.02	1.72	**0.08**		0.57	0.17	0.04	3.44	**0.00**		0.38	0.19	0.03	2.01	**0.04**
Mental health diagnosis	2.23	0.24	0.10	9.38	**0.00**		1.88	0.20	0.11	9.22	**0.00**		2.51	0.23	0.13	10.81	**0.00**
Self-rated health	-1.40	0.13	-0.13	-10.51	**0.00**		-0.83	0.11	-0.10	-7.25	**0.00**		-0.63	0.13	-0.06	-4.81	**0.00**
Uncertainty about future	2.07	0.13	0.21	15.75	**0.00**		1.26	0.11	0.16	11.17	**0.00**		1.96	0.13	0.22	15.24	**0.00**
Loneliness	3.24	0.10	0.39	32.37	**0.00**		1.38	0.09	0.22	16.09	**0.00**		1.82	0.10	0.25	18.64	**0.00**
Worry about finances	0.73	0.10	0.09	7.04	**0.00**		0.46	0.09	0.07	5.19	**0.00**		0.40	0.10	0.05	3.95	**0.00**
Self-isolation	-0.05	0.23	0.00	-0.23	0.82		0.33	0.20	0.02	1.66	0.10		-0.11	0.23	-0.01	-0.50	0.62
Hygiene behaviours	-0.08	0.05	-0.02	-1.67	0.10		0.28	0.04	0.08	6.73	**0.00**		0.17	0.05	0.04	3.57	**0.00**
Exposure to COVID-19 information	0.13	0.21	0.01	0.61	0.54		-0.58	0.18	-0.04	-3.16	**0.00**		-0.09	0.21	0.00	-0.43	0.67
Concern/worry about contracting COVID-19	-0.53	0.15	-0.05	-3.68	**0.00**		0.47	0.12	0.06	3.75	**0.00**		0.20	0.14	0.02	1.39	0.17
Likelihood of contracting COVID-19	0.01	0.01	0.03	2.15	**0.03**		0.00	0.00	0.01	1.00	0.32		0.01	0.01	0.03	2.48	**0.01**
Perceived control	-0.04	0.01	-0.07	-5.94	**0.00**		-0.02	0.01	-0.05	-3.89	**0.00**		-0.02	0.01	-0.05	-3.95	**0.00**
Severity of illness	0.26	0.13	0.03	2.02	**0.04**		0.30	0.11	0.04	2.67	**0.01**		-0.02	0.13	0.00	-0.14	0.89
Concern/worry about loved ones contracting COVID-19	0.01	0.13	0.00	0.04	0.97		0.37	0.11	0.05	3.30	**0.00**		0.75	0.13	0.08	5.84	**0.00**

Note. B: N=4810. Unstandardized coefficient; SE: Standard error; Exp(B): Exponentiated regression coefficient; RC: Reference category.

Discussion

This survey presents the first insight into how the COVID-19 pandemic has impacted the mental health of people living in Australia, in a sample of 5070 individuals. Rapidly disseminating an online survey enabled us to assess a large number of participants during the peak of the pandemic in Australia to identify fears and acute distress and identify the relationship between demographic and psychological predictors of mental health. While very few individuals reported that they (0.15%) or their family/friends (4.8%) had contracted COVID-19, one quarter (25.9%) of respondents were very or extremely worried about contracting COVID-19, and over half (52.7%) were very or extremely worried about their family and friends contracting COVID-19. Almost four in five participants reported that since the outbreak their mental health had worsened, with over half (55%) saying it had worsened a little, and almost a quarter of respondents (23%) saying it had worsened a lot. A small minority reported better mental health (4.8%). Results showed that many people are experiencing high levels of uncertainty about the future (80%), and half of respondents reporting moderate to extreme loneliness and worry about their financial situation. Given loneliness, social isolation, and financial stress are significant risk factors for poor mental and physical health, and risk factors for suicidal ideation (e.g., 19, 20, 30), these findings are concerning.

