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Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications in Australia

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Abstract

Objective: To examine SARS-CoV-2 vaccine confidence, attitudes and intentions in Australian adults.

Methods: Nationwide survey in February-March 2021 of adults representative across sex, age and location. Vaccine uptake and a range of putative drivers of uptake, including vaccine confidence, socioeconomic status, and sources of trust, were examined using logistic and Bayesian regressions for vaccines generally and for SARS-CoV-2 vaccines.

Results: Overall 1,166 surveys were collected from participants aged 18-90 years (mean 52, SD of 19). Seventy-eight percent reported being likely to receive a vaccine against COVID-19. Higher SARS-CoV-2 vaccine intentions were associated with: increasing age (OR: 1.04 95%CI [1.03-1.044]), being male (OR: 1.37, 95% CI [1.08 – 1.72]), residing in the least disadvantaged area quintile (OR: 2.27 95%CI [1.53 – 3.37]) and a self-perceived high risk of getting COVID-19 (OR: 1.52 95% CI [1.08 – 2.14]). However, 72% of participants did not believe that they were at a high risk of getting COVID-19. Findings regarding vaccines in general were similar except there were no sex differences. For both the SARS-CoV-2 vaccine and vaccines in general, there were no differences in intentions to vaccinate as a function of education level, perceived income level, and rurality. Knowing that the vaccine is safe and effective, and that getting vaccinated will protect others, trusting the company that made it and getting vaccination recommended by a doctor were reported to influence a large proportion of the study cohort to uptake the SARS-CoV-2 vaccine. Seventy-eight percent reported the intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post-vaccine.

Conclusions: Seventy-eight percent of Australians are likely to receive a SARS-CoV-2 vaccine. Key influencing factors identified in this study (e.g. knowing that the vaccine is safe and effective, getting a doctor's recommendation to get vaccinated) can be used to inform public health messaging to enhance vaccination rates.

Keywords: COVID-19, Infection control, Public Health, Preventive Medicine, Respiratory infections

Strengths and limitations of this study

- This research captured a large, representative sample of the adult Australian population across age, sex, location, and socioeconomic status.
- We have self-reported Australian uptake intentions and attitudes on general vaccines and COVID-19 vaccine, and intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post SARS-CoV-2 vaccine.
- We examine a range of drivers and factors that may influence intent to get the SARS-CoV-2 vaccine uptake, including vaccine confidence, demographics and socioeconomic status.
- The survey is based on established behavioural theories, and is the Australian arm of the international iCARE survey which to date has collected global comparative information from over 90,000 respondents in 140 countries.
- Our survey was only available in English, which may have led to an underrepresentation of ethnic groups, and participation was voluntary, so our sample may be prone to selection bias from those with more interest or engagement in COVID-19.

Introduction

The SARS-CoV-2 (COVID-19) pandemic has resulted in an estimated 211 million cases and 4.43 million deaths worldwide, including 44,028 cases and 981 deaths in Australia (1), as of August 2021. The R0 value has increased from 2-3 for the original Wuhan SARS-CoV-2 virus to 5-6 for the Delta variant of the SARS-CoV-2 virus currently dominating the world (2). Whilst vaccinated individuals can be infected with and transmit SARS-CoV-2, the vaccines reduce the likelihood for serious illness and subsequent hospitalisation and death by greater than 80% and 85% (3). Therefore, vaccinated populations are pivoting from the prevention of SARS-CoV-2 infections to instead accepting that the virus is endemic with the aim to minimise serious illness, hospitalisation, and death (4, 5)

Minimising serious illness, hospitalisations, and deaths will require high vaccination rates for SARS-CoV-2, and ongoing preventative health behaviours such as physical distancing and wearing face masks (6) to protect the unvaccinated (e.g. young children) and those in which the vaccine is less effective such as the immunocompromised.(7) It is now clear that combined behavioural strategies and vaccination (including boosters), are the pathway out of perpetual strict population level restrictions, which in Australia have included limiting gatherings, restricting education and work attendance, stay at home orders and closing both state and international borders (8, 9). Although these restrictions have been effective at reducing COVID-19 transmission and have prevented large numbers of deaths to date (10, 11), they come with serious economic, social and mental health costs that are unacceptable in the long term (8).

Australia is a country with a strong public health record, backed by high vaccination rates, high socioeconomic status, low population density and a universal free health care system. (12) These factors, alongside the strict policies including lockdowns, and Australia being an island nation, making it easier to secure borders, had contributed to Australia largely controlling the pandemic

prior to the emergence of the Delta variant.(12) However, having a low SARS-CoV-2 vaccination rate, due to public concerns over the safety of the Astra Zeneca vaccine and a lack of supply of the mRNA vaccines, Australia has been susceptible to recent delta variant outbreaks.

Vaccine uptake is critical to the long-term management of the COVID-19 pandemic. To date, over 11% of the world's population have received at least one dose of a SARS-CoV-2 vaccine (3). Vaccine supply and uptake needs to be accelerated globally to enhance protection against COVID-19.(13) Vaccine hesitancy and vaccine confidence are key determinants of vaccine uptake, and it is vital to understand factors associated with hesitancy. Vaccine confidence refers to the trust in the vaccines, the providers who administer it, and the science, processes, and policies behind it (14). Vaccine hesitancy is the sense of uncertainty in vaccines for a particular belief or reason.(14, 15) Vaccine hesitancy and reduced confidence may result in the refusal of, or delay in the acceptance of, a vaccination (16). Both vaccine hesitancy and confidence are complex and can be influenced by many determinants, (16) broadly grouped into three categories: 1) Contextual socio-politico-cultural factors, e.g., compatibility of vaccination with religious beliefs; 2) Individual and group influences, e.g., personal perception of the vaccine, or influences from the social and peer environment; and 3) Vaccine specific factors, e.g., issues directly related to the vaccine or vaccination such as the accelerated development of vaccines for SARS-CoV-2 may increase safety concerns in the population (8). Existing work on population intentions around the SARS-CoV-2 vaccines is emerging globally. A French study conducted early in the pandemic (March 2020) found that 26% of participants would not accept to receive a SARS-CoV-2 vaccine if it became available. (17) This was more prevalent amongst those in lower-income categories, young women and those older than 75 years of age. In the UK, 14% of participants in a study were unwilling to receive a vaccine, with 23% being unsure. (6) Similar to the French study, females and those from lower-income groups, reported being less likely to have a SARS-CoV-2 vaccine if available. (6)

The vaccine confidence index (VCI) consist of four questions to understand a person's perceptions about if vaccines are safe, important, effective, and/or compatible with religious beliefs. (18). The VCI was developed following the identification of key drivers which influence the public's confidence in vaccines. (14) Data has suggested approximately 1-in-5 Australians were hesitant regarding SARS-CoV-2 vaccines in the early stages of the COVID-19 pandemic in March/April 2020: with 14% to 24% respondents being unsure or unwilling to get a vaccine if available (19, 20).

This study identifies characteristics of Australians who intend or did not intend to get the vaccine in March 2021. Australia offers a unique case study to gain insights and inform mitigation strategies which could be applied globally. As attitudes towards the SARS-CoV-2 vaccine may vary over time, this new information will be able to inform current public health campaigns and policy (20, 21) and assist with effectively targeting those who currently have lower vaccine intentions. Hence here we aim to characterise the beliefs, intentions, and hesitancy of Australians towards vaccines generally (importance, safety and efficacy), and to SARS- CoV-2 specifically, to inform strategies to address this and increase uptake.

Methods

This project is part of the Australian arm of the International COVID-19 Awareness and Responses Evaluation (iCARE) study, which is investigating people's understanding, attitudes, beliefs, and actions towards the COVID-19 pandemic. (22) The Montreal Behavioural Medicine Centre, the lead institution, (23) has REB approval from the Comité d'éthique de la recherche du CIUSSS-NIM (Centre intégré universitaire de santé et de services sociaux du Nord-de-l'île-de-Montréal), approval#: 2020-2099/25-03-2020. This paper reports the analysis of the new vaccination questions asked in the third round of the Australian longitudinal survey (24); which comprised a national representative sample. The third round included new questions on attitudes towards the COVID-19 vaccination and intention to vaccinate against COVID-19 in Australia, therefore longitudinal comparison with earlier rounds (24) is not possible. Here we report the nationally representative cross-sectional analysis of respondents in this third survey conducted in early 2021. This project was approved by the Monash University Human Research Ethics Committee (#ID: 24449).

Sampling

Survey respondents were recruited by an online sampling provider that sent out invitations between February 14th and March 7th, 2021. By this time, Australia had recorded 28,947 COVID-19 cases with . variable virus impacts and policy approaches across states and a lack of national coordination. At a state level, Western Australia was lifting a lockdown (February 5th, 2021) and Victoria had entered a "circuit breaker," 5-day lockdown having had more than 100 days in lockdown in 2020 (February 12th, 2012). The first public COVID-19 vaccinations were available on the 21st of February, 2021. Electronic survey invitations were emailed to approximately 12,000 adults having a residential address in Australia, and briefly described the survey content, estimated survey duration, and a link to the online survey. The first page of the survey described the study, its purpose, and advised readers that continuing to the next page would be an indicator of consent to participate in the study. All participants who completed the online survey were reimbursed by ISO 26362 as per industry

requirements. Representative sampling for key demographics of the Australian population was done using quota sampling for age, sex, and residential location (state/territory and remoteness area).

Patient and public involvement

As part of the main iCARE study, there are several community collaborators who provide continual input into the development of the survey design, ensuring that the items are relevant and appropriately worded. For Australia, the survey was reviewed by the Monash Partners Consumer and Carer group and involved two members paid for their time to identify text that wasn't clear or irrelevant to Australia, and recommend alternative wording and areas to clarify. Other community members and contacts of the researchers provided input into the timing to complete the survey, and subsequently this feedback resulted in the survey being shortened to reduce participant burden.

Analysis Plan

Participant demographic data included residential postcode, which were mapped to the Australian Bureau of Statistics remoteness areas and socioeconomic index for areas (SEIFA). (25) Specifically, the index of relative socioeconomic disadvantage (IRSD) was applied and divided into five quintiles, from 1 (most disadvantaged) to 5 (most advantaged). Ethnicity information provided by participants was used to make two groupings of "Australian/New Zealand/UK" and everyone else.

Descriptive statistics reported the participant demographics and attitudes for a series of vaccine-related questions including the VCI. (14, 18).

To characterise the beliefs, intentions and hesitancy of Australians towards vaccines generally and SARS- CoV -2 vaccines specifically, a series of univariate logistic regressions were done with dichotomous outcomes. Responses were dichotomised using the most extreme positive response e.g. "Always" vs other. To examine robustness, regressions were repeated by re-dichotomising outcomes to include the two most extreme responses instead of one. Unlike in similar analyses (18), our outcomes could not be examined using ordinal logistic regression because of low numbers in some response categories.

Possible predictors examined in the logistic regressions, included age, sex, essential worker status, belief that a participant is at high risk, residential area, flu vaccination status, education level, ethnicity, perceived income level, and IRSD quintile. Ethnicity data was missing for n=431 participants, therefore, these results were exploratory only. Responses to the VCI questions were also examined. All results are displayed as odds ratios, with 95% confidence intervals. Sensitivity analyses involved Bayesian logistic regression to enabled global comparisons with a recent Lancet publication. (18) and were conducted on the same outcome variables as in the logistic regressions. Normal priors (0,1) were set for each regression parameter and used 5,000 burn-in steps and 50,000 sampling iterations. Statistical analyses used STATA SE/v16. Significance level was set as <0.05.

Results

There were 1166 survey respondents reported in this cross-sectional analysis. Response rate was approximately 10% for new participants and 60% for those in the longitudinal arm (24). Ages ranged from 18-90 years with a mean of 51.7 years (table 1), similar to the Australian population, apart from an overly represented group of participants aged 70 years or more. Sampling ensured a reasonable representativeness across sex, rurality and the three largest states (New South Wales, Victoria and Queensland). Education levels were similar to the Australian population. Less than half of participants (45%) were in full-or part-time work, lower than national statistics reported for the same time period (63%), and likely due to the overly represented 70+ age group. Fifteen percent reported being essential workers, with 7% healthcare workers. There was minimal missing data (table 1), except for ethnicity, with 50% respondents identifying as Australian/UK/NZ (n=580), 13% as other (n= 155) but 37% were missing (n=431).

Sixty-five percent of participants generally accept routine vaccines for themselves or for their children, with 6% either rarely or never accepting vaccinations (table 2). At the time of this study, only 27 (2%) participants had already received at least one dose of a COVID-19 vaccination. The

majority (78%) reported that they were likely to get the SARS-CoV-2 vaccine (table 2), and fifteen percent of all participants were either unlikely or very unlikely to get the SARS-CoV-2 vaccine. Seventy-two percent of our study cohort did not believe that there were at a high risk of being infected with COVID-19.

The VCI questions showed most Australians (>60%) strongly agreed on the safety, importance, and effectiveness of general vaccines (figure 1). Fifty-seven percent strongly agreed that general vaccines are compatible with their religious beliefs (figure 1). Approximately ten percent of participants did not know whether vaccines are safe or effective. (figure 1)

Predictors for vaccine uptake

Determinants that were similar for both general (Table 3) and SARS-CoV-2 vaccine uptake intention (Table 4) included:

Higher likelihood of vaccine uptake was significantly associated with:

- Increasing age with Odds Ratio (OR) = 1.6 (95% Confidence Interval: 1.4-1.8) and 2.0 (95% CI: 1.8-2.3) for general and SARS-CoV-2 vaccine respectively; residing in the least disadvantaged areas SES quintile (OR = 2.1 (95% CI: 1.4-3.2) and 2.7 (95% CI: 1.5-3.4) for general and SARS-CoV-2 vaccines).
- Identifying as Australian/NZ/UK with an OR = 2.3 (95% CI: 1.6 - 3.3) and 1.9 (95% CI: 1.3 – 2.7) for general and SARS-CoV-2 vaccines; however, as noted there was much missing data for the ethnicity variable, therefore this result is considered exploratory only.
- Strong agreement with the VCI questions. For example, strong agreement with the statement “Vaccines are effective” had an OR = 14.6 (95% CI: 10.9 – 19.5) for general vaccine and 14.0 (95% CI: 10.4 – 18.9) for SARS-CoV-2 vaccine.

Lower likelihood of vaccine uptake was significantly associated with:

- Being a healthcare worker: With an OR of 0.5 (95%CI: 0.3 – 0.8) and 0.5 (95%CI: 0.3 – 0.8), for general and SARS-CoV-2 vaccines, respectively. However, this is exploratory only due to the small sample of healthcare workers and inability to delineate what worker type (e.g. allied health, medical, social worker, etc.)

There were no significant findings for educational level, perceived income or residential rurality.

Differences between the general vaccines and the new COVID vaccines:

- There were no differences between the sexes for the likelihood of general vaccine uptake, whilst SARS-CoV-2 vaccine intention to uptake was significantly higher for men compared to women with OR of 1.37(95% CI: 1.08 – 1.72).

Factors that might influence decisions to get the SARS-CoV-2 vaccine:

Having information that the SARS-CoV-2 vaccine is safe (85%), effective (85%), will help protect people around the participant (80%), and trusting the company who developed the vaccine (78%) were reported to influence the participants somewhat or to a great extent to get vaccinated (Table 5). A doctor's recommendation (72%) and convenience factors (72%) were also positive predictor variables for vaccine uptake. Other positive predictors include believing that the participant was at high risk of getting COVID-19 or suffering from severe complications (69%), increasing civil liberties (68%), and seeing others get vaccinated (66%).

Sensitivity analyses:

Bayesian regression analyses produced very similar results to initial logistic regression analyses. The regressions repeated with re-dichotomising outcomes to include the two most extreme responses instead of one, showed similar findings (supplementary table).

Discussion

We examined the beliefs, intentions, and hesitancy of 1166 Australians towards vaccines in general and to the SARS-CoV-2 vaccine in a large, nationally representative cross-sectional analysis of a surveys in early 2021. Seventy-eight percent of all participants reported being likely to get the SARS-CoV-2 vaccine when it became available to them. Rates of both general vaccine uptake and SARS-CoV-2 vaccine uptake increased with age, believing that vaccines are safe and effective, and residing in the least disadvantaged socioeconomic region. Being male was associated with higher intentions to get the SARS-CoV-2 vaccine but had no statistically significant difference to general vaccine intention compared to females. There were no statistically significant differences in education level, perceived income level or rurality and rates of either general or SARS-CoV-2 vaccine acceptance. Strong influencing factors reported to convince people to uptake the SARS-CoV-2 vaccine were; knowing that the SARS-CoV-2 vaccine is safe and effective; trusting the vaccine producers; knowing it will help protect people close to them; recommendations from doctors to get vaccinated; and convenience getting the vaccine.

The following factors were identified as having more of an influence on vaccination rates, and hence could be inform public health policies and messaging to enhance vaccination rates. Having knowledge that the SARS-CoV-2 vaccine is safe and effective will encourage a large proportion of the study cohort to get vaccinated. These two factors are encompassed in the VCI and were recently examined in a large international study. (18) Together, they are likely to play the largest role in the uptake of the SARS-CoV-2 vaccine. Responsible, accurate reporting of the balance of risks and benefits in the media and social media is likely important to build trust in the vaccines and the companies that manufacture them.(26) Since trust in the vaccine companies is identified as a strong influencing factor in encouraging vaccination, this needs to be reaffirmed by focusing on the stringent regulatory processes the companies must adhere to, which can be conveyed in consistent and transparent public health messaging. Participants also indicated that knowing that the SARS-CoV-2 vaccine would protect those around them, was a significant factor influencing intention to

vaccinate. Whilst those who are vaccinated can still transmit SARS-CoV2, transmission is decreased meaning family and friends are more protected, (27) which appeals to pro-social or altruistic attitudes, known to effectively increase vaccination rates.(28) Another key driver of vaccine uptake likelihood in our study was getting a recommendation from a doctor, aligned with previous immunisation programs, including in the H1N1 pandemic, and should be encouraged with the SARS-CoV-2 vaccine. (21) Medical professionals will benefit from consistent updated access to accurate information on the SARS-CoV-2 vaccine, countering non evidence based anti-vaccination messages, outlining benefits and risks, interpreting evidence as it emerges and personalising it to the individuals who seek care. (21, 29)

Convenience factors such as time needed or travel requirements to get vaccinated have also been identified as a strong influencing factor. This could translate to greater numbers of local vaccination sites in Australia, alongside the rollout of mass vaccination hubs, and of vaccinations to GP clinics, pharmacies, schools, and workplaces, already shown to increase the rate of other vaccinations including the annual influenza vaccine. (30) Here 68% of participants noted intention to get vaccinated if it offered them increased civil liberties, such as going to concerts or sporting events.

When choosing to get vaccinated, the perceived likelihood of infection, the prevalence and severity of the relevant disease are key in the decision making process. (31) In early 2021 in our study, 72% of all participants did not believe that they were at a high risk of getting COVID-19, likely reflecting the low numbers of infections, hospitalisations and deaths in Australia at that time. (32) Misinformation in the media also equated COVID-19 severity to that of the seasonal flu (33). These factors are likely to have presented obstacles to initial vaccination uptake in Australia, with participants perceived a higher risk of getting COVID-19 reporting 50% higher likelihood of getting vaccinated. Previous research on the SARS-CoV-2 vaccine, as well as vaccination research during the 2009 H1N1 pandemic echo our results. (29, 34). Leveraging anticipated regret, shown to be one of the strongest predictors

for vaccine intention, could also be further explored to enhance SARS-CoV-2 vaccination rates. (29, 35) Consistent with other early surveys (36), we noted that men report the most willingness to receive a SARS-CoV-2 vaccine, however, this intention may not translate to gender differences in vaccination uptake (37).

Exploratory findings based on a small sample, suggested that healthcare workers and those not identifying themselves being from Australia/NZ/UK were less likely to accept both general and the SARS-CoV-2 vaccines. Considering the influence that healthcare workers have on the general population, their high exposure rates this presents a barrier to both effective vaccine uptake and to infection rates control. A 2021 review found an average of 23% (range: 4% to 72%) of healthcare workers reported vaccine hesitancy. The review also found that being male, older and a doctor were associated with higher rates of SARS-CoV-2 vaccine acceptance in healthcare workers. (38) The current study did not delineate between types of healthcare workers (e.g. doctors, nurses, allied health). Given pending policies around mandatory healthcare worker vaccination, the knowledge, attitudes and beliefs driving this behaviour needs further exploration. Additionally, our findings identified a higher rate of vaccine hesitancy in people who did not identify their ethnicity as Australian/New Zealanders or UK groups, consistent with past research in this and other vaccines. (29) However, the findings for both these high-risk groups need to be interpreted with caution due to the small sample size. Better data here could aid in further targeting policy-based communications and interventions.

Public health authorities need to provide transparent, easy to interpret information on the SARS-CoV-2 vaccines to the general population, as highlighted by Eastwood et al during the H1N1 pandemic. (39) This will aid in alleviating the confusion which may stem from misinformation present in the media and online networks. Furthermore, we echo the suggestions made in Seale et al., which includes tailoring messages and engaging community leaders in disseminating information

about vaccines in culturally and linguistically diverse groups, with the known influence of social groups and community leaders of similar backgrounds. (40) For healthcare workers, engagement and education is important, given the important role they play in modelling health-promoting behaviour for the general public (37). Mandatory influenza vaccination is already in place for many healthcare workers in Australia, and mandatory SARS-CoV2 vaccination has been introduced for aged care workers and some jurisdictional healthcare workers with likelihood of scale up. (38). Finally, healthcare workers beliefs and attitudes to the SARS-CoV2 vaccine may reflect similar concerns to their broader community as seen in the UK with hesitancy being more frequent in non-white British healthcare workers, female sex, and younger age (41).

The strengths of our study include a large, generally representative sample across Australia and evidence based approaches including the vaccine confidence index. Limitations to our study include that this the survey was only available in English, which is likely to have reduced representation of ethnic groups. Internet access was required, which may account for the increased representation of those in the least disadvantaged quintile. Furthermore, since we rely on self-reported behaviour, there is the risk of a social desirability bias, with participants potentially over-reporting socially desirable traits in their responses and the voluntary nature of the survey makes it prone to a selection bias. (9, 42)

There is a paucity of studies on what influences people to consider taking the vaccine in Australia in 2021, where access to the SARS-CoV-2 vaccines is increasing, but still limited by age and occupation at the time of the survey. Since this survey, the rapid emergence of the highly transmissibility Delta variant, the major challenges of large scale, extended lockdowns escalating the imperative for rapid vaccination, and highlighting the importance of work in this field. Behavioural research such as the iCARE study can inform policymakers in understanding the public's knowledge, attitudes,

perceptions and beliefs towards the SARS-CoV-2 vaccine, which in turn drive their behaviours including vaccination and can aid with targeting public health messages. (21)

Conclusion:

Given the worldwide morbidity, hospitalisation, and death from COVID-19, the established safety and effectiveness of widely tested vaccines to prevent these complications, and the imperative to accelerate vaccination globally including in Australia, the results of this study on vaccine hesitancy are important. Here we show that vaccine safety, effectiveness, trust in the companies, and recommendations from doctors are important determinants of vaccine intentions. Further work to understand vaccine hesitancy in identified target groups including culturally and linguistically diverse groups and healthcare workers are important moving forward to support equity in vaccine uptake. This work can directly inform strategies to optimise communication and SARS-CoV-2 vaccine uptake, especially in Australia, now vital as the Delta variant takes a grip on the country.

Contributorship statement

SB and KL led study conceptualisation. JE and JG were responsible for the statistical analyses. JG and JE wrote the first draft of the paper. JB and HT are the senior authors and guarantors. All authors contributed to the development of the research question, study design in relation to the Australian data analysis, interpretation of the results, critical revision of the manuscript for important intellectual content, and approved the final version of the manuscript. JB attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Competing interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Data sharing statement

Data can be made available to approved researchers by contacting the corresponding author.

Ethics Approval Statement

The studies involving human participants were reviewed and approved by Monash University Human Research Ethics Committee (MUHREC Project ID: 24449). The patients/participants provided their written informed consent to participate in this study.

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Tables and Figures

Figure Legend (Figure in separate 'image' file designation)

Figure 1: Vaccine Confidence Index: Responses to the questions about if general vaccines are safe, important, effective, and compatible with your religious beliefs.

Table 1: Participant demographics (n = 1166).

	Australian Population (%)	Sample N (%) 1158
Age (mean, SD)	39	51.7, 19.3
Age (median, IQR)	38	53, 37.5
Age Breakdown[1]		
18-29	19	214 (18)
30-39	19	175 (15)
40-49	17	142 (12)
50-59	16	148 (13)
60-69	14	143 (12)
70+	15	336 (29)
Sex[1]		
Males	50	583 (50)
Females	50	572 (49)
Others/Prefers not to answer	0	8 (0.7)
Area of residence[2]		
Urban/City/Suburban/Regional	90	979 (87)
Rural/Country	10	142 (13)
I don't know/prefer not to answer	-	5 (0.4)
Location by state/territory		
New South Wales	32	254 (22)
Victoria	26	561 (48)
Queensland	20	163 (14)
South Australia	7	76 (7)
Western Australia	10	82 (7)
Tasmania	2	14 (1.2)
Australian Capital Territory	2	9 (1)
Northern Territory	1	6 (1)
Missing	-	1 (0)
Highest Education level attained[3]		
Graduate/Postgraduate/University degree	52	432 (47)
TAFE/Secondary or High School	45	560 (50)
Primary school or less	3	12 (1)
I don't know/prefer not to answer	-	19 (2)
Essential worker		175 (15)
Healthcare workers	13 (including social assistance)	80 (7)
IRSD quintile		
Quintile 1 – most disadvantaged	20	145 (12)
Quintile 2	20	198 (17)
Quintile 3	20	235 (20)
Quintile 4	20	238 (20)
Quintile 5 – least disadvantaged	20	345 (30)

Ethnicity[4]		
Australian/New Zealand/UK	73	580 (50)
Other	27	155 (13)
Missing	-	431 (37)

Where applicable, variable categories have been collapsed to allow for concordance with national data published by the Australian Bureau of Statistics (ABS):
1: Australian population breakdowns by age, sex, and state of residence are obtained from the Australian Bureau of Statistics (ABS). Age is presented in 10-year bands, and the first band that is comparable to the current study is 20-29 years. The proportion of Australians by age is calculated as the proportion of those 20 or over.
2: https://www.abs.gov.au/statistics/people/population/regional-population/2019-20
3: The Australian survey data present a combined the graduate/postgraduate or university degree category, and a combined TAFE and high school category: https://www.abs.gov.au/statistics/people/education/education-and-work-australia/latest-release#data-download
4: National estimates for ethnicity were obtained by assessing the "country of birth" data provided by the ABS 2016 Census. Whereas the survey 'ethnicity' variable was created using survey responses to the ethnicity item.

Table 2: Uptake intentions and attitudes on general vaccines and COVID-19 vaccine, and intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post COVID-19 vaccine.

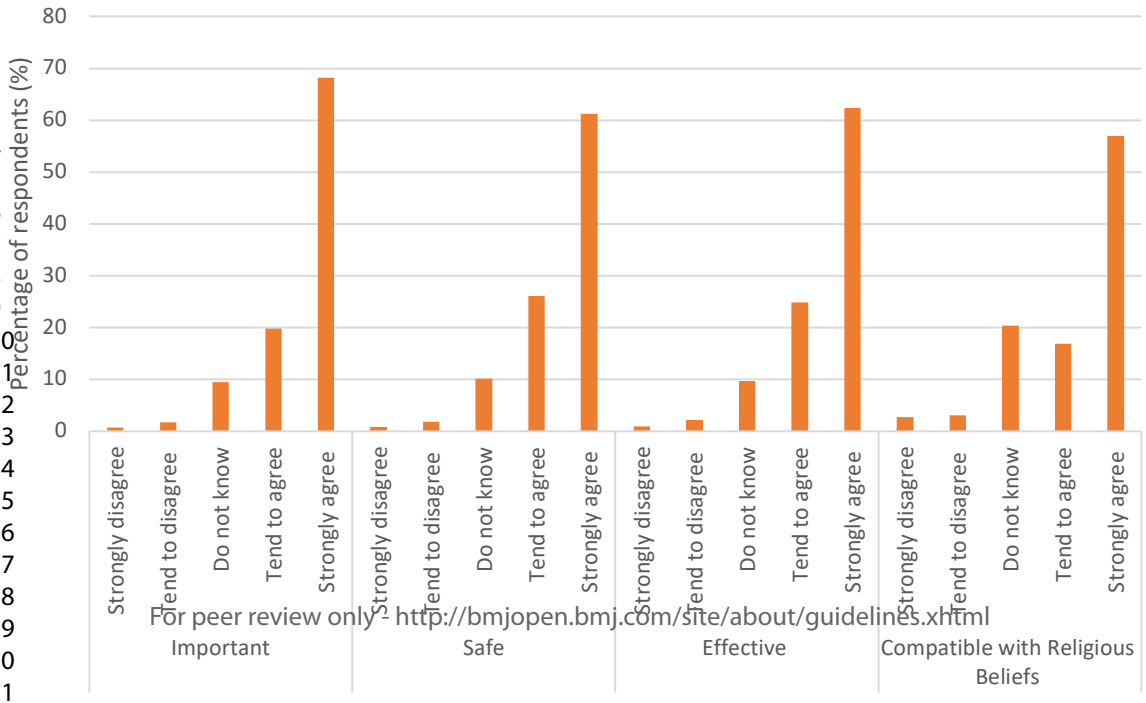
	N (%)
Had already received at least 1 dose of COVID-19 vaccine	27 (2)
Likelihood of getting COVID-19 vaccine if it were available today	
Extremely likely	597 (53)
Somewhat likely	283 (25)
Unlikely	88 (8)
Very unlikely	83 (7)
I don't know/prefer not to answer	80 (7)
Generally accept vaccines for yourself or for your children	
Always	736 (65)
Mostly	232 (21)
Sometimes	100 (9)
Rarely	41 (4)
Never	21 (2)
Intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post vaccine	
Most of the time	526 (47)
Some of the time	343 (31)
Seldom	94 (8)
Never	54 (5)
I don't know/prefer not to answer	95 (9)
Seasonal flu vaccine over the last 5 years	
Every year	511 (46)
3-4 years	163 (15)
1-2 years	202 (18)
Never	218 (19)
I don't know/prefer not to answer	27 (2)

*Table 3: Vaccine uptake determinants: Univariate regression analyses with possible predictors that influence general vaccine uptake (left columns) and SARS-CoV-2 vaccine uptake(right columns) . *Age variable is scaled to have a mean of 0 and unit standard deviation.**Ethnicity data was missing for n=431, therefore results for this variable are exploratory only.*

	Do you generally accept vaccines for yourself or for your children?				**If a vaccine for COVID-19 were available today, what is the likelihood that you would get vaccinated?**			
	Outcome: "Always" vs not				**Outcome: Extremely likely v. Not**			
	OR	**95% confidence interval**		**P**	**OR**	**95% confidence interval**		**p**
Vaccines confidence (strongly agree v not strongly agree)								
Vaccines are important	10.6	8.00	14.09	<0.001	6.73	5.09	8.90	<0.001
Vaccines are safe	13.45	10.08	17.94	<0.001	14.67	10.92	19.71	<0.001
Vaccines are effective	14.58	10.90	19.50	<0.001	14.02	10.42	18.86	<0.001
Age (Continuous) *	1.59	1.40	1.80	<0.001	2.01	1.77	2.27	<0.001
Sex								
Females	(Ref)	-	-	-	-	-	-	-
Males	0.93	0.73	1.18	0.543	1.37	1.08	1.72	0.008
Essential Worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.72	0.52	0.995	0.047	0.65	0.47	0.90	0.009
Healthcare Worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.51	0.32	0.80	0.004	0.53	0.33	0.84	0.007
Residential Area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	0.89	0.60	1.31	0.551	1.12	0.78	1.62	0.528
Urban/City	0.85	0.56	1.28	0.425	1.30	0.88	1.92	0.187
Major States								
Others	(Ref)	-	-	-	-	-	-	-
VIC (1)	1.54	1.09	2.17	0.015	2.14	1.53	2.99	<0.001
QLD (2)	0.58	0.38	0.89	0.013	1.01	0.66	1.54	0.965
NSW (3)	0.85	0.58	1.26	0.436	1.13	0.77	1.65	0.529
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	1.28	0.87	1.89	0.209	1.46	0.96	2.22	0.074
Three or Four	2.76	1.81	4.20	<0.001	2.53	1.64	3.89	<0.001
Every year (five times)	10.55	7.25	15.36	<0.001	8.52	5.93	12.23	<0.001
Education level								
Primary school or less	(Ref)	-	-	-	-	-	-	-
Secondary/ High school	1.35	0.40	4.62	0.629	1.46	0.46	4.64	0.521
TAFE	0.83	0.24	2.82	0.766	0.96	0.30	3.04	0.942
University degree	0.82	0.24	2.79	0.753	1.06	0.33	3.35	0.927
Graduate/postgraduate degree	0.84	0.25	2.87	0.782	1.13	0.35	3.59	0.841
Perceived income level (231, 20.55% of participants did not want to answer/did not know)								
Bottom third	(Ref)	-	-	-	-	-	-	-
Middle third	0.86	0.63	1.17	0.324	0.81	0.61	1.09	0.168
Top third	1.24	0.80	1.93	0.329	0.97	0.65	1.46	0.900
IRSD quintile (Area Socioeconomic Level indicator);								
Quintile 1 – most disadvantaged	(Ref)	-	-	-	-	-	-	-
Quintile 2	1.15	0.75	1.77	0.528	1.14	0.74	1.75	0.556
Quintile 3	1.36	0.89	2.07	0.155	1.22	0.80	1.85	0.352
Quintile 4	1.20	0.79	1.82	0.388	1.21	0.80	1.83	0.369
Quintile 5 - least disadvantaged	2.11	1.41	3.15	<0.001	2.27	1.53	3.37	<0.001
Ethnicity								
Other	(Ref)	-	-	-	-	-	-	-
Australian/New Zealand/UK	2.30	1.60	3.31	<0.001	1.90	1.33	2.72	<0.001
Believing that participant is at high risk of COVID-19								
No/don't know/prefer not to answer					(Ref)	-	-	-
Yes					1.52	1.08	2.14	0.016