To rapidly respond to the evolving COVID-19 situation, we administered online validated self-report questionnaires rather than diagnostic interviews. It is important to note that these questionnaires assessed *symptoms* of distress during the past week and should not be taken as indicative of a 'diagnosis' of a depressive or anxiety disorder. We found higher than expected levels of acute distress based on research in China during the COVID-19 pandemic (8), and compared to normative data (22, 31). Between 20.3-24.1% of the current sample were experiencing severe or extremely severe levels of depression, anxiety and stress, and a further 18-22% moderate symptoms. Only 38% of the current sample had normal depression, 50% had normal anxiety, and 46% had normal stress levels, whereas in the Chinese sample reported by Wang et al. (8) 64-69% had normal anxiety, stress and depression on the DASS-21. These differences may be due to the high proportion of people with pre-existing mental health diagnoses (70%) in our sample, which have been shown to be a vulnerable group (8, 10), or because of the significant proportion with a self-reported chronic illness (38%), who may be more susceptible to more severe COVID-19 disease, and therefore more

distressed. Having a personal history of chronic illness was a consistent predictor of higher depression, anxiety and stress, whereas better self-rated health was associated with better mental health. Compared to the Australian population, this sample appeared to have poorer health, with 30% reported being in fair or poor health (compared to 15% in the Australian population), and 30% reporting being in very good or excellent health (compared to 56% of Australians) (32).

Our data gave some insights into other demographic variables which predict higher psychological distress. Specific occupational factors predicted higher distress levels: student status (depression and anxiety), being an at home parent (depression and stress), a carer or retired (predicted higher depression), whereas education was associated with lower psychological distress. In contrast to past research, identifying as female predicted lower depression, however identifying as non-binary or a different gender identity was associated with higher self-reported anxiety and stress. Identifying as Aboriginal or Torres Strait Islander also predicted worse anxiety and stress levels. These groups may be particularly vulnerable during the current pandemic, and longitudinal research is needed to explore the longer term predictors of poorer mental health over time.

Our results confirm fears about the potential impact of the COVID-19 pandemic on people with lived experience of mental illness (7). Participants with a self-reported history of mental health problems were more afraid of COVID-19 and more worried about their loved ones contracting COVID-19, had higher distress, depression, anxiety, health anxiety and contamination fears, and higher rates of elevated health anxiety (26% versus 11%) than those without pre-existing mental health diagnoses. Relative to those without mental health issues, a greater proportion of people with self-reported mental health problems had elevated health anxiety (26% versus 11%), and said their mental health had been ‘a lot worse’ since the outbreak (26% versus 13%). Having a history of mental health issues was a consistent predictor of higher depression, anxiety and stress.

Because we did not collect any information about the history and nature of these mental health diagnoses, we cannot determine whether these individuals had higher distress prior to the pandemic, or whether distress increased as a result of the pandemic, due to inability to access usual supports, social isolation or loneliness (7). However, our findings highlight the need for proactive mental health

interventions for those who are experiencing elevated symptoms of depression, anxiety and stress during the current COVID-19 pandemic, regardless of whether the distress is an exacerbation or recurrence of pre-existing mental health concerns, or new onset. Digital interventions, which have been shown to be highly effective and cost-effective for depression and anxiety treatment (33) will be crucial to respond to these ongoing mental health concerns, as they have capacity to deliver high quality interventions for distress at scale, and to those in social isolation who are unable to attend face-to-face services (7, 34).

This study provides new knowledge about the rates of health anxiety during the COVID-19 pandemic. Over one in four (26%) of people with a prior history of mental health issues, and 11% of those without pre-existing mental health issues reported elevated health anxiety in the past week, which is higher than rates of health anxiety in the general Australian population (3.4% (35)), and closer to the rates of health anxiety observed in general practice (10%) and outpatient medical clinic settings (20-25%) (36). While these symptoms are not necessarily indicative of illness anxiety disorder, high health anxiety is likely to have significant ramifications for health service utilisation. Responses to health anxiety vary substantially, with responses ranging from a complete avoidance of doctors, hospitals, and medical settings due to fear, to the other end of the spectrum of excessive, repeated, and unnecessary health service use, diagnostic testing, emergency visits and paramedic calls (37). Proactive treatment of health anxiety with digital interventions may also be needed should these symptoms persist (38, 39).

In prior research, risk perceptions, including the perceived risk of contracting the virus, perceived control over the virus, and the perceived seriousness of the symptoms have been shown to be associated with psychological distress, and behavioural responses to disease outbreaks. Consistent with the findings of SARS pandemics, and our previous study, we found moderate perceptions of risk of contracting the virus. Participants rated on average that there was a 50% likelihood of contracting the virus personally, and higher perceived risk was associate with higher depression and stress levels. In the current cohort approximately one third of participants expected COVID-19 to lead to severe symptoms (32.1%), and in some cases death (4%), which is higher than in our previous study, where we found only 25% expected severe symptoms. The expected severity of the COVID-19 illness differs markedly to the reality for most people, as studies show that 80% of people will experience no or mild symptoms (40). These findings reinforce the need for

education campaigns to address these misperceptions, especially as research has shown that these beliefs are associated with engagement with distress. These risk perceptions explained a relatively small amount of variance in the regression analyses, with perceived control over COVID-19 a consistent predictor of better mental health and higher perceived severity of illness associated with higher depression and anxiety. However, it is important to note that other predictors, including loneliness, financial stress, uncertainty, demographic factors, and prior history of mental and chronic illness were stronger predictors of distress.