*Table 4: Factors reported by n=1,081 Australians that may influence intent to get the SARS-CoV-2 vaccine. *Combined 'somewhat' and 'to a great extent' responses. Influencing factors are ranked in descending order, from most likely to influence SARS-CoV-2 vaccine uptake to least likely.*

N (row %)	Combined strongest likelihood *	To a great extent	Somewhat	Very Little	Not at all	I don't know	Total
Having information that the vaccine is safe and unlikely to have any major long- term side effects	921 (85)	661 (61)	260 (24)	78 (7)	50 (5)	32 (3)	1,081
Having information that the vaccine is effective (i.e., provides a high degree of protection	913 (85)	661 (61)	252 (23)	78 (7)	58 (5)	31 (3)	1,080
Knowing that getting vaccinated will help protect others around me	858 (80)	548 (51)	310 (29)	107 (10)	72 (7)	36 (3)	1,073
Trusting the company who developed the vaccine (Pfizer, Moderna, Sinopharm, etc.)	839 (78)	474 (44)	365 (34)	112 (10)	75 (7)	50 (5)	1,076
Receiving the vaccine dose(s) according to the manufacturers' instructions	818 (76)	505 (47)	313 (29)	122 (11)	90 (8)	42 (4)	1,072
Wanting to contribute to high population rates of vaccination to achieve 'herd immunity'	791 (74)	476 (44)	315 (29)	131 (12)	101 (9)	52 (5)	1,075
The convenience of getting the vaccine (e.g., requires little time, no need to travel far)	772 (72)	417 (39)	355 (33)	143 (13)	118 (11)	42 (4)	1,075
Getting a recommendation from my doctor to get vaccinated	774 (72)	438 (41)	336 (31)	163 (15)	97 (9)	37 (3)	1,071
Believing that I am high risk of getting COVID-19 or suffering severe complications	729 (69)	361 (34)	368 (35)	175 (17)	119 (11)	37 (3)	1,060
Learning that being vaccinated would allow me to attend public events (e.g., concerts, sporting events) or travel	734 (68)	422 (39)	312 (29)	179 (17)	121 (11)	39 (4)	1,073
Seeing more and more people getting the vaccine	708 (66)	335 (31)	373 (35)	191 (18)	135 (13)	34 (3)	1,068
Hearing that other people have positive attitudes towards the vaccine	687 (64)	306 (29)	381 (36)	195 (18)	151 (14)	35 (3)	1,068
Only needing one dose of the vaccine to be protected	647 (61)	302 (28)	345 (32)	203 (19)	159 (15)	56 (5)	1,065
Believing that getting vaccinated would reduce my worries and anxiety	635 (60)	273 (26)	362 (34)	225 (21)	156 (15)	43 (4)	1,059
Getting a recommendation from my employer to get vaccinated	386 (52)	158 (21)	228 (31)	163 (22)	147 (20)	44 (6)	740



***Supplementary 1: Vaccine uptake sensitivity analysis**: Univariate regression analyses with possible predictors that influence general vaccine uptake (left columns) and SARS-CoV-2 vaccine uptake(right columns), using "Always/Mostly" and "Extremely/Somewhat likely" answer options. *Age variable is scaled to have a mean of 0 and unit standard deviation.**Ethnicity data was missing for n=431, therefore results for this variable are exploratory only.*

	Do you generally accept vaccines for yourself or for your children?				If a vaccine for COVID-19 were available today, what is the likelihood that you would get vaccinated?			
	Outcome: "Always/Mostly" vs not				Outcome: Extremely/somewhat likely v. not			
	OR	95% confidence interval		P	OR	95% confidence interval		p
Vaccines confidence (strongly agree v not strongly agree)								
Vaccines are important	14.28	9.66	21.09	<0.001	7.01	5.23	9.40	<0.001
Vaccines are safe	26.21	15.44	44.48	<0.001	10.07	7.29	13.92	<0.001
Vaccines are effective	20.30	12.65	32.58	<0.001	9.80	7.13	13.48	<0.001
Age (Continuous) *	1.53	1.31	1.80	<0.001	1.60	1.39	1.84	<0.001
Sex								
Females	(Ref)	-	-	-	-	-	-	-
Males	0.94	0.06	5.73	0.649	1.30	0.99	1.70	0.058
Essential worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.91	0.19	0.93	0.034	0.86	0.59	1.25	0.426
Healthcare worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.67	0.38	1.17	0.155	0.96	0.56	1.64	0.888
Residential Area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	0.95	0.56	1.62	0.844	1.01	0.66	1.55	0.956
Urban/City	0.80	0.45	1.40	0.427	1.41	0.88	2.26	0.151
Major States								
Others	(Ref)	-	-	-	-	-	-	-
VIC (1)	1.45	0.93	2.27	0.100	1.40	0.95	2.05	0.089
QLD (2)	0.68	0.41	1.14	0.140	0.69	0.44	1.10	0.117
NSW (3)	0.90	0.56	1.46	0.672	0.94	0.62	1.45	0.796
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	2.06	1.32	3.21	0.001	2.38	1.58	3.59	<0.001
Three or Four	4.22	2.40	7.43	<0.001	3.10	1.96	4.90	<0.001
Every year (five times)	18.62	10.22	33.93	<0.001	10.26	6.73	15.63	<0.001
Education level								
Primary school or less	(Ref)	-	-	-	-	-	-	-
Secondary/ High school	2.56	0.66	9.96	0.174	1.56	0.41	5.96	0.518
TAFE	1.85	0.48	7.12	0.369	0.99	0.26	3.76	0.989
University degree	1.46	0.38	5.57	0.579	1.04	0.27	3.93	0.957
Graduate/postgraduate degree	2.58	0.66	10.12	0.174	1.31	0.34	5.01	0.698
Perceived income level (231 (20.55%) of participants did not want to answer/did not know)								
Bottom third	(Ref)	-	-	-	-	-	-	-
Middle third	1.30	0.86	1.96	0.210	1.40	0.98	2.00	0.062
Top third	1.64	0.89	3.04	0.116	1.33	0.81	2.19	0.256
IRSD quintile (Area Socioeconomic Level indicator)								
Quintile 1 – most disadvantaged	(Ref)	-	-	-	-	-	-	-
Quintile 2	0.81	0.46	1.42	0.458	1.25	0.78	1.99	0.354
Quintile 3	0.77	0.45	1.33	0.350	1.28	0.82	2.01	0.281
Quintile 4	0.83	0.48	1.43	0.496	1.39	0.88	2.19	0.153
Quintile 5 - least disadvantaged	1.56	0.90	2.70	0.115	2.42	1.55	3.80	<0.001
Ethnicity								
Other	(Ref)	-	-	-	-	-	-	-
Australian/New Zealand/UK	2.79	1.74	4.49	<0.001	1.54	1.02	2.31	0.04
Believing that participant is at high risk of COVID-19								
No/don't know/prefer not to answer					(Ref)	-	-	-
Yes					1.52	0.99	2.33	0.054

***Supplementary 2: Standard vs. Bayesian logistic regression for SARS-CoV-2 vaccine uptake**: Univariate regression analyses with possible predictors that influence SARS-CoV-2 vaccine uptake, showing standard logistic regressions (left column) and Bayesian logistic regressions (right column). *Age variable is scaled to have a mean of 0 and unit standard deviation.*

If a vaccine for COVID-19 were available today, what is the likelihood that you would get vaccinated?								
	Standard logit				Bayesian logit			
	OR	95% confidence interval		P	OR Coef (median)	95% HPD interval		p
Vaccines are important (strongly agree v not strongly agree)	6.73	5.09	8.90	<0.001	6.45 1.85	4.86 1.59	8.35 2.13	Significant- Does not cross 1 or 0
Vaccines are safe (strongly agree v not strongly agree)	14.67	10.92	19.71	<0.001	13.76 2.61	10.07 2.32	18.05 2.90	Significant
Vaccines are effective (strongly agree v not strongly agree)	14.02	10.42	18.86	<0.001	13.00 2.57	9.59 2.29	17.09 2.85	Significant
Age (Continuous)*	2.01	1.77	2.27	<0.001	2.01 0.69	1.76 0.57	2.25 0.82	Significant (does not cross 1 or 0)
Sex (Males v Females)	1.37	1.08	1.72	0.008	1.38 0.32	1.06 0.08	1.70 0.55	Significant (does not cross 1 or 0)
Essential Worker (Yes v No) *Includes healthcare worker too	0.65	0.47	0.90	0.009	0.67 -1.32	0.47 -2.13	0.89 -0.58	Significant
Healthcare worker (Yes v No)	0.53	0.33	0.84	0.007	0.56 -0.60	0.31 -1.08	0.81 -0.15	Significant
Believe that participant is at high risk of COVID-19 (Yes v Not yes (No and I don't know/prefer not to answer))	1.52	1.08	2.14	0.016	1.52 0.41	1.03 0.06	2.05 0.75	Significant
COVID-19 app (extremely likely to get vs. not extremely likely to get)	4.52	3.47	5.90	<0.001	4.47 1.49	3.36 1.23	5.70 1.75	Significant
Residential area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	1.12	0.78	1.62	0.528	1.13 0.10	0.75 -0.24	1.55 0.47	Not significant
Urban/City	1.30	0.88	1.92	0.187	1.31 0.25	0.84 -0.13	1.81 0.63	Not significant
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	1.46	0.96	2.22	0.074	1.36 0.29	0.86 -0.12	1.93 0.68	Not significant
Three or Four	2.53	1.64	3.89	<0.001	2.34 0.83	1.41 0.42	3.30 1.24	Significant
Every year (five times)	8.52	5.93	12.23	<0.001	7.82 2.04	5.25 1.71	10.43 2.38	Significant
IRSD quintile (Socioeconomic status); Quintile 1 (Greater disadvantaged), Quintile 5 (Lack of disadvantage)								
Quintile 1 (greater disadvantage)	(Ref)	-	-	-	-	-	-	-
Quintile 2	1.14	0.74	1.75	0.556	1.13 0.11	0.71 -0.31	1.61 0.50	Not significant
Quintile 3	1.22	0.80	1.85	0.352	1.21 0.17	0.79 -0.22	1.70 0.54	Not significant
Quintile 4	1.21	0.80	1.83	0.369	1.19 0.16	0.76 -0.24	1.67 0.53	Not significant
Quintile 5 (least disadvantage)	2.27	1.53	3.37	<0.001	2.23 0.78	1.47 0.41	3.08 1.15	Significant

***Supplementary 3: Standard vs. Bayesian logistic regression for general vaccine uptake**: Univariate regression analyses with possible predictors that influence general vaccine uptake, showing standard logistic regressions (left column) and Bayesian logistic regressions (right column). *Age variable is scaled to have a mean of 0 and unit standard deviation.*

Do you generally accept vaccines for yourself or for your children?								
	Standard logit				Bayesian logit			
	OR	95% confidence interval		P	OR Coef (median)	95% HPD interval		p
Vaccines are important (strongly agree v not strongly agree)	10.6	8.00	14.09	<0.001	10.17 2.31	7.49 2.04	13.07 2.59	Significant
Vaccines are safe (strongly agree v not strongly agree)	13.45	10.08	17.94	<0.001	12.85 2.54	9.36 2.27	16.56 2.83	Significant
Vaccines are effective (strongly agree v not strongly agree)	14.58	10.90	19.50	<0.001	13.91 2.62	9.93 2.33	17.92 2.91	Significant
Age (Continuous)*	1.59	1.40	1.80	<0.001	1.59 0.46	1.40 0.34	1.79 0.59	Significant
Sex (Males v Females)	0.93	0.73	1.18	0.543	0.94 -0.06	0.72 -0.30	1.18 0.18	Not significant (crosses 1 and 0)
Essential Worker (Yes v No) *Includes healthcare worker too	0.72	0.52	0.995	0.047	0.74 -0.32	0.52 -0.64	0.99 -0.01	Significant
Healthcare worker (Yes v No)	0.51	0.32	0.80	0.004	0.54 -0.64	0.32 -1.08	0.80 -1.18	Significant
Believe that participant is at high risk of COVID-19 (Yes v Not yes (No and I don't know/prefer not to answer))	1.40	0.97	2.01	0.070	1.41 0.33	0.92 -0.02	1.93 -0.70	Not significant
COVID-19 app (extremely likely to get vs. not extremely likely to get)	3.89	2.92	5.19	<0.001	3.84 1.33	2.83 1.05	4.99 1.62	Significant
Residential Area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	0.89	0.60	1.31	0.551	0.93 -0.08	0.62 -0.46	1.29 0.28	Not significant
Urban/City	0.85	0.56	1.28	0.425	0.89 -0.13	0.56 -0.54	1.25 0.25	Not significant
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	1.28	0.87	1.89	0.209	1.23 0.19	0.80 -0.19	1.69 0.55	Not significant
Three or Four	2.76	1.81	4.20	<0.001	2.61 0.94	1.63 0.54	3.69 1.34	Significant
Every year (five times)	10.55	7.25	15.36	<0.001	9.85 2.27	6.49 1.92	13.38 2.63	Significant
IRSD quintile (Socioeconomic status); Quintile 1 (Greater disadvantaged), Quintile 5 (Lack of disadvantage)								
Quintile 1 (greater disadvantage)	(Ref)	-	-	-	-	-	-	-
Quintile 2	1.15	0.75	1.77	0.528	1.15 0.12	0.71 -0.30	1.66 0.55	Not significant
Quintile 3	1.36	0.89	2.07	0.155	1.35 0.28	0.82 -0.12	1.91 0.70	Not significant
Quintile 4	1.20	0.79	1.82	0.388	1.20 0.17	0.77 -0.24	1.71 0.56	Not significant
Quintile 5 (least disadvantage)	2.11	1.41	3.15	<0.001	2.09 0.72	1.31 0.33	2.91 1.11	Significant

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1,2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*8-9*
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	10
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	9
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	10-11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 3

		(*b*) Report category boundaries when continuous variables were categorized	Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Attitudes towards vaccines and intention to vaccinate against COVID-19 – a cross-sectional analysis: Implications for public health communications in Australia

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Attitudes towards vaccines and intention to vaccinate against COVID-19 – a cross-sectional analysis: Implications for public health communications in Australia

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Abstract

Objective: To examine SARS-CoV-2 vaccine confidence, attitudes and intentions in Australian adults as part of the iCARE Study.

Design and setting: Cross-sectional online survey conducted when free COVID-19 vaccinations first became available in Australia in February, 2021.

Participants: Total of 1,166 Australians from general population aged 18-90 years (mean 52, SD of 19)

Main outcome measures: Primary outcome: Responses to question "If a **vaccine** for COVID-19 were available today, what is the likelihood that you would get vaccinated?"

Secondary outcome: Analyses of putative drivers of uptake, including vaccine confidence, socioeconomic status, and sources of trust, derived from multiple survey questions.

Results: Seventy-eight percent reported being likely to receive a SARS-CoV-2 vaccine. Higher SARS-CoV-2 vaccine intentions were associated with: increasing age (OR: 1.04 95%CI [1.03-1.044]), being male (1.37 [1.08–1.72]), residing in least disadvantaged area quintile (2.27 [1.53–3.37]) and a self-perceived high risk of getting COVID-19 (1.52 [1.08–2.14]). However, 72% did not believe they were at a high risk of getting COVID-19. Findings regarding vaccines in general were similar except there were no sex differences. For both the SARS-CoV-2 vaccine and vaccines in general, there were no differences in intentions to vaccinate as a function of education level, perceived income level, and rurality. Knowing that the vaccine is safe and effective, and that getting vaccinated will protect others, trusting the company that made it and vaccination recommended by a doctor were reported to influence a large proportion of the study cohort to uptake the SARS-CoV-2 vaccine. Seventy-eight percent reported the intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post-vaccine.

Conclusions: Most Australians are likely to receive a SARS-CoV-2 vaccine. Key influencing factors identified (e.g. knowing vaccine is safe and effective, and doctor's recommendation to get vaccinated) can inform public health messaging to enhance vaccination rates.