Similar to Wang et al. (8), some of the most common precautionary behaviours were avoiding touching objects that had been touched by others, washing hands, and using hand sanitiser. Participants also commonly reported staying at home and avoiding social events and socialising with others outside of the household. In contrast to media portrayals of panic buying, excessive purchasing behaviour was not common. In previous research, higher engagement in hygiene behaviours, such as handwashing have been associated with lower distress and anxiety, suggesting behavioural control may be protective for mental health. However, in the current cohort we found some inconsistent results, with engagement in *more* hygiene behaviours associated with *higher* anxiety and stress levels (they were not associated with depression). These findings differ to the findings of Wang et al. (8) during the early stages of the epidemic in China, where the use of precautionary measures, such as avoiding sharing utensils, hand hygiene and wearing masks were associated with lower stress, anxiety and depression. However, the current findings are consistent with some research from the SARS epidemic, in which moderate levels of anxiety were associated with higher uptake of precautionary behaviours (41). It is possible that the association we found was due to people who were higher in anxiety or stress using these behaviours in an attempt to control anxiety.

Finally, concerns have been raised about the potential impact of social isolation and quarantine on physical inactivity, as well as increased alcohol use and abuse. On the AUDIT-C brief screener for alcohol use, approximately 52.7% met criteria for hazardous drinking levels, which is higher than the 42% found in primary care samples in Australia (42) and higher than USA-based population samples (35 %-45%) (43). However it is important to note that participants with a prior experience of mental health problems had lower rates of hazardous drinking, and lower rates of inactivity. In the current sample, 42.7% met the

national physical activity recommendations of 150 minutes or more of moderate to vigorous activity over the past week, which are similar to the population based normative data from the Australian National Health survey (43-44%) (32). We will be following up these participants longitudinally to explore whether activity levels decrease further as isolation restrictions proceed. Given the importance of exercise and physical activity in maintaining mental health and promoting overall health and wellbeing, interventions could be used to assist increasing activity levels for those sedentary at home.

Limitations

The results are based on a convenience sample recruited online, who were mostly women (85%) and well educated, and a significant proportion reported having lived experience of a mental health diagnosis (70%). This may overestimate the symptom severity and impact of COVID-19, especially given past studies have shown worse impact of pandemics on those with pre-existing mental illness, and in females. It may also mean that the results cannot generalise to the broader Australian population. Results are also based solely on validated self-report measures, due to their ease and speed of assessment, and administration. Conducting diagnostic interviews to assess mental health diagnoses with more than 5000 participants in 10 days would not have been feasible. Future studies need to explore the impact of COVID-19 on mental health of COVID-19 patients, given evidence of increased rates of Post -Traumatic Stress Disorder, sleep disturbance and depression in SARS patients (5, 44). Finally, the study was cross-sectional; the next step in our research is to track this cohort over time, to explore how their mental health changes as the pandemic evolves in Australia.

Acknowledgements

We thank all of the participants who kindly contributed to this study.

References

1. World Health Organisation. Coronavirus disease 2019 (COVID-19) Situation Report – 85 2020 [Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200414-sitrep-85-covid-19.pdf?sfvrsn=7b8629bb_2.

2. Harvey SB, Strudwick J, Petrie K, Gayed A, Santkar S, Counson I, et al. Expected impact of COVID-19 on the mental health of health professionals. A systematic review and meta-analysis of studies from the current and previous pandemics. under review.

3. Chua SE, Cheung V, McAlonan GM, Cheung C, Wong JW, Cheung EP, et al. Stress and psychological impact on SARS patients during the outbreak. Canadian journal of psychiatry Revue canadienne de psychiatrie. 2004;49(6):385-90.

4. Chua SE, Cheung V, Cheung C, McAlonan GM, Wong JW, Cheung EP, et al. Psychological effects of the SARS outbreak in Hong Kong on high-risk health care workers. Canadian journal of psychiatry Revue canadienne de psychiatrie. 2004;49(6):391-3.

5. Mak IWC, Chu CM, Pan PC, Yiu MGC, Chan VL. Long-term psychiatric morbidities among SARS survivors. General Hospital Psychiatry. 2009;31(4):318-26.

6. Phua DH, Tang HK, Tham KY. Coping responses of emergency physicians and nurses to the 2003 severe acute respiratory syndrome outbreak. Academic emergency medicine : official journal of the Society for Academic Emergency Medicine. 2005;12(4):322-8.

7. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. The Lancet Psychiatry.

8. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. International journal of environmental research and public health. 2020;17(5).

9. Zhang Y, Ma ZF. Impact of the COVID-19 Pandemic on Mental Health and Quality of Life among Local Residents in Liaoning Province, China: A Cross-Sectional Study. International journal of environmental research and public health. 2020;17:2381.

10. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. General Psychiatry. 2020;33(2):e100213.

11. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Network Open. 2020;3(3):e203976-e.

12. Wang C, Pan R, Wan X, Tan Y, Xu L, McIntyre RS, et al. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. Brain, behavior, and immunity. 2020.

13. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 epidemic in China: a web-based cross-sectional survey. medRxiv. 2020:2020.02.19.20025395.

14. Faasse K, Newby JM. Public perceptions of COVID-19 in Australia: perceived risk, knowledge, health-protective behaviours, and vaccine intentions. medRxiv. 2020.04.25.20079996.

15. Blakey SM, Abramowitz JS. Psychological Predictors of Health Anxiety in Response to the Zika Virus. J Clin Psychol Med Settings. 2017;24(3-4):270-8.

16. Wheaton MG, Abramowitz JS, Berman NC, Fabricant LE, Olatunji BO. Psychological predictors of anxiety in response to the H1N1 (swine flu) pandemic. Cognitive Therapy and Research. 2012;36(3):210-8.

17. Asmundson GJG, Taylor S. Coronaphobia: Fear and the 2019-nCoV outbreak. Journal of anxiety disorders. 2020;70:102196.

18. Asmundson GJG, Taylor S. How health anxiety influences responses to viral outbreaks like COVID-19: What all decision-makers, health authorities, and health care professionals need to know. Journal of anxiety disorders. 2020;71:102211.

19. Beutel ME, Klein EM, Brähler E, Reiner I, Jünger C, Michal M, et al. Loneliness in the general population: prevalence, determinants and relations to mental health. BMC Psychiatry. 2017;17(1):97.

20. Cacioppo JT, Hughes ME, Waite LJ, Hawkley LC, Thisted RA. Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. Psychology and aging. 2006;21(1):140-51.

21. Glonti K, Gordeev VS, Goryakin Y, Reeves A, Stuckler D, McKee M, et al. A systematic review on health resilience to economic crises. PloS one. 2015;10(4):e0123117.

22. Lovibond SH, Lovibond PF. Manual for the Depression Anxiety Stress Scales. 2nd ed. Sydney: Psychology Foundation; 1995.

23. Asmundson GJR, Carleton NR, Bovell CV, Taylor S. Comparison of unitary and multidimensional models of the Whiteley Index in a nonclinical sample: implications for understanding and assessing health anxiety. Journal of Cognitive Psychotherapy. 2008;22(2):87-96.

24. Burns GL, Keortge SG, Formea GM, Sternberger LG. Revision of the Padua Inventory of obsessive compulsive disorder symptoms: Distinctions between worry, obsessions, and compulsions. Behaviour Research and Therapy. 1996;34(2):163-73.

25. Bults M, Beaujean DJ, de Zwart O, Kok G, van Empelen P, van Steenbergen JE, et al. Perceived risk, anxiety, and behavioural responses of the general public during the early phase of the Influenza A (H1N1) pandemic in the Netherlands: results of three consecutive online surveys. BMC public health. 2011;11:2.

26. Bults M, Beaujean DJ, Richardus JH, Voeten HA. Perceptions and behavioral responses of the general public during the 2009 influenza A (H1N1) pandemic: a systematic review. Disaster medicine and public health preparedness. 2015;9(2):207-19.

27. Greenwood JLJ, Joy EA, Stanford J. The physical activity vital sign: a primary care tool to guide counseling for obesity. Journal of Physical Activity and Health. 2010;7(5):571-6.

28. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Archives of Internal Medicine. 1998;158(16):1789-95.

29. Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a brief screen for alcohol misuse in primary care. Alcoholism, clinical and experimental research. 2007;31(7):1208-17.

30. Barr B, Taylor-Robinson D, Scott-Samuel A, McKee M, Stuckler D. Suicides associated with the 2008-10 economic recession in England: time trend analysis. BMJ : British Medical Journal. 2012;345:e5142.