Keywords: COVID-19, Infection control, Public Health, Preventive Medicine, Respiratory infections

Strengths and limitations of this study

- This research captured a large, representative sample of the adult Australian population across age, sex, location, and socioeconomic status around the time that free COVID-19 vaccinations first became available to Australians in February, 2021.
- We have self-reported Australian uptake intentions and attitudes on general vaccines and COVID-19 vaccine, and intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post SARS-CoV-2 vaccine.
- We examine a range of drivers and factors that may influence intent to get the SARS-CoV-2 vaccine uptake, including vaccine confidence, demographics and socioeconomic status.
- The survey is based on established behavioural theories, and is the Australian arm of the international iCARE survey which to date has collected global comparative information from over 105,000 respondents in 140 countries.
- Our survey was only available in English, which may have led to an underrepresentation of ethnic groups, and participation was voluntary, so our sample may be prone to selection bias from those with more interest or engagement in COVID-19.

Introduction

The SARS-CoV-2 (COVID-19) pandemic has resulted in an estimated 211 million cases and 4.43 million deaths worldwide, including 44,028 cases and 981 deaths in Australia (1), as of August 2021. The R0 value, which represents the average number of people a single infected person can expect to transmit a virus to in a completely susceptible population, has increased from 2-3 for the original Wuhan SARS-CoV-2 virus to 5-6 for the Delta variant of the SARS-CoV-2 virus currently dominating the world (2). Whilst vaccinated individuals can be infected with and transmit SARS-CoV-2, the vaccines reduce the likelihood for serious illness and subsequent hospitalisation and death by greater than 80% and 85% (3). Therefore, vaccinated populations are likely to pivot from the prevention of SARS-CoV-2 infections to instead accepting that the virus is endemic with the aim to minimise serious illness, hospitalisation, and death (4, 5).

Minimising serious illness, hospitalisations, and deaths requires high vaccination rates for SARS-CoV-2, and ongoing preventative health behaviours such as physical distancing and wearing face masks (6) to protect the unvaccinated (e.g. young children) and those in which the vaccine is less effective such as the immunocompromised (7). It is now clear that combined behavioural strategies and vaccination (including boosters), are the pathway out of perpetual strict population level restrictions, which in Australia have included limiting gatherings, restricting education and work attendance, stay at home orders and closing both state and international borders (8, 9). Although these restrictions have been effective at reducing COVID-19 transmission and have prevented large numbers of deaths to date (10, 11), they come with serious economic, social and mental health costs that are unacceptable in the long term (8).

Australia is a country with a strong public health record, backed by high socioeconomic status, low population density and a universal free health care system (12).There is also high vaccine uptake in

general. For example, rates of Hepatitis B immunisation amongst 1-year olds in Australia was 95% in 2020, which was higher when compared to other high-income countries such as the United States (91%) and Canada (84%).(13) These factors, alongside the strict policies including lockdowns, and Australia being an island nation, making it easier to secure borders, had contributed to Australia largely controlling the pandemic prior to the emergence of the Delta variant (12). However, having a low SARS-CoV-2 vaccination rate, due to public concerns over the safety of the Astra Zeneca vaccine and a lack of supply of the mRNA vaccines, Australia has been particularly susceptible to recent delta variant outbreaks (14).

Vaccine uptake is critical to the long-term management of the COVID-19 pandemic. To date, over 11% of the world's population have received at least one dose of a SARS-CoV-2 vaccine (3). Vaccine supply and uptake needs to be accelerated globally to enhance protection against COVID-19 (15). Vaccine hesitancy and vaccine confidence are key determinants of vaccine uptake, and it is vital to understand factors associated with hesitancy. Vaccine confidence refers to the trust in the vaccines, the providers who administer it, and the science, processes, and policies behind it (16). Vaccine hesitancy is the sense of uncertainty in vaccines for a particular belief or reason (16, 17). Vaccine hesitancy and reduced confidence may result in the refusal of, or delay in the acceptance of, a vaccination (18). Both vaccine hesitancy and confidence are complex and can be influenced by many determinants, as identified by the Strategic Advisory Group of Experts on Immunization (SAGE) working group on vaccine hesitancy, (18) and are broadly grouped into three categories: 1) Contextual socio-politico-cultural factors, 2) Individual and group influences, and 3) Vaccine specific factors, see Box 1 for examples (8). Existing work on population intentions around the SARS-CoV-2 vaccines is emerging globally (19). A French study conducted early in the pandemic (March 2020) found that 26% of participants would not accept to receive a SARS-CoV-2 vaccine if it became available (20). This was more prevalent amongst those in lower-income categories, young women and those older than 75 years of age. In the UK, 14% of participants in a study were unwilling to

receive a vaccine, with 23% being unsure (6). Similar to the French study, females and those from lower-income groups, reported being less likely to have a SARS-CoV-2 vaccine if available (6).

The vaccine confidence index (VCI) consist of four questions to understand a person's perceptions about if vaccines are safe, important, effective, and/or compatible with religious beliefs (21). The VCI was developed following the identification of key drivers which influence the public's confidence in vaccines (16). Data has suggested approximately 1-in-5 Australians were hesitant regarding SARS-CoV-2 vaccines in the early stages of the COVID-19 pandemic in March/April 2020: with 14% to 24% respondents being unsure or unwilling to get a vaccine if available (22, 23).

This study identifies characteristics of Australians who intend or did not intend to get the vaccine in March 2021. Australia, as an island nation that overall had minimal to no community transmission of SARS CoV-2 prior to the delta outbreak, offers a unique case study to gain insights and inform mitigation strategies which could be applied globally. As attitudes towards the SARS-CoV-2 vaccine may vary over time, this new information will be able to inform current public health campaigns and policy (23, 24) and assist with effectively targeting those who currently have lower vaccine intentions. Hence here we aim to characterise the beliefs, intentions, and hesitancy of Australians towards vaccines generally (importance, safety and efficacy), and to SARS- CoV-2 specifically, to inform strategies to address this and increase uptake.

Methods

This project is part of the Australian arm of the International COVID-19 Awareness and Responses Evaluation (iCARE) study, which is investigating people's understanding, attitudes, beliefs, and actions towards the COVID-19 pandemic (25). The Montreal Behavioural Medicine Centre, the lead institution, (26) has research ethics board approval from the Comité d'éthique de la recherche du CIUSSS-NIM (Centre intégré universitaire de santé et de services sociaux du Nord-de-l'île-de-Montréal), approval#: 2020-2099/25-03-2020. The iCARE aims, measures and survey construction are reported in detail elsewhere (25) and the survey results and publications resulting from this international collaboration are available at https://mbmc-cmcm.ca/covid19/. This paper reports the analysis of the new vaccination questions asked in the third round of the Australian longitudinal survey (27); which comprised a national representative sample (survey included in supplementary documents). The third round included new questions on attitudes towards the COVID-19 vaccination and intention to vaccinate against COVID-19 in Australia, therefore longitudinal comparison with earlier rounds (27) is not possible. Here we report the nationally representative cross-sectional analysis of respondents in this third survey conducted in early 2021. This sub-project was approved by the Monash University Human Research Ethics Committee (#ID: 24449).

Sampling

Survey respondents were recruited by an online sampling provider that sent out invitations between February 14th and March 7th, 2021. By this time, Australia had recorded 28,947 COVID-19 cases with variable virus impacts and policy approaches across states and a lack of national coordination. At a state level, Western Australia was lifting a lockdown (February 5th, 2021) and Victoria had entered a "circuit breaker," 5-day lockdown having had more than 100 days in lockdown in 2020 (February 12th, 2012). The first public COVID-19 vaccinations were available on the February 21st, 2021. Electronic survey invitations were emailed to approximately 12,000 adults having a residential address in Australia, and briefly described the survey content, estimated survey duration, and a link to the online survey. The first page of the survey described the study, its purpose, and advised

readers that continuing to the next page would be an indicator of consent to participate in the study. All participants who completed the online survey were reimbursed by ISO 26362 as per industry requirements. Representative sampling for key demographics of the Australian population was done using quota sampling for age, sex, and residential location (state/territory and remoteness area) with quota's set to reach the maximum numbers as indicated by the proportion shown for the usual Australian population in Table 1. After 4 days of recruitment and from then on approximately weekly, the demographics (age, sex, and broad location of residence (state/rurality)) of participants with completed surveys were examined, and further sampling was targeted to underrepresented groups to align with population characteristics. Non-responders characteristics were not collected as this wasn't permitted by the sampling company in this study. In previous arms of the iCARE survey in Australia the response rate was approximately 10% for new participants, which the sampling company reported was typically expected for their online surveys of similar length (using only email recruitment and electronic surveys). To minimise non-response bias, the sampling company would send reminders to potential participants two times approximately one week apart (provided they didn't belong to a quota that had been reached).

Patient and public involvement

As part of the main iCARE study, there are several community collaborators who provide continual input into the development of the survey design, ensuring that the items are relevant and appropriately worded. In addition, members of the general public have been engaged to contribute to the dissemination of study results through sharable infographics made available on the study website. For Australia, the survey was reviewed by the Monash Partners Consumer and Carer group and involved two members paid for their time to identify text that wasn't clear or irrelevant to Australia, and recommend alternative wording and areas to clarify. Other community members and contacts of the researchers provided input into the timing to complete the survey, and subsequently this feedback resulted in the survey being shortened to reduce participant burden.

Analysis Plan

Participant demographic data included residential postcode, which were mapped to the Australian Bureau of Statistics remoteness areas and socioeconomic index for areas (SEIFA) (28). Specifically, the index of relative socioeconomic disadvantage (IRSD) was applied and divided into five quintiles, from 1 (most disadvantaged) to 5 (most advantaged). Ethnicity information provided by participants was used to make two groupings of "Australian/New Zealand/UK" and everyone else.

Descriptive statistics reported the participant demographics and attitudes for a series of vaccine-related questions including the VCI (16, 21).

To characterise the beliefs, intentions and hesitancy of Australians towards vaccines generally and SARS- CoV -2 vaccines specifically, a series of univariate logistic regressions were done with dichotomous outcomes. Responses were dichotomised using the most extreme positive response e.g. "Always" vs other. To examine robustness, regressions were repeated by re-dichotomising outcomes to include the two most extreme responses instead of one. Unlike in similar analyses (21), our outcomes could not be examined using ordinal logistic regression because of low numbers in some response categories.

Possible predictors examined in the logistic regressions, included age, sex, essential worker status, belief that a participant is at high risk, residential area, flu vaccination status, education level, ethnicity, perceived income level, and IRSD quintile. Ethnicity data was missing for n=431 participants, therefore, these results were exploratory only. Responses to the VCI questions were also examined. All results are displayed as odds ratios, with 95% confidence intervals.

Sensitivity analyses involved Bayesian logistic regression to enabled global comparisons with a recent Lancet publication (21), and were conducted on the same outcome variables as in the logistic regressions. Normal priors (0,1) were set for each regression parameter and used 5,000 burn-in steps and 50,000 sampling iterations. Statistical analyses used STATA SE/v16. Significance level was set as <0.05.

Results

There were 1166 survey respondents in this cross-sectional analysis. Response rate was approximately 10% for new participants and 60% for those in the longitudinal arm (27). Ages ranged from 18-90 years with a mean of 51.7 years (table 1), similar to the Australian population, apart from an overly represented group of participants aged 70 years or more. Sampling ensured a reasonable representativeness across sex, rurality and the three largest states (New South Wales, Victoria and Queensland). Education levels were similar to the Australian population. Less than half of participants (45%) were in full-or part-time work, lower than national statistics reported for the same time period (63%), and likely due to the overly represented 70+ age group. Fifteen percent reported being essential workers, with 7% healthcare workers. There was minimal missing data (table 1), except for ethnicity, with 50% respondents identifying as Australian/UK/NZ (n=580), 13% as other (n= 155) but 37% were missing (n=431).

Sixty-five percent of participants generally accept routine vaccines for themselves or for their children, with 6% either rarely or never accepting vaccinations (table 2). At the time of this study, only 27 (2%) participants had already received at least one dose of a COVID-19 vaccination. The majority (78%) reported that they were likely to get the SARS-CoV-2 vaccine (table 2), and fifteen percent of all participants were either unlikely or very unlikely to get the SARS-CoV-2 vaccine. Seventy-two percent of our study cohort did not believe that there were at a high risk of being infected with COVID-19.

The VCI questions showed most Australians (>60%) strongly agreed on the safety, importance, and effectiveness of general vaccines (figure 1). Fifty-seven percent strongly agreed that general vaccines are compatible with their religious beliefs (figure 1). Approximately ten percent of participants did not know whether vaccines are safe or effective (figure 1).

Predictors for vaccine uptake

Determinants that were similar for both general (Table 3) and SARS-CoV-2 vaccine uptake intention (Table 4) included:

Higher likelihood of vaccine uptake was significantly associated with:

- Increasing age with Odds Ratio (OR) = 1.6 (95% Confidence Interval: 1.4-1.8) and 2.0 (95% CI: 1.8-2.3) for general and SARS-CoV-2 vaccine respectively; residing in the least disadvantaged areas SES quintile (OR = 2.1 (95% CI: 1.4-3.2) and 2.7 (95% CI: 1.5-3.4) for general and SARS-CoV-2 vaccines).
- Identifying as Australian/NZ/UK with an OR = 2.3 (95% CI: 1.6 - 3.3) and 1.9 (95% CI: 1.3 – 2.7) for general and SARS-CoV-2 vaccines; however, as noted there was much missing data for the ethnicity variable, therefore this result is considered exploratory only.
- Strong agreement with the VCI questions. For example, strong agreement with the statement "Vaccines are effective" had an OR = 14.6 (95% CI: 10.9 – 19.5) for general vaccine and 14.0 (95% CI: 10.4 – 18.9) for SARS-CoV-2 vaccine.

Lower likelihood of vaccine uptake was significantly associated with:

- Being a healthcare worker: With an OR of 0.5 (95%CI: 0.3 – 0.8) and 0.5 (95%CI: 0.3 – 0.8), for general and SARS-CoV-2 vaccines, respectively. However, this is exploratory only due to the small sample of healthcare workers and inability to delineate what worker type (e.g. allied health, medical, social worker, etc.)

There were no significant findings for educational level, perceived income or residential rurality.

Differences between the general vaccines and the new COVID vaccines:

- There were no differences between the sexes for the likelihood of general vaccine uptake, whilst SARS-CoV-2 vaccine intention to uptake was significantly higher for men compared with women with OR of 1.37(95% CI: 1.08 – 1.72).

Factors that might influence decisions to get the SARS-CoV-2 vaccine:

Having information that the SARS-CoV-2 vaccine is safe (85%), effective (85%), will help protect people around the participant (80%), and trusting the company who developed the vaccine (78%) were reported to influence the participants somewhat or to a great extent to get vaccinated (Table 4). A doctor's recommendation (72%) and convenience factors (72%) were also positive predictor variables for vaccine uptake. Other positive predictors include believing that the participant was at high risk of getting COVID-19 or suffering from severe complications (69%), increasing civil liberties (68%), and seeing others get vaccinated (66%).

Sensitivity analyses:

Bayesian regression analyses produced very similar results to initial logistic regression analyses. The regressions repeated with re-dichotomising outcomes to include the two most extreme responses instead of one, showed similar findings (supplementary table).

Discussion

We examined the beliefs, intentions, and hesitancy of 1166 Australians towards vaccines in general and to the SARS-CoV-2 vaccine in a large, nationally representative cross-sectional analysis of a surveys in early 2021. Seventy-eight percent of all participants reported being likely to get the SARS-CoV-2 vaccine when it became available to them. Rates of both general vaccine uptake and SARS-CoV-2 vaccine uptake increased with age, believing that vaccines are safe and effective, and residing in the least disadvantaged socioeconomic region. Being male was associated with higher intentions to get the SARS-CoV-2 vaccine but had no statistically significant difference to general vaccine intention compared with females. There were no statistically significant differences in education level, perceived income level or rurality and rates of either general or SARS-CoV-2 vaccine acceptance. Strong influencing factors reported to convince people to uptake the SARS-CoV-2 vaccine were; knowing that the SARS-CoV-2 vaccine is safe and effective; trusting the vaccine

producers; knowing it will help protect people close to them; recommendations from doctors to get vaccinated; and convenience getting the vaccine.