31. Crawford JR, Henry JD. The Depression Anxiety Stress Scales (DASS): normative data and latent structure in a large non-clinical sample. The British journal of clinical psychology. 2003;42(Pt 2):111-31.

32. Australian Bureau of Statistics. National Health Survey: First Results, 2014-15. Canberra; 2014.

33. Andrews G, Basu A, Cuijpers P, Craske MG, McEvoy P, English CL, et al. Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: An updated meta-analysis. Journal of anxiety disorders. 2018;55:70-8.

34. Wind TR, Rijkeboer M, Andersson G, Riper H. The COVID-19 pandemic: The 'black swan' for mental health care and a turning point for e-health. Internet interventions. 2020;20:100317-.

35. Sunderland M, Newby JM, Andrews G. Health anxiety in Australia: prevalence, comorbidity, disability and service use. Br J Psychiatry. 2013;202(1):56-61.

36. Tyrer P, Cooper S, Crawford M, Dupont S, Green J, Murphy D, et al. Prevalence of health anxiety problems in medical clinics. Journal of Psychosomatic Research. 2011;71(6):392-4.

37. American Psychiatric A. Diagnostic and statistical manual of mental disorders : DSM-5. Arlington, VA: American Psychiatric Association; 2013.

38. Newby JM, Smith J, Uppal S, Mason E, Mahoney AEJ, Andrews G. Internet-based cognitive behavioral therapy versus psychoeducation control for illness anxiety disorder and somatic symptom disorder: A randomized controlled trial. US: American Psychological Association; 2018. p. 89-98.

39. Hedman E, Axelsson E, Andersson E, Lekander M, Ljotsson B. Exposure-based cognitive-behavioural therapy via the internet and as bibliotherapy for somatic symptom disorder and illness anxiety disorder: randomised controlled trial. The British journal of psychiatry : the journal of mental science. 2016;209(5):407-13.

40. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020;323(13):1239-42.

41. Leung GM, Lam TH, Ho LM, Ho SY, Chan BH, Wong IO, et al. The impact of community psychological responses on outbreak control for severe acute respiratory syndrome in Hong Kong. Journal of epidemiology and community health. 2003;57(11):857-63.

42. Hobden B, Bryant J, Sanson-Fisher R, Oldmeadow C, Carey M. Do rates of depression vary by level of alcohol misuse in Australian general practice? %J Australian Journal of Primary Health. 2017;23(3):263-7.

43. Delaney KE, Lee AK, Lapham GT, Rubinsky AD, Chavez LJ, Bradley KA. Inconsistencies between alcohol screening results based on AUDIT-C scores and reported drinking on the AUDIT-C questions: prevalence in two US national samples. Addiction Science & Clinical Practice. 2014;9(1):2.

44. Moldofsky H, Patcai J. Chronic widespread musculoskeletal pain, fatigue, depression and disordered sleep in chronic post-SARS syndrome; a case-controlled study. BMC neurology. 2011;11:37.

Figure 1

Click here to download Figure Plos One Figure 1 .tiff

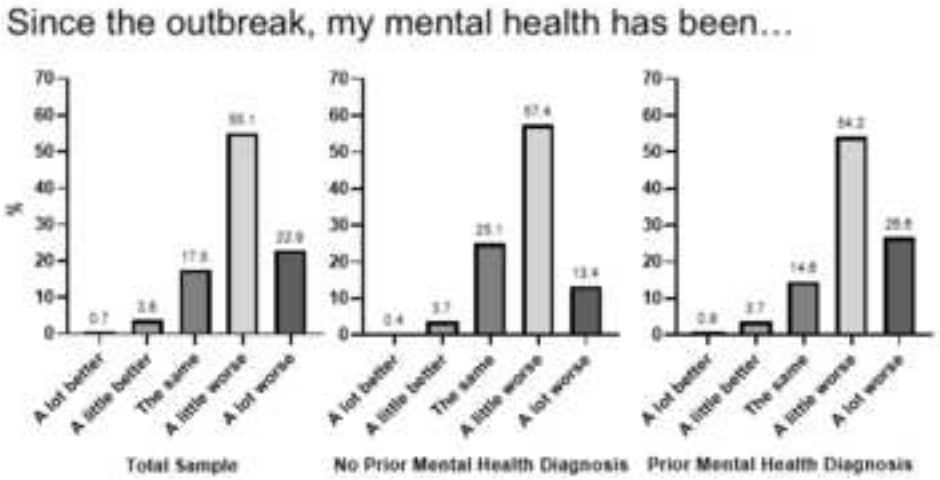

Figure 2

Click here to download Figure Plos One Figure 2.tiff