A 2021 study exploring global trends in SARS-CoV-2 vaccine hesitancy found that males, older adults, those with a history of influenza vaccination were less likely to report hesitancy, echoing the findings in our study.(29) They also found that those living in urban regions and that those who were in the middle or top tiered of perceived income were less likely to be vaccine hesitant, with our study finding no significant relationship between these variables. (29) Fifty-three percent of participants in our study indicated that they were extremely likely to get a SARS-CoV-2 vaccine, which was lower than those reported in Brazil (89%), Italy (81%) (Canada (71%) and the UK (80%), but similar to the US (57%) and higher than Turkey and France (49% for both). (29)

The following factors were identified as having more of an influence on vaccination rates, and hence could be used to inform public health policies and messaging to enhance vaccination rates. Having knowledge that the SARS-CoV-2 vaccine is safe and effective will encourage a large proportion of the study cohort to get vaccinated. These two factors are encompassed in the VCI and were recently examined in a large international study (21). Together, they are likely to play the largest role in the uptake of the SARS-CoV-2 vaccine. Responsible, accurate reporting of the balance of risks and benefits in the media and social media is likely important to build trust in the vaccines and the companies that manufacture them (30). Since trust in the vaccine companies is identified as a strong influencing factor in encouraging vaccination, this needs to be reaffirmed by focusing on the stringent regulatory processes the companies must adhere to, which can be conveyed in consistent and transparent public health messaging. Participants also indicated that knowing that the SARS-CoV-2 vaccine would protect those around them, was a significant factor influencing intention to vaccinate. Whilst those who are vaccinated can still transmit SARS-CoV2, transmission is decreased meaning family and friends are more protected, (31) which appeals to pro-social or altruistic

attitudes, known to effectively increase vaccination rates (32). Another key driver of vaccine uptake likelihood in our study was getting a recommendation from a doctor, aligned with previous immunisation programs, including in the H1N1 pandemic, and should be encouraged with the SARS-CoV-2 vaccine (24). Medical professionals will benefit from consistent updated access to accurate information on the SARS-CoV-2 vaccine, countering non evidence based anti-vaccination messages, outlining benefits and risks, interpreting evidence as it emerges and personalising it to the individuals who seek care (24, 33).

Convenience factors such as time needed or travel requirements to get vaccinated have also been identified as a strong influencing factor. This could be why increased local vaccination sites in Australia,including popup clinics at areas such as schools and mosques and shopping centres, alongside the rollout of mass vaccination hubs, and of vaccinations to GP clinics, pharmacies, , and workplaces, already shown to increase the rate of other vaccinations including the annual influenza vaccine have also assisted in boosting Australia's vaccination rates for COVID-19 (34). Here 68% of participants noted intention to get vaccinated if it offered them increased civil liberties, such as going to concerts or sporting events.

When choosing to get vaccinated, the perceived likelihood of infection, the prevalence and severity of the relevant disease are key in the decision making process (35). In early 2021 in our study, 72% of all participants did not believe that they were at a high risk of getting COVID-19, likely reflecting the low numbers of infections, hospitalisations and deaths in Australia at that time (36). Misinformation in the media also equated COVID-19 severity to that of the seasonal flu (37). These factors are likely to have presented obstacles to initial vaccination uptake in Australia, with participants who perceived a higher risk of getting COVID-19 reported a 50% higher likelihood of getting vaccinated. Previous research on the SARS-CoV-2 vaccine, as well as vaccination research during the 2009 H1N1 pandemic echo our results (33, 38). Leveraging anticipated regret, shown to be one of the strongest

predictors for vaccine intention, could also be further explored to enhance SARS-CoV-2 vaccination rates. (33, 39) Consistent with other early surveys (40), we noted that men report the most willingness to receive a SARS-CoV-2 vaccine, however, this intention may not translate to gender differences in vaccination uptake (41).

Exploratory findings based on a small sample, suggested that healthcare workers and those not identifying themselves being from Australia/NZ/UK were less likely to accept both general and the SARS-CoV-2 vaccines. Considering the influence that healthcare workers have on the general population, their high exposure rates this presents a barrier to both effective vaccine uptake and to infection rates control. A 2021 review found an average of 23% (range: 4% to 72%) of healthcare workers reported vaccine hesitancy. The review also found that being male, older and a doctor were associated with higher rates of SARS-CoV-2 vaccine acceptance in healthcare workers (42). The current study did not delineate between types of healthcare workers (e.g. doctors, nurses, allied health).. Our findings also identified a higher rate of vaccine hesitancy in people who did not identify their ethnicity as Australian/New Zealanders or UK groups, consistent with past research in this and other vaccines (33). However, the findings for both these high-risk groups need to be interpreted with caution due to the small sample size. More data here could aid in further targeting policy-based communications and interventions.

Public health authorities need to provide transparent, easy to interpret information on the SARS-CoV-2 vaccines to the general population, as highlighted by Eastwood et al during the H1N1 pandemic (43). This will aid in alleviating the confusion which may stem from misinformation present in the media and online networks. Furthermore, we echo the suggestions made in Seale et al., which includes tailoring messages and engaging community leaders in disseminating information about vaccines in culturally and linguistically diverse groups, with the known influence of social groups and community leaders of similar backgrounds (44). For healthcare workers, engagement

and education is important, given the important role they play in modelling health-promoting behaviour for the general public (37). Mandatory influenza vaccination is already in place for many healthcare workers in Australia, and mandatory SARS-CoV2 vaccination has been introduced for aged care workers and for healthcare workers in all states and territories (42). This may have contributed to increased vaccine uptake with recent government figures indicating that in the majority of regions ≥ 90% of aged care workers are fully vaccinated (45). Further, anecdotally it appears that the majority of those working in other health facilities have been vaccinated with minimal numbers standing down for refusing the SARS-CoV2 vaccine since the mandatory policy was introduced. Healthcare workers beliefs and attitudes to the SARS-CoV2 vaccine may reflect similar concerns to their broader community as seen in the UK with hesitancy being more frequent in non-white British healthcare workers, female sex, and younger age (46). Understanding the impact of mandates, knowledge, attitudes and beliefs driving this behaviour remains important given the risks to staff and patients and the need for booster (or third dose) vaccines in the ongoing pandemic.

The strengths of our study include a large, generally representative sample across Australia and evidence based approaches including the vaccine confidence index. Limitations to our study include that this the survey was only available in English, which is likely to have reduced representation of ethnic groups. Internet access was required, which may account for the increased representation of those in the least disadvantaged quintile. Future studies should address these issues in order to characterise vaccine intentions and attitudes in more remote and higher risk groups. Furthermore, since we rely on self-reported behaviour, there is the risk of a social desirability bias, with participants potentially over-reporting socially desirable traits in their responses and the voluntary nature of the survey makes it prone to a selection bias (9, 47). Also the response rate of 10% for new participants is a limitation that possibly introduced non-responder bias, and further studies with greater resources to limit this bias by employing additional strategies such as telephone recruitment and hard copy surveys could be conducted (48).

There is a paucity of studies on what influences people to consider taking the vaccine in Australia in 2021, where access to the SARS-CoV-2 vaccines is increasing, but still limited by age and occupation at the time of the survey. Since this survey, the rapid emergence of the highly transmissibility Delta variant, the major challenges of large scale, extended lockdowns escalating the imperative for rapid vaccination, and highlighting the importance of work in this field. Behavioural research such as the iCARE study can inform policymakers in understanding the public's knowledge, attitudes, perceptions and beliefs towards the SARS-CoV-2 vaccine, which in turn drive their behaviours including vaccination and can aid with targeting public health messages (24).

Conclusion:

Given the worldwide morbidity, hospitalisation, and death from COVID-19, the established safety and effectiveness of widely tested vaccines to prevent these complications, and the imperative to accelerate vaccination globally including in Australia, the results of this study on vaccine hesitancy are important. Here we show that vaccine safety, effectiveness, trust in the companies, and recommendations from doctors are important determinants of vaccine intentions. Further work to understand vaccine hesitancy in identified target groups including culturally and linguistically diverse groups and healthcare workers are important moving forward to support equity in vaccine uptake. This work can directly inform strategies to optimise communication and SARS-CoV-2 vaccine uptake, especially in Australia, now vital as the Delta variant takes a grip on the country.

Contributorship statement

SB and KL led study conceptualisation. JE, SD and JG were responsible for the statistical analyses. JG and JE wrote the first draft of the paper, with early input from DE. JB and HT are the senior authors and guarantors. All authors contributed to the development of the research question, study design in relation to the Australian data analysis, interpretation of the results, critical revision of the manuscript for important intellectual content, and approved the final version of the manuscript. JB attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Competing interests

SB has received consultancy fees from Merck for the development of behavior change continuing education modules, speaker fees from Novartis and Janssen and has served on advisory boards for Bayer, Sanofi and Sojecci Inc, none of which are related to the current article.

KL has served on the advisory board for Schering-Plough, Takeda, AbbVie, Almirall, Janssen, GSK, Novartis, Boehringer Ingelheim (BI), and Sojecci Inc, and has received sponsorship for investigator-generated research grants from GlaxoSmithKline (GSK) and AbbVie, speaker fees from GSK, Astra-Zeneca, Astellas, Novartis, Takeda, AbbVie, Merck, Boehringer Ingelheim, Bayer, Pfizer, Xfacto, and Air Liquide, and support for educational materials from Merck, none of which are related to the current article.

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Data sharing statement

Data can be made available to approved researchers by contacting the corresponding author.

The iCARE study is an open access study. Data access procedures are available at https://mbmc-cmcm.ca/covid19/apl/. Planned analyses are logged at https://mbmc-cmcm.ca/covid19/apl/log/.

Ethics Approval Statement

The studies involving human participants were reviewed and approved by Monash University Human Research Ethics Committee (MUHREC Project ID: 24449). The patients/participants provided their written informed consent to participate in this study.

The Montreal Behavioural Medicine Centre, the lead institution, has research ethics board approval from the Comité d'éthique de la recherche du CIUSSS-NIM (Centre intégré universitaire de santé et de services sociaux du Nord-de-l'île-de-Montréal), approval#: 2020-2099/25-03-2020.

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Tables and Figures

Figure Legend (Figure in separate 'image' file designation)

Figure 1: Vaccine Confidence Index: Responses to the questions about if general vaccines are safe, important, effective, and compatible with your religious beliefs.

Box 1. Vaccine hesitancy and confidence are complex and can be influenced by many determinants, as identified by the Strategic Advisory Group of Experts on Immunization (SAGE) working group on vaccine hesitancy.

Categories	**Examples**
Contextual socio-politico-cultural factors	- compatibility of vaccination with religious beliefs
Individual and group influences	- personal perception of the vaccine - influences from the social and peer environment
Vaccine specific factors	- issues directly related to the vaccine or vaccination - accelerated development of vaccines for SARS-CoV-2 may increase safety concerns in the population

Table 1: Participant demographics (n = 1166).

	Australian Population (% unless otherwise indicated)	Sample N (%) 1158
Age (mean, SD)	39	51.7, 19.3
Age (median, IQR)	38	53, 37.5
Age Breakdown[1] (%)		
18-29	19	214 (18)
30-39	19	175 (15)
40-49	17	142 (12)
50-59	16	148 (13)
60-69	14	143 (12)
70+	15	336 (29)
Sex[1] (%)		
Males	50	583 (50)
Females	50	572 (49)
Others/Prefers not to answer	0	8 (0.7)
Area of residence[2] (%)		
Urban/City/Suburban/Regional	90	979 (87)
Rural/Country	10	142 (13)
I don't know/prefer not to answer	-	5 (0.4)
Location by state/territory (%)		
New South Wales	32	254 (22)
Victoria	26	561 (48)
Queensland	20	163 (14)
South Australia	7	76 (7)
Western Australia	10	82 (7)
Tasmania	2	14 (1.2)
Australian Capital Territory	2	9 (1)
Northern Territory	1	6 (1)
Missing	-	1 (0)
Highest Education level attained[3] (%)		
Graduate/Postgraduate/University degree	52	432 (47)
TAFE/Secondary or High School	45	560 (50)
Primary school or less	3	12 (1)
I don't know/prefer not to answer	-	19 (2)
Essential worker (%)		175 (15)
Healthcare workers	13 (including social assistance)	80 (7)
IRSD quintile (%)		
Quintile 1 – most disadvantaged	20	145 (12)
Quintile 2	20	198 (17)
Quintile 3	20	235 (20)
Quintile 4	20	238 (20)
Quintile 5 – least disadvantaged	20	345 (30)
Ethnicity[4] (%)		
Australian/New Zealand/UK	73	580 (50)
Other	27	155 (13)
Missing	-	431 (37)

Where applicable, variable categories have been collapsed to allow for concordance with national data published by the Australian Bureau of Statistics (ABS):
1: The total Australian population was 25,704,340 as of March 2021; the total population and percentage breakdowns by age, sex, and state of residence are obtained from the Australian Bureau of Statistics, (49) who provide a quarterly release of their official estimates of this demographic data. Age is presented in 10-

year bands, and the first band that is comparable to the current study is 20-29 years. The proportion of Australians by age is calculated as the proportion of those 20 or over.
2: Estimates for percentage of population by area of residence were obtained from the ABS, who release this data yearly. (50)
3: Estimates for the percentage of population by level of education were obtained from the ABS, who release this data yearly.(51)
4: National estimates for ethnicity were obtained by assessing the "country of birth" data provided by the ABS 2016 Census. Whereas the survey 'ethnicity' variable was created using survey responses to the ethnicity item.

Table 2: Uptake intentions and attitudes on general vaccines and COVID-19 vaccine, and intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post COVID-19 vaccine.

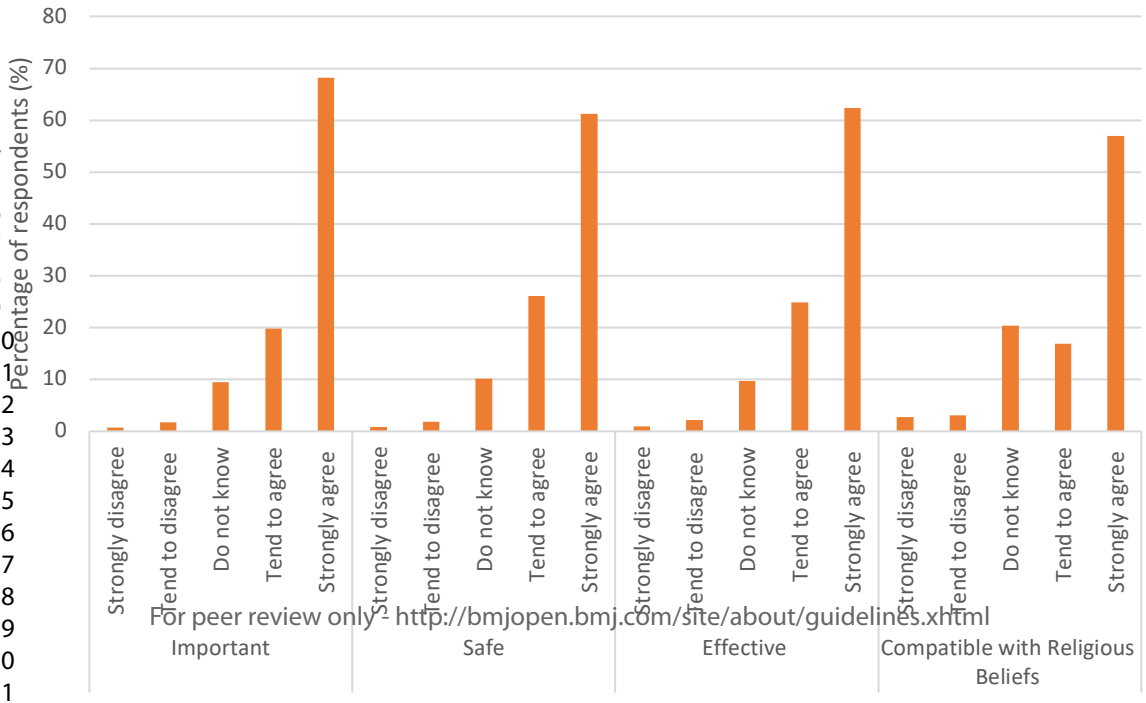
	N (%)
Had already received at least 1 dose of COVID-19 vaccine	27 (2)
Likelihood of getting COVID-19 vaccine if it were available today	
Extremely likely	597 (53)
Somewhat likely	283 (25)
Unlikely	88 (8)
Very unlikely	83 (7)
I don't know/prefer not to answer	80 (7)
Generally accept vaccines for yourself or for your children	
Always	736 (65)
Mostly	232 (21)
Sometimes	100 (9)
Rarely	41 (4)
Never	21 (2)
Intent to continue engaging in virus-protecting behaviours (mask wearing, social distancing etc.) post vaccine	
Most of the time	526 (47)
Some of the time	343 (31)
Seldom	94 (8)
Never	54 (5)
I don't know/prefer not to answer	95 (9)
Seasonal flu vaccine over the last 5 years	
Every year	511 (46)
3-4 years	163 (15)
1-2 years	202 (18)
Never	218 (19)
I don't know/prefer not to answer	27 (2)

*Table 3: Vaccine uptake determinants: Univariate regression analyses with possible predictors that influence general vaccine uptake (left columns) and SARS-CoV-2 vaccine uptake(right columns) . *Age variable is scaled to have a mean of 0 and unit standard deviation.**Ethnicity data was missing for n=431, therefore results for this variable are exploratory only.*

	Do you generally accept vaccines for yourself or for your children?				**If a vaccine for COVID-19 were available today, what is the likelihood that you would get vaccinated?**			
	Outcome: "Always" vs not				**Outcome: Extremely likely v. Not**			
	OR	**95% confidence interval**		**P**	**OR**	**95% confidence interval**		**p**
Vaccines confidence (strongly agree v not strongly agree)								
Vaccines are important	10.6	8.00	14.09	<0.001	6.73	5.09	8.90	<0.001
Vaccines are safe	13.45	10.08	17.94	<0.001	14.67	10.92	19.71	<0.001
Vaccines are effective	14.58	10.90	19.50	<0.001	14.02	10.42	18.86	<0.001
Age (Continuous) *	1.59	1.40	1.80	<0.001	2.01	1.77	2.27	<0.001
Sex								
Females	(Ref)	-	-	-	-	-	-	-
Males	0.93	0.73	1.18	0.543	1.37	1.08	1.72	0.008
Essential Worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.72	0.52	0.995	0.047	0.65	0.47	0.90	0.009
Healthcare Worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.51	0.32	0.80	0.004	0.53	0.33	0.84	0.007
Residential Area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	0.89	0.60	1.31	0.551	1.12	0.78	1.62	0.528
Urban/City	0.85	0.56	1.28	0.425	1.30	0.88	1.92	0.187
Major States								
Others	(Ref)	-	-	-	-	-	-	-
VIC (1)	1.54	1.09	2.17	0.015	2.14	1.53	2.99	<0.001
QLD (2)	0.58	0.38	0.89	0.013	1.01	0.66	1.54	0.965
NSW (3)	0.85	0.58	1.26	0.436	1.13	0.77	1.65	0.529
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	1.28	0.87	1.89	0.209	1.46	0.96	2.22	0.074
Three or Four	2.76	1.81	4.20	<0.001	2.53	1.64	3.89	<0.001
Every year (five times)	10.55	7.25	15.36	<0.001	8.52	5.93	12.23	<0.001
Education level								
Primary school or less	(Ref)	-	-	-	-	-	-	-
Secondary/ High school	1.35	0.40	4.62	0.629	1.46	0.46	4.64	0.521
TAFE	0.83	0.24	2.82	0.766	0.96	0.30	3.04	0.942
University degree	0.82	0.24	2.79	0.753	1.06	0.33	3.35	0.927
Graduate/postgraduate degree	0.84	0.25	2.87	0.782	1.13	0.35	3.59	0.841
Perceived income level (231, 20.55% of participants did not want to answer/did not know)								
Bottom third	(Ref)	-	-	-	-	-	-	-
Middle third	0.86	0.63	1.17	0.324	0.81	0.61	1.09	0.168
Top third	1.24	0.80	1.93	0.329	0.97	0.65	1.46	0.900
IRSD quintile (Area Socioeconomic Level indicator);								
Quintile 1 – most disadvantaged	(Ref)	-	-	-	-	-	-	-
Quintile 2	1.15	0.75	1.77	0.528	1.14	0.74	1.75	0.556
Quintile 3	1.36	0.89	2.07	0.155	1.22	0.80	1.85	0.352
Quintile 4	1.20	0.79	1.82	0.388	1.21	0.80	1.83	0.369
Quintile 5 - least disadvantaged	2.11	1.41	3.15	<0.001	2.27	1.53	3.37	<0.001
Ethnicity								
Other	(Ref)	-	-	-	-	-	-	-
Australian/New Zealand/UK	2.30	1.60	3.31	<0.001	1.90	1.33	2.72	<0.001
Believing that participant is at high risk of COVID-19								
No/don't know/prefer not to answer					(Ref)	-	-	-
Yes					1.52	1.08	2.14	0.016

*Table 4: Factors reported by n=1,081 Australians that may influence intent to get the SARS-CoV-2 vaccine. *Combined 'somewhat' and 'to a great extent' responses. Influencing factors are ranked in descending order, from most likely to influence SARS-CoV-2 vaccine uptake to least likely.*

N (row %)	Combined strongest likelihood *	To a great extent	Somewhat	Very Little	Not at all	I don't know	Total
Having information that the vaccine is safe and unlikely to have any major long- term side effects	921 (85)	661 (61)	260 (24)	78 (7)	50 (5)	32 (3)	1,081
Having information that the vaccine is effective (i.e., provides a high degree of protection	913 (85)	661 (61)	252 (23)	78 (7)	58 (5)	31 (3)	1,080
Knowing that getting vaccinated will help protect others around me	858 (80)	548 (51)	310 (29)	107 (10)	72 (7)	36 (3)	1,073
Trusting the company who developed the vaccine (Pfizer, Moderna, Sinopharm, etc.)	839 (78)	474 (44)	365 (34)	112 (10)	75 (7)	50 (5)	1,076
Receiving the vaccine dose(s) according to the manufacturers' instructions	818 (76)	505 (47)	313 (29)	122 (11)	90 (8)	42 (4)	1,072
Wanting to contribute to high population rates of vaccination to achieve 'herd immunity'	791 (74)	476 (44)	315 (29)	131 (12)	101 (9)	52 (5)	1,075
The convenience of getting the vaccine (e.g., requires little time, no need to travel far)	772 (72)	417 (39)	355 (33)	143 (13)	118 (11)	42 (4)	1,075
Getting a recommendation from my doctor to get vaccinated	774 (72)	438 (41)	336 (31)	163 (15)	97 (9)	37 (3)	1,071
Believing that I am high risk of getting COVID-19 or suffering severe complications	729 (69)	361 (34)	368 (35)	175 (17)	119 (11)	37 (3)	1,060
Learning that being vaccinated would allow me to attend public events (e.g., concerts, sporting events) or travel	734 (68)	422 (39)	312 (29)	179 (17)	121 (11)	39 (4)	1,073
Seeing more and more people getting the vaccine	708 (66)	335 (31)	373 (35)	191 (18)	135 (13)	34 (3)	1,068
Hearing that other people have positive attitudes towards the vaccine	687 (64)	306 (29)	381 (36)	195 (18)	151 (14)	35 (3)	1,068
Only needing one dose of the vaccine to be protected	647 (61)	302 (28)	345 (32)	203 (19)	159 (15)	56 (5)	1,065
Believing that getting vaccinated would reduce my worries and anxiety	635 (60)	273 (26)	362 (34)	225 (21)	156 (15)	43 (4)	1,059
Getting a recommendation from my employer to get vaccinated	386 (52)	158 (21)	228 (31)	163 (22)	147 (20)	44 (6)	740



***Supplementary 1: Vaccine uptake sensitivity analysis**: Univariate regression analyses with possible predictors that influence general vaccine uptake (left columns) and SARS-CoV-2 vaccine uptake(right columns), using "Always/Mostly" and "Extremely/Somewhat likely" answer options. *Age variable is scaled to have a mean of 0 and unit standard deviation.**Ethnicity data was missing for n=431, therefore results for this variable are exploratory only.*

	Do you generally accept vaccines for yourself or for your children?				If a vaccine for COVID-19 were available today, what is the likelihood that you would get vaccinated?			
	Outcome: "Always/Mostly" vs not				Outcome: Extremely/somewhat likely v. not			
	OR	95% confidence interval		P	OR	95% confidence interval		p
Vaccines confidence (strongly agree v not strongly agree)								
Vaccines are important	14.28	9.66	21.09	<0.001	7.01	5.23	9.40	<0.001
Vaccines are safe	26.21	15.44	44.48	<0.001	10.07	7.29	13.92	<0.001
Vaccines are effective	20.30	12.65	32.58	<0.001	9.80	7.13	13.48	<0.001
Age (Continuous) *	1.53	1.31	1.80	<0.001	1.60	1.39	1.84	<0.001
Sex								
Females	(Ref)	-	-	-	-	-	-	-
Males	0.94	0.06	5.73	0.649	1.30	0.99	1.70	0.058
Essential worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.91	0.19	0.93	0.034	0.86	0.59	1.25	0.426
Healthcare worker								
No	(Ref)	-	-	-	-	-	-	-
Yes	0.67	0.38	1.17	0.155	0.96	0.56	1.64	0.888
Residential Area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	0.95	0.56	1.62	0.844	1.01	0.66	1.55	0.956
Urban/City	0.80	0.45	1.40	0.427	1.41	0.88	2.26	0.151
Major States								
Others	(Ref)	-	-	-	-	-	-	-
VIC (1)	1.45	0.93	2.27	0.100	1.40	0.95	2.05	0.089
QLD (2)	0.68	0.41	1.14	0.140	0.69	0.44	1.10	0.117
NSW (3)	0.90	0.56	1.46	0.672	0.94	0.62	1.45	0.796
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	2.06	1.32	3.21	0.001	2.38	1.58	3.59	<0.001
Three or Four	4.22	2.40	7.43	<0.001	3.10	1.96	4.90	<0.001
Every year (five times)	18.62	10.22	33.93	<0.001	10.26	6.73	15.63	<0.001
Education level								
Primary school or less	(Ref)	-	-	-	-	-	-	-
Secondary/ High school	2.56	0.66	9.96	0.174	1.56	0.41	5.96	0.518
TAFE	1.85	0.48	7.12	0.369	0.99	0.26	3.76	0.989
University degree	1.46	0.38	5.57	0.579	1.04	0.27	3.93	0.957
Graduate/postgraduate degree	2.58	0.66	10.12	0.174	1.31	0.34	5.01	0.698
Perceived income level (231 (20.55%) of participants did not want to answer/did not know)								
Bottom third	(Ref)	-	-	-	-	-	-	-
Middle third	1.30	0.86	1.96	0.210	1.40	0.98	2.00	0.062
Top third	1.64	0.89	3.04	0.116	1.33	0.81	2.19	0.256
IRSD quintile (Area Socioeconomic Level indicator)								
Quintile 1 – most disadvantaged	(Ref)	-	-	-	-	-	-	-
Quintile 2	0.81	0.46	1.42	0.458	1.25	0.78	1.99	0.354
Quintile 3	0.77	0.45	1.33	0.350	1.28	0.82	2.01	0.281
Quintile 4	0.83	0.48	1.43	0.496	1.39	0.88	2.19	0.153
Quintile 5 - least disadvantaged	1.56	0.90	2.70	0.115	2.42	1.55	3.80	<0.001
Ethnicity								
Other	(Ref)	-	-	-	-	-	-	-
Australian/New Zealand/UK	2.79	1.74	4.49	<0.001	1.54	1.02	2.31	0.04
Believing that participant is at high risk of COVID-19								
No/don't know/prefer not to answer					(Ref)	-	-	-
Yes					1.52	0.99	2.33	0.054

***Supplementary 2: Standard vs. Bayesian logistic regression for SARS-CoV-2 vaccine uptake**: Univariate regression analyses with possible predictors that influence SARS-CoV-2 vaccine uptake, showing standard logistic regressions (left column) and Bayesian logistic regressions (right column). *Age variable is scaled to have a mean of 0 and unit standard deviation.*

If a vaccine for COVID-19 were available today, what is the likelihood that you would get vaccinated?								
	Standard logit				Bayesian logit			
	OR	95% confidence interval		P	OR Coef (median)	95% HPD interval		p
Vaccines are important (strongly agree v not strongly agree)	6.73	5.09	8.90	<0.001	6.45 1.85	4.86 1.59	8.35 2.13	Significant- Does not cross 1 or 0
Vaccines are safe (strongly agree v not strongly agree)	14.67	10.92	19.71	<0.001	13.76 2.61	10.07 2.32	18.05 2.90	Significant
Vaccines are effective (strongly agree v not strongly agree)	14.02	10.42	18.86	<0.001	13.00 2.57	9.59 2.29	17.09 2.85	Significant
Age (Continuous)*	2.01	1.77	2.27	<0.001	2.01 0.69	1.76 0.57	2.25 0.82	Significant (does not cross 1 or 0)
Sex (Males v Females)	1.37	1.08	1.72	0.008	1.38 0.32	1.06 0.08	1.70 0.55	Significant (does not cross 1 or 0)
Essential Worker (Yes v No) *Includes healthcare worker too	0.65	0.47	0.90	0.009	0.67 -1.32	0.47 -2.13	0.89 -0.58	Significant
Healthcare worker (Yes v No)	0.53	0.33	0.84	0.007	0.56 -0.60	0.31 -1.08	0.81 -0.15	Significant
Believe that participant is at high risk of COVID-19 (Yes v Not yes (No and I don't know/prefer not to answer))	1.52	1.08	2.14	0.016	1.52 0.41	1.03 0.06	2.05 0.75	Significant
COVID-19 app (extremely likely to get vs. not extremely likely to get)	4.52	3.47	5.90	<0.001	4.47 1.49	3.36 1.23	5.70 1.75	Significant
Residential area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	1.12	0.78	1.62	0.528	1.13 0.10	0.75 -0.24	1.55 0.47	Not significant
Urban/City	1.30	0.88	1.92	0.187	1.31 0.25	0.84 -0.13	1.81 0.63	Not significant
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	1.46	0.96	2.22	0.074	1.36 0.29	0.86 -0.12	1.93 0.68	Not significant
Three or Four	2.53	1.64	3.89	<0.001	2.34 0.83	1.41 0.42	3.30 1.24	Significant
Every year (five times)	8.52	5.93	12.23	<0.001	7.82 2.04	5.25 1.71	10.43 2.38	Significant
IRSD quintile (Socioeconomic status); Quintile 1 (Greater disadvantaged), Quintile 5 (Lack of disadvantage)								
Quintile 1 (greater disadvantage)	(Ref)	-	-	-	-	-	-	-
Quintile 2	1.14	0.74	1.75	0.556	1.13 0.11	0.71 -0.31	1.61 0.50	Not significant
Quintile 3	1.22	0.80	1.85	0.352	1.21 0.17	0.79 -0.22	1.70 0.54	Not significant
Quintile 4	1.21	0.80	1.83	0.369	1.19 0.16	0.76 -0.24	1.67 0.53	Not significant
Quintile 5 (least disadvantage)	2.27	1.53	3.37	<0.001	2.23 0.78	1.47 0.41	3.08 1.15	Significant

***Supplementary 3: Standard vs. Bayesian logistic regression for general vaccine uptake**: Univariate regression analyses with possible predictors that influence general vaccine uptake, showing standard logistic regressions (left column) and Bayesian logistic regressions (right column). *Age variable is scaled to have a mean of 0 and unit standard deviation.*

Do you generally accept vaccines for yourself or for your children?								
	Standard logit				Bayesian logit			
	OR	95% confidence interval		P	OR Coef (median)	95% HPD interval		p
Vaccines are important (strongly agree v not strongly agree)	10.6	8.00	14.09	<0.001	10.17 2.31	7.49 2.04	13.07 2.59	Significant
Vaccines are safe (strongly agree v not strongly agree)	13.45	10.08	17.94	<0.001	12.85 2.54	9.36 2.27	16.56 2.83	Significant
Vaccines are effective (strongly agree v not strongly agree)	14.58	10.90	19.50	<0.001	13.91 2.62	9.93 2.33	17.92 2.91	Significant
Age (Continuous)*	1.59	1.40	1.80	<0.001	1.59 0.46	1.40 0.34	1.79 0.59	Significant
Sex (Males v Females)	0.93	0.73	1.18	0.543	0.94 -0.06	0.72 -0.30	1.18 0.18	Not significant (crosses 1 and 0)
Essential Worker (Yes v No) *Includes healthcare worker too	0.72	0.52	0.995	0.047	0.74 -0.32	0.52 -0.64	0.99 -0.01	Significant
Healthcare worker (Yes v No)	0.51	0.32	0.80	0.004	0.54 -0.64	0.32 -1.08	0.80 -1.18	Significant
Believe that participant is at high risk of COVID-19 (Yes v Not yes (No and I don't know/prefer not to answer))	1.40	0.97	2.01	0.070	1.41 0.33	0.92 -0.02	1.93 -0.70	Not significant
COVID-19 app (extremely likely to get vs. not extremely likely to get)	3.89	2.92	5.19	<0.001	3.84 1.33	2.83 1.05	4.99 1.62	Significant
Residential Area								
Rural/Country Area	(Ref)	-	-	-	-	-	-	-
Suburban/Regional	0.89	0.60	1.31	0.551	0.93 -0.08	0.62 -0.46	1.29 0.28	Not significant
Urban/City	0.85	0.56	1.28	0.425	0.89 -0.13	0.56 -0.54	1.25 0.25	Not significant
Flu Vaccination (over past 5 years)								
Never	(Ref)	-	-	-	-	-	-	-
Once or Twice	1.28	0.87	1.89	0.209	1.23 0.19	0.80 -0.19	1.69 0.55	Not significant
Three or Four	2.76	1.81	4.20	<0.001	2.61 0.94	1.63 0.54	3.69 1.34	Significant
Every year (five times)	10.55	7.25	15.36	<0.001	9.85 2.27	6.49 1.92	13.38 2.63	Significant
IRSD quintile (Socioeconomic status); Quintile 1 (Greater disadvantaged), Quintile 5 (Lack of disadvantage)								
Quintile 1 (greater disadvantage)	(Ref)	-	-	-	-	-	-	-
Quintile 2	1.15	0.75	1.77	0.528	1.15 0.12	0.71 -0.30	1.66 0.55	Not significant
Quintile 3	1.36	0.89	2.07	0.155	1.35 0.28	0.82 -0.12	1.91 0.70	Not significant
Quintile 4	1.20	0.79	1.82	0.388	1.20 0.17	0.77 -0.24	1.71 0.56	Not significant
Quintile 5 (least disadvantage)	2.11	1.41	3.15	<0.001	2.09 0.72	1.31 0.33	2.91 1.11	Significant

Australian arm of International COVID-19 Survey WAVE 3

Start of Block: Introduction

We are inviting you to complete this short 10-15 minute survey every couple of months, and the questions may change depending on new issues arising during the COVID-19 pandemic. You are welcome to complete only the surveys that you wish and by completing one survey does not mean that you have to do further surveys. You are free to withdraw at any time and you can choose not to answer any specific questions. If you have participated via an invitation from the Online Research Unit, then your previous surveys may be linked in a privacy preserving manner whereby you cannot be identified. We will not be collecting any information that we can use to identify you, so your responses remain completely anonymous.

We are the Australian arm of a group of over a 120 researchers from more than 30 countries. We are researchers at the Monash Centre for Health Research and Implementation at Monash University (https://www.monash.edu/medicine/sphpm/mchri/mchri). For this COVID-19 survey study we are affiliated with the Montreal Behavioural Medicine Centre (www.mbmc-cmcm.ca) and University of Quebec at Montreal and Concordia University in Canada. We want to understand people's awareness, attitudes, beliefs, and behaviours around COVID-19, which is also known as coronavirus or novel coronavirus, throughout the world. We also want to know how the pandemic is affecting different aspects of people's lives. To do this we are asking people from different countries to complete this survey. We also want to have a variety of different views, so anyone can complete the survey, no matter what your age, sex, or background is.
The survey will require about 15 minutes to complete. Please make sure you give yourself enough time, as you cannot save the survey and come back to it later. There are no risks associated with your participation to this study.

All data will be securely collected on servers at Monash University (Australia) and University of Quebec at Montreal (Canada). Respecting international data sharing agreements supported by the Fonds de la recherche du Québec (FRQ), the data from this study will be made available to study collaborators.

Researchers in the future will be able to request data access, in which case a data sharing agreement form will need to be signed alongside the lead researchers, and data provided will be anonymous. All copies of the study data will be stored on secure, password protected servers that can only be accessed by authorized individuals.

The main results from this study will be posted on the main study website (www.mbmc-cmcm.ca/covid19), where everyone will be able to access them.

If you have any questions about the study, please contact the Australian team through the project email: joanne.enticott@monash.edu. The current study has been approved by the Monash University Human Research Ethics Committee (MUHREC project: 24449). Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics Committee (MUHREC):

Tel: +61 3 9905 2052;

Fax: +61 3 9905 3831;

Email: muhrec@monash.edu;

Address: 26 Sports Walk, Clayton Campus Research Office, Monash University VIC 3800.

When answering the survey, please remember: A red asterisk (*) appears next to mandatory questions. If you do not wish to answer a mandatory question, please click "I don't know/I prefer not to answer" to continue. If you experience display issues with the survey, please try a different device and/or web browser.

If you consent to participate, please click on "Next".

You may have participated in a previous version of this survey from The Online Research Unit on behalf of Monash University. Do you give us consent to link your survey in a privacy preserving manner whereby you cannot be identified?

- ○ Yes (4)
- ○ No (5)

End of Block: Introduction

Start of Block: A. Information

A. Information

*

1. What is your postcode?*

_____

2. How would you describe your **sex**?

- Male (1)
- Female (2)
- Other (3)
- I prefer not to answer (4)

3. What is your age? (years old)

_____

Thank you for taking your time to attempt this survey. Unfortunately we are only looking for participants aged 18 and over

4. How many **adults** (aged 18 years old and over) live with you at home?

▼ 0 (4) ... 10+ (14)

5. How many **children** (aged under 18 years old) live with you at home

▼ 0 (14) ... 10+ (13)

Display This Question:

If 5. How many children (aged under 18 years old) live with you at home != 0

5. a) Are you a parent of any of these children?

- Yes (1)
- No (2)
- I prefer not to answer (3)

6. How would you describe your current employment status?

- Retired (1)
- Homemaker (9)
- Receiving social assistance or disability pay (2)
- Unemployed (3)
- Student (4)
- Part-time job (5)
- Full-time job (6)
- Self-employed (7)
- I don't know/I prefer not to answer (8)

7. Are you currently receiving **unemployment insurance / benefits**?

- No (1)
- Yes (2)
- I don't know/I prefer not to answer (3)

8. Are you an **essential service worker** as defined by your country (healthcare, police, etc)?

- No (1)
- Yes (2)
- I don't know/I prefer not to answer (3)

9. Are you a **healthcare worker**?

- No (1)
- Yes (2)
- I don't know/I prefer not to answer (3)

10. Do you have any form of **paid sick leave** from your job?

- No (1)
- Yes (2)
- I don't know/I prefer not to answer (3)

End of Block: A. Information

Start of Block: Participant is under 18 years old

Start of Block: B. REACTIONS TO COVID-19

B. REACTIONS TO COVID-19Different people, organizations, governments, and health authorities have recommended people do a variety of things to reduce and slow the spread of COVID-19 in the population.

11. For each of the following, please indicate what actions or behaviours your **government or local health authority has recommended**.

	Yes (1)	No (2)	I don't know/I prefer not to answer (3)
Hand washing with soap and water for 20 seconds (1)	○	○	○
Wearing a face mask in indoor spaces (shops, restaurants, public transit, at work) (3)	○	○	○
Wearing a face mask outside (7)	○	○	○
Staying at least 1-2 metres away from other people (8)	○	○	○
Staying/working at home rather than going to work or school (9)	○	○	○
Self-quarantining if you are returning from a trip (14)	○	○	○
Self-quarantining if you have or believe you have the virus (10)	○	○	○
Avoiding going out to bars/pubs/restaurants (17)	○	○	○
Avoiding large social gatherings (18)	○	○	○
Avoiding small social gatherings (19)	○	○	○
Avoiding indoor social gatherings (20)	○	○	○
Avoiding any non-essential travel (21)	○	○	○

12. To what extent do you believe that the measures asked of you by your government or local health authority **are important** to prevent and/or reduce the spread of COVID-19?

- Very important (1)
- Somewhat important (2)
- Not very important (3)
- Not important at all (4)
- I don't know/I prefer not to answer (5)

13. a) What do you think of the **actions taken** by your government or local health authority to prevent and/or reduce the spread of COVID-19?

- Too strict (1)
- About right (2)
- Too lenient (3)
- I don't know/I prefer not to answer (4)

13. b) How likely are you to download and install a **government COVID-19 tracing app** on your phone?

- ○ Extremely likely (1)
- ○ Somewhat likely (2)
- ○ Unlikely (3)
- ○ Very unlikely (4)
- ○ I don't know/I prefer not to answer (5)

14. Do you think your government or local health authority's actions are motivated by:

- ○ Mainly protecting people's health related to COVID-19 (1)
- ○ Generally protecting people's health related to COVID-19 and a little bit on protecting the economy (2)
- ○ Generally protecting the economy and a little bit on protecting people's health related to COVID-19 (3)
- ○ Mainly protecting the economy (4)
- ○ I don't know/I prefer not to answer (5)

15. Please indicate the **frequency with which you have adopted each action/behaviour** in response to the COVID-19 pandemic:

	Yes (1)	No (2)	I don't know/I prefer not to answer (3)
Hand washing with soap and water for 20 seconds (1)	○	○	○
Wearing a face mask in indoor spaces (shops, restaurants, public transit, at work) (3)	○	○	○
Wearing a face mask outside (7)	○	○	○
Staying at least 1-2 metres away from other people (8)	○	○	○
Staying/working at home rather than going to work or school (9)	○	○	○
Self-quarantining if you are returning from a trip (14)	○	○	○
Self-quarantining if you have or believe you have the virus (10)	○	○	○
Avoiding going out to bars/pubs/restaurants (17)	○	○	○
Avoiding large social gatherings (18)	○	○	○
Avoiding small social gatherings (19)	○	○	○
Avoiding indoor social gatherings (20)	○	○	○
Avoiding any non-essential travel (21)	○	○	○

16. Among the following local health authority or government measures to slow the spread of COVID-19, please rate the extent to which each one would **convince you to change your**

behaviours (e.g., practice physical distancing, avoid social gatherings, wear a facemask):

	To a great extent (1)	Somewhat (2)	Very little (3)	Not at all (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
Threat of fines (1)	○	○	○	○	○	○
Threat of arrest/jail (2)	○	○	○	○	○	○
Threat of institutional quarantine (e.g., in a hospital or care centre) (3)	○	○	○	○	○	○
Providing information on local infection/death rates (4)	○	○	○	○	○	○
Providing information about infection/death rates outside my country (5)	○	○	○	○	○	○
Providing information about the availability of healthcare resources (doctors, hospital beds, ventilators) to treat the sick (8)	○	○	○	○	○	○
Providing information about how your actions are slowing the spread of infection (9)	○	○	○	○	○	○

Providing information about how your actions are saving lives (10)	○	○	○	○	○	○
Providing information about how your actions are improving the economy (11)	○	○	○	○	○	○
Providing information about how your actions will help things 'get back to normal' quicker (12)	○	○	○	○	○	○

17. If you **are using** or **considering using** your governments' mobile/cell phone contact tracing application, which of the following has, or would, convince you to use it?

	To a great extent (1)	Somewhat (2)	Very little (3)	Not at all (4)	I don't know (5)	Not applicable (6)
If it is mandatory (e.g., a government requirement or as a part of my job) (1)	○	○	○	○	○	○
Knowing that using the application is helping slow down the spread of COVID-19 (2)	○	○	○	○	○	○
Being guaranteed that nobody will have access to my personal information, not even the government (3)	○	○	○	○	○	○
Knowing that if I have been exposed to someone who tested positive for COVID-19 as soon as possible (4)	○	○	○	○	○	○

End of Block: B. REACTIONS TO COVID-19

Start of Block: C. VIEWS SURROUNDING COVID-19

C. VIEWS SURROUNDING COVID-19In this section, we ask questions about your views surrounding COVID-19.

18. For each of the following, please rate the extent of your **concern** about each situation:
Because of COVID-19, I am concerned about …

	To a great extent (1)	Somewhat (2)	Very little (3)	Not at all (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
… being infected myself (1)	○	○	○	○	○	○
… the impact of being infected on my health, including dying (2)	○	○	○	○	○	○
… losing my job / family income (4)	○	○	○	○	○	○
… not having enough money for food and/or rent (6)	○	○	○	○	○	○
... gaining weight (16)	○	○	○	○	○	○
… going back to work or school (5)	○	○	○	○	○	○
… not being able to go to school or university (3)	○	○	○	○	○	○
… infecting other people I live with (7)	○	○	○	○	○	○
… infecting other people in the community (8)	○	○	○	○	○	○
… a person I live with being infected and/or dying (9)	○	○	○	○	○	○
… a family member I don't live with being infected and/or dying (10)	○	○	○	○	○	○
…not being able to see my friends, socialise (11)	○	○	○	○	○	○

…the healthcare system becoming overloaded/not being able to care for the sick (12)	○	○	○	○	○	○
… my country going into an economic recession/depression (14)	○	○	○	○	○	○
… how long it will take for things to go back to "normal" (13)	○	○	○	○	○	○
… there being more waves of COVID-19 infections in the future (15)	○	○	○	○	○	○

19. How many people do you **know personally**, that are or have **likely been infected?**

- ○ 0 (1)
- ○ 1 (2)
- ○ 2 to 4 (3)
- ○ 5 to 9 (4)
- ○ 10 or more (5)
- ○ I don't know/I prefer not to answer (6)

Display This Question:

If 19. How many people do you know personally, that are or have likely been infected? = 1

Or 19. How many people do you know personally, that are or have likely been infected? = 2 to 4

Or 19. How many people do you know personally, that are or have likely been infected? = 5 to 9

Or 19. How many people do you know personally, that are or have likely been infected? = 10 or more

20. Have any of these people been someone **that lives with you?**

- No (1)
- Yes (2)
- I don't know/I prefer not to answer (3)

Display This Question:

If 19. How many people do you know personally, that are or have likely been infected? = 1

Or 19. How many people do you know personally, that are or have likely been infected? = 2 to 4

Or 19. How many people do you know personally, that are or have likely been infected? = 5 to 9

Or 19. How many people do you know personally, that are or have likely been infected? = 10 or more

21. Of the people you **know personally** that were or likely were infected, how many have **passed away** due to COVID-19?

- 0 (1)
- 1 (2)
- 2 to 4 (3)
- 5 to 9 (4)
- 10 or more (5)
- I don't know/I prefer not to answer (6)

End of Block: C. VIEWS SURROUNDING COVID-19

Start of Block: D. VACCINATION

22. a) If a **vaccine** for COVID-19 were available today, what is the likelihood that you would get vaccinated?

- Extremely likely (1)
- Somewhat likely (2)
- Unlikely (3)
- Very unlikely (4)
- I don't know/I prefer not to answer (5)

22. b) Do you generally accept vaccines for yourself or for your children?

- Always (1)
- Mostly (2)
- Sometimes (3)
- Rarely (4)
- Never (5)

23. Have you received at least one dose of a COVID-19 vaccine?

- No (1)
- Yes (2)
- I prefer not to answer (3)

Display This Question:

If 23. Have you received at least one dose of a COVID-19 vaccine? = No

23. a) To what extent would the following influence your decision to get the COVID-19 vaccine?

	To a Great Extent (1)	Somewhat (2)	Very Little (3)	Not at All (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
Trusting the company who developed the vaccine (Pfizer, Moderna, Sinopharm, etc.) (1)	○	○	○	○	○	○
Having information that the vaccine is safe and unlikely to have any major long-term side effects (2)	○	○	○	○	○	○
Having information that the vaccine is effective (i.e., provides a high degree of protection) (3)	○	○	○	○	○	○
Believing that I am high risk of getting COVID-19 or suffering severe complications (4)	○	○	○	○	○	○
Hearing that other people have positive attitudes towards the vaccine (5)	○	○	○	○	○	○
Seeing more and more people getting the vaccine (6)	○	○	○	○	○	○

Learning that being vaccinated would allow me to attend public events (e.g., concerts, sporting events) or travel (7)	○	○	○	○	○	○
Wanting to contribute to high population rates of vaccination to achieve 'herd immunity' (8)	○	○	○	○	○	○
Getting a recommendation from my employer to get vaccinated (9)	○	○	○	○	○	○
Only needing one dose of the vaccine to be protected (10)	○	○	○	○	○	○
Believing that getting vaccinated would reduce my worries and anxiety (11)	○	○	○	○	○	○
Getting a recommendation from my doctor to get vaccinated (12)	○	○	○	○	○	○
Receiving the vaccine dose(s) according to the manufacturers' instructions (13)	○	○	○	○	○	○

The convenience of getting the vaccine (e.g., requires little time, no need to travel far) (14)	○	○	○	○	○	○
Knowing that getting vaccinated will help protect others around me (15)	○	○	○	○	○	○

Display This Question:

If 23. Have you received at least one dose of a COVID-19 vaccine? = Yes

23. b) To what did each of the following influence your decision to get the COVID-19 vaccine

	To a Great Extent (1)	Somewhat (2)	Very Little (3)	Not at All (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
Trusting the company who developed the vaccine (Pfizer, Moderna, Sinopharm, etc.) (1)	○	○	○	○	○	○
Having information that the vaccine is safe and unlikely to have any major long-term side effects (2)	○	○	○	○	○	○
Having information that the vaccine is effective (i.e., provides a high degree of protection) (3)	○	○	○	○	○	○
Believing that I am high risk of getting COVID-19 or suffering severe complications (4)	○	○	○	○	○	○
Hearing that other people have positive attitudes towards the vaccine (5)	○	○	○	○	○	○
Seeing more and more people getting the vaccine (6)	○	○	○	○	○	○

Learning that being vaccinated would allow me to attend public events (e.g., concerts, sporting events) or travel (7)	○	○	○	○	○	○
Wanting to contribute to high population rates of vaccination to achieve 'herd immunity' (8)	○	○	○	○	○	○
Getting a recommendation from my employer to get vaccinated (9)	○	○	○	○	○	○
Only needing one dose of the vaccine to be protected (10)	○	○	○	○	○	○
Believing that getting vaccinated would reduce my worries and anxiety (11)	○	○	○	○	○	○
Getting a recommendation from my doctor to get vaccinated (12)	○	○	○	○	○	○
Receiving the vaccine dose(s) according to the manufacturers' instructions (13)	○	○	○	○	○	○

The convenience of getting the vaccine (e.g., requires little time, no need to travel far) (14)	○	○	○	○	○	○
Knowing that getting vaccinated will help protect others around me (15)	○	○	○	○	○	○

24. If you got, or when you get, the COVID-19 vaccine, do you intend to continue engaging in other virus-protective behaviours (e.g., mask wearing, social distancing)?

- ○ Most of the time (1)
- ○ Some of the time (2)
- ○ Seldom (3)
- ○ Never (4)
- ○ I don't know/prefer not to answer (5)

25. Over the past 5 years, how many times have you received the **seasonal flu vaccine**?

- Every year (1)
- At least 3 out of the past 5 years (2)
- Once or twice (3)
- Never (4)
- I don't know/I prefer not to answer (5)
- Not applicable (6)

26. Did you get the seasonal flu vaccine for the current flu season?

- Yes (1)
- No (2)
- I don't know/I prefer not to answer (3)
- Not applicable in my country (4)

27. Please indicate your response to the following statements:

	Strongly agree (1)	Tend to agree (2)	Do not know (6)	Tend to disagree (7)	Strongly disagree (8)
Vaccines are important for children to have (1)	○	○	○	○	○
Overall I think vaccines are safe (2)	○	○	○	○	○
Overall I think vaccines are effective (3)	○	○	○	○	○
Vaccines are compatible with my religious beliefs (4)	○	○	○	○	○

End of Block: D. VACCINATION

Start of Block: E: IMPACTS OF COVID-19

D: IMPACTS OF COVID-19

28. COVID-19 has affected several aspects of people's lives. Please rate the extent to which COVID-19 has impacted the following aspects of your life:

	To a great extent (1)	Somewhat (2)	Very little (3)	Not at all (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
…I have felt nervous, anxious, or worried (1)	○	○	○	○	○	○
…I have felt sad, depressed, or hopeless (2)	○	○	○	○	○	○
…I have felt lonely and isolated (3)	○	○	○	○	○	○
…I have felt irritable, frustrated or angry (4)	○	○	○	○	○	○
... I have felt worried about my body weight (22)	○	○	○	○	○	○
… I have cancelled medical appointments or using hospital emergency services for a non-COVID-related problem (6)	○	○	○	○	○	○
…I have lost my job or had to close my business (11)	○	○	○	○	○	○
…I have had my job hours cut/lost income (12)	○	○	○	○	○	○
... I am working more than before COVID-19 (23)	○	○	○	○	○	○
…I have been unable to pay my rent/mortgage (13)	○	○	○	○	○	○
…I have been unable to pay for food (14)	○	○	○	○	○	○

…I have had more physical fights or arguments with family members I live with (15)	○	○	○	○	○	○
…I have had trouble getting non-COVID-19 related medical care (20)	○	○	○	○	○	○
…my country has gone into an economic recession/depression (21)	○	○	○	○	○	○
…someone close to me has passed away due to COVID-19 (5)	○	○	○	○	○	○

29. In general, how have the following behaviours changed since the start of COVID-19?

	I do this a lot more (1)	I do this more (2)	I do this as much as before (3)	I do this less (4)	I do this a lot less (5)	I don't do this (6)	I don't know/I prefer not to answer (7)
Doing physical activity (1)	○	○	○	○	○	○	○
Eating a healthy diet (2)	○	○	○	○	○	○	○
Drinking alcohol (3)	○	○	○	○	○	○	○
Smoking cigarettes (4)	○	○	○	○	○	○	○
Vaping or using electronic cigarettes (5)	○	○	○	○	○	○	○
Using recreational drugs (e.g., marijuana, cocaine, opioids, hallucinogens, etc.) (6)	○	○	○	○	○	○	○

30. Since the start of the COVID-19 pandemic my body weight has_____:

- Increased a lot (1)
- Increased a little (2)
- Remained the same (3)
- Decreased a little (4)
- Decreased a lot (5)
- I don't know/ I prefer not to answer (6)

31. How has your **overall quality of life changed** as a result of the COVID-19 pandemic?

- It's gotten much better (1)
- It's gotten better (2)
- It's remained the same (3)
- It's gotten worse (4)
- It's gotten much worse (5)
- I don't know/I prefer not to answer (6)

Display This Question:

If 5. How many children (aged under 18 years old) live with you at home != 0

32. How have the changes in your children's schooling impacted your work?

- ○ There has been no change to my work because of my children's schooling (1)
- ○ I am working the same hours but my schedule has changed a lot because of my children's schooling (2)
- ○ I am still working, but I have had to reduce my hours because of my children's schooling (4)
- ○ I have stopped working because of my children's schooling (5)
- ○ I am still working, but I have had to increase my hours because of my children's schooling (6)
- ○ I don't know/I prefer not to answer (7)

End of Block: E: IMPACTS OF COVID-19

Start of Block: F: SOURCES OF COVID-19 INFORMATION

E: SOURCES OF COVID-19 INFORMATIONIn this section, we ask about the sources of information you rely on for your information on COVID-19.

33. Among the following sources of information about COVID-19, please rate the extent to which you consult each of these to get your information about COVID-19:

I get most of my COVID-19 information from …

	To a great extent (1)	Somewhat (2)	Very little (3)	Not at all (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
… My workplace (1)	○	○	○	○	○	○
… Local/national/global news (newspapers, television, radio, online) (2)	○	○	○	○	○	○
ABC specific broadcasting (radio and television, and online) (10)	○	○	○	○	○	○
… My doctor or healthcare professional (3)	○	○	○	○	○	○
… My health authorities and government (4)	○	○	○	○	○	○
… My National leader (5)	○	○	○	○	○	○
… A community/religious/cultural leader (6)	○	○	○	○	○	○
… The World Health Organization (WHO) (7)	○	○	○	○	○	○
… The scientific literature (8)	○	○	○	○	○	○
… Other people or groups via social media or the internet (9)	○	○	○	○	○	○

34. Among the following sources of information about COVID-19, please rate the extent to which you consult each of these to get your information about COVID-19:

	To a Great Extent (1)	Somewhat (2)	Very Little (3)	Not at All (4)	I don't know/I prefer not to answer (5)	Not applicable (6)
Word of mouth (1)	○	○	○	○	○	○
Television news (2)	○	○	○	○	○	○
Radio news (3)	○	○	○	○	○	○
Newspapers (4)	○	○	○	○	○	○
Internet news (5)	○	○	○	○	○	○
Social media (6)	○	○	○	○	○	○

End of Block: F: SOURCES OF COVID-19 INFORMATION

Start of Block: G. CURRENT HEALTH STATUS

F. CURRENT HEALTH STATUS

35. To your knowledge, has a doctor or healthcare professional told you that you have any of the following health conditions?

	Yes (1)	No (2)	I don't know/I prefer not to answer (3)
Any heart disease or history of heart attack or stroke (1)	○	○	○
Any chronic lung disease (e.g., asthma, chronic obstructive pulmonary disease, COPD/emphysema/chronic bronchitis) (2)	○	○	○
Active/current cancer (3)	○	○	○
Hypertension (high blood pressure) (4)	○	○	○
Diabetes (high blood sugar) (5)	○	○	○
Severe obesity (6)	○	○	○
Any autoimmune disease (e.g., lupus, multiple sclerosis, rheumatoid arthritis, psoriasis, Crohn's disease, inflammatory bowel disease) (7)	○	○	○
Other condition that compromises the immune system (e.g., organ transplant recipient, on immunosuppressant medications) (8)	○	○	○
Any depressive disorder (e.g., major depression) (9)	○	○	○
Any anxiety disorder (e.g., panic disorder, generalized anxiety disorder, post-traumatic stress disorder) (10)	○	○	○
Alzheimer's or dementia (11)	○	○	○

36. Do you think you have been **infected** with COVID-19?

- ○ No (1)
- ○ Yes, but I have recovered (2)
- ○ Yes, and I am still having symptoms (3)
- ○ I don't know/I prefer not to answer (4)

37. Do you think you are at a high risk of being infected with COVID-19 in the future?

- ○ No (1)
- ○ Yes (2)
- ○ I don't know/ I prefer not to answer (3)

38. Have you tried getting **tested** for the virus?

- ○ No (1)
- ○ Yes, and I got tested (2)
- ○ Yes, but I did not get tested (3)
- ○ I don't know/I prefer not to answer (4)

Display This Question:

If 38. Have you tried getting tested for the virus? = Yes, and I got tested

38. a) Why did you try to get tested for the virus (check all that apply)?

- ☐ I had symptoms of COVID-19 (fever, cough, sore throat, sneezing) (1)
- ☐ I provided care for person(s) with COVID-19 (probable or confirmed) (2)
- ☐ I had close contact with a person with COVID-19 (probable or confirmed) (3)
- ☐ I returned from international travel (4)
- ☐ I was worried and wanted peace of mind (5)
- ☐ Other (6) _____
- ☐ I don't know/I prefer not to answer (7)

Display This Question:

If 38. Have you tried getting tested for the virus? = Yes, and I got tested

38. b) What was the **result** of your test?

- ○ COVID-19 positive (1)
- ○ COVID-19 negative (2)
- ○ I am still waiting for my result (3)
- ○ I don't know/I prefer not to answer (4)

End of Block: G. CURRENT HEALTH STATUS

Start of Block: H. HEALTH BEHAVIOURS

G. HEALTH BEHAVIOURS

39. Have you ever **smoked regular tobacco cigarettes**?

- Never (1)
- In the past (ex-smoker) (2)
- I smoke occasionally (3)
- I smoke daily (4)
- I don't know/I prefer not to answer (5)

40. Do you currently use any **vaping or electronic cigarettes products**?

- No (1)
- Yes, occasionally (2)
- Yes, daily (3)
- I don't know/I prefer not to answer (4)

41. In general, how would you rate your **health behaviours** compared to the average person in your country?

	I do it a lot more than most (1)	I do it more than most (2)	I do this about the same as most (3)	I do this less than most (4)	I don't do this (5)	I don't know/I prefer not to answer (6)
Doing physical activity (1)						
Eating a healthy diet (2)						
Drinking alcohol (3)						

End of Block: H. HEALTH BEHAVIOURS

Start of Block: I. SCHOOL RELATED ISSUES

Display This Question:

If 6. How would you describe your current employment status? = Student

42. Are you currently going to school or university?

- I am only attending school or university in person (same as pre-COVID) (1)
- I am attending school or university in person and online (2)
- I am only attending school or university online (3)
- I am not currently at school or university (4)
- I don't know/I prefer not to answer (5)

Display This Question:

If 6. How would you describe your current employment status? = Student

43. What do you think of your school or university's measures to prevent the spread of COVID-19?

- There are no COVID-19 specific prevention measures (1)
- The measures are too lenient (2)
- The measures are just about right (3)
- The measures are too strict (4)
- I don't know/I prefer not to answer (5)

Display This Question:

If 42. Are you currently going to school or university? = I am only attending school or university in person (same as pre-COVID)

Or 42. Are you currently going to school or university? = I am attending school or university in person and online

44. How is attending school or university **in person** impacting you? Please rate each statment.

	To a Great Extent (1)	Somewhat (2)	Very Little (3)	Not at All (4)	I don't know/I prefer not to answer (5)
I am concerned about catching COVID at school or university (1)	○	○	○	○	○
I feel happy about being at school or university (2)	○	○	○	○	○
I feel angry, irritable, or frustrated about being at school or university (3)	○	○	○	○	○
I feel relaxed about being at school or university (4)	○	○	○	○	○
My mental health has gotten worse (5)	○	○	○	○	○
My mental health has improved (9)	○	○	○	○	○
My physical health has gotten worse (6)	○	○	○	○	○
My physical health has improved (7)	○	○	○	○	○
I have been able to have more interactions with my friends (8)	○	○	○	○	○

Display This Question:

If 42. Are you currently going to school or university? = I am only attending school or university in person (same as pre-COVID)

Or 42. Are you currently going to school or university? = I am attending school or university in person and online

And 36. Do you think you have been infected with COVID-19? = Yes, but I have recovered

Or 36. Do you think you have been infected with COVID-19? = Yes, and I am still having symptoms

45. Do you think that you have caught COVID-19 from someone at your school or university?

- Yes (1)
- No (2)
- I don't know/ I prefer not to answer (3)

46. How do you think attending school or university **in person** might impact you? Please rate each statement

	To a Great Extent (1)	Somewhat (2)	Very Little (3)	Not at All (4)	I don't know/I prefer not to answer (5)
I am concerned about catching COVID at school or university (1)					
I feel happy about being at school or university (2)					
I feel angry, irritable, or frustrated about being at school or university (3)					
I feel relaxed about being at school or university (4)					
My mental health has gotten worse (5)					
My mental health has improved (9)					
My physical health has gotten worse (6)					
My physical health has improved (7)					
I have been able to have more interactions with my friends (8)					

End of Block: I. SCHOOL RELATED ISSUES

Start of Block: J. DEMOGRAPHICS

H. DEMOGRAPHICS:

47. What **region/province/state/county** do you live in?

_____

48. In what type of **area** do you live?

- ○ Rural/Country area (1)
- ○ Suburban/Regional (2)
- ○ Urban/City (3)
- ○ I don't know/I prefer not to answer (4)

49. In what **city or town** do you live?

_____

Display This Question:

If 2. How would you describe your sex? = Female

50. a) Are you currently **pregnant**?

- ○ I don't know/I prefer not to answer (1)
- ○ No (2)
- ○ Yes (3)

Display This Question:

If 50. a) Are you currently pregnant? = Yes

50. a) i. How many weeks have you been pregnant? (weeks)

_____

Display This Question:

If 50. a) Are you currently pregnant? = Yes

50. a) ii. How concerned are you about your unborn baby being infected?

- ○ To a great extent (1)
- ○ Somewhat (2)
- ○ Very little (3)
- ○ Not at all (4)
- ○ I don't know/I prefer not to answer (5)

Display This Question:

If 50. a) Are you currently pregnant? = Yes

50. b) ii. How concerned are you about your unborn baby being infected?

- To a great extent (1)
- Somewhat (2)
- Very little (3)
- Not at all (4)

51. How would you describe your **ethnicity** (optional)?

_____

52. What is your perception of your average annual **household income** relative to others in your country?

- Bottom third (1)
- Middle third (2)
- Top third (3)
- I don't know/I prefer not to answer (4)

53. Prior to the COVID-19 pandemic, how would you describe your **employment status**?

- Retired (1)
- Homemaker (9)
- Receiving social assistance or on disability pay (2)
- Unemployed (3)
- Student (4)
- Part-time job (5)
- Full-time job (6)
- Self-employed (7)
- I don't know/I prefer not to answer (8)

54. What is your highest level of **completed education**?

- Primary school or less (1)
- Secondary/high school (2)
- TAFE (7)
- University degree (3)
- Graduate/Postgraduate degree (4)
- I have never been to school (5)
- I don't know/I prefer not to answer (6)

55. Were you receiving unemployment insurance / benefits?

- ○ No (1)
- ○ Yes (2)
- ○ I don't know/I prefer not to answer (3)

56. Prior to the pandemic, how many **hours** per week did you work/go to school? (hours)

_____

57. Prior to the COVID-19 pandemic, how would you best describe your primary **job sector**?

- ○ Professional (health, physical/earth science/engineering professionals, teacher/university professor, business/sales and marketing professional, software developer, legal, clergy, author, journalist, performing artist) (1)
- ○ Manager (chief executive, administrative manager, production and sales, hospitality and retail manager) (2)
- ○ Technician or associate professional (in field of health, engineering, business, legal, social, or information/communications) (3)
- ○ Clerical support worker (office clerk, secretary, customer service clerks) (4)
- ○ Service and sales worker (travel agent, cook, hair dresser/barber, retail sales, cashier, personal care worker) (5)
- ○ Skilled agricultural, forestry and fishery worker (6)
- ○ Craft and related trades worker (builders, machinists, electricians, printing, food processing) (7)
- ○ Plant and machine operator and assembler (includes truck drivers) (8)
- ○ Elementary occupations (cleaner, helper, agricultural laborer, transport laborer, street vendor, refuse worker) (9)
- ○ Armed forces occupations (commissioned and non-commissioned) (10)
- ○ Other (11)
- ○ I don't know/I prefer not to answer (12)

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58. Would you like to participate in further research?

- ○ Yes (1)
- ○ No (2)
- ○ I prefer not to answer (3)

End of Block: J. DEMOGRAPHICS

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1,2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*8-9*
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	10
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	9
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	10-11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 3

		(*b*) Report category boundaries when continuous variables were categorized	Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.