Describing Australia's COVID-19 vaccine success, and ongoing challenges: October 2021

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The survey data is available for download through the Australian Data Archive (doi:10.80408/H6AQQE).

Abstract

The aim of this paper is to use longitudinal data from the ninth wave of the ANU Impact Monitoring Survey program (collected in October 2021) to answer four key research questions related to vaccination in Australia: What are the factors associated with the relatively high vaccine uptake achieved in Australia? What are the remaining concerns for those who haven't been vaccinated and can extra information shift these attitudes? What is the expected likelihood of individuals taking a booster or third-dose vaccine? and What are the factors associated with booster willingness?

Results confirm that vaccine rates are low in the states territories that did not experience significant lockdowns during the third wave of COVID-19 infections in Australia. Controlling for these differences, we also find that education and the socioeconomic status of the area in which a person lives to be the main determinant of vaccine uptake.

Side effects are now the overwhelming main concern for the remaining unvaccinated. An experiment using different types of information messages shows the importance of getting these right, as we find that they can have adverse effects on the attitudes among the remaining unvaccinated.

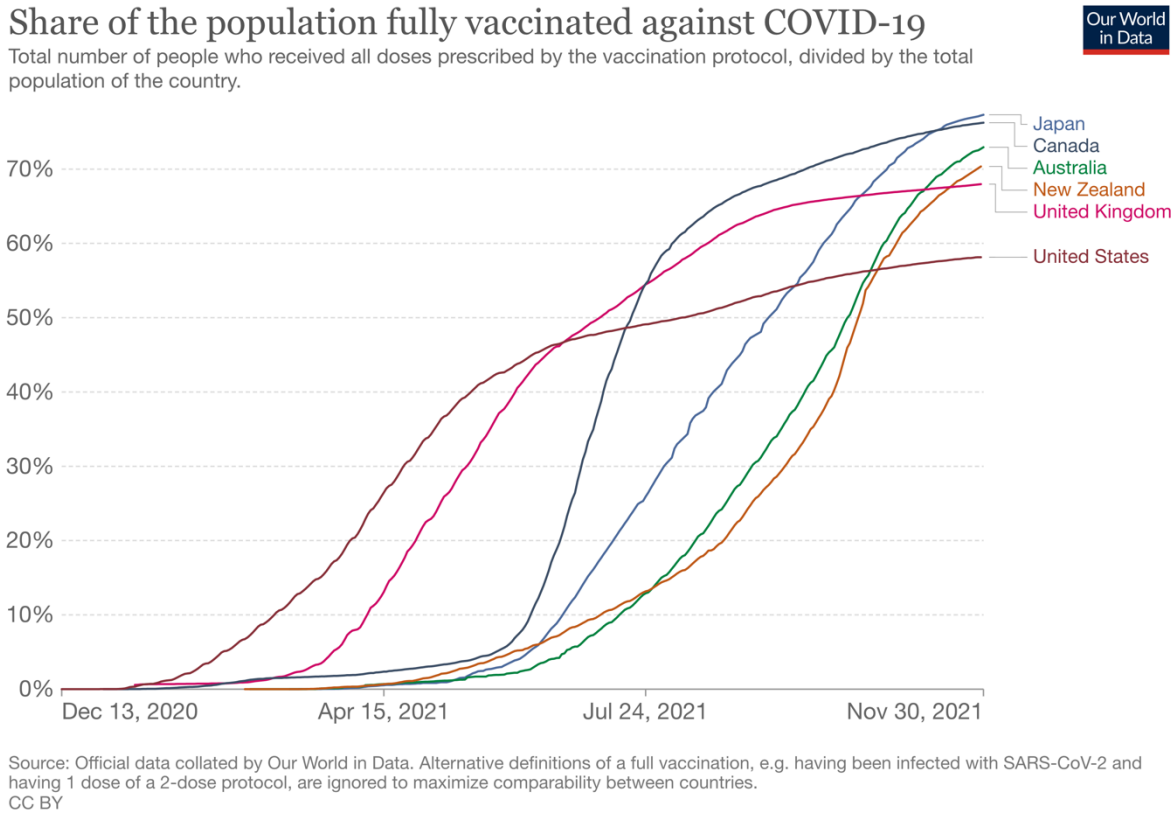
Focusing on boosters, we find that Australians are very willing to receive a COVID-19 booster when it is recommended for them to take one – 71.9 per cent of vaccinated adults say that they would definitely get a booster vaccine when recommended. Males, younger Australians, those who live outside of advantaged areas, those who have not completed Year 12, those who a language other than English, and those who have had their first dose vaccination relatively recently are all less willing to receive a booster vaccine. In a further information experiment we find that some message can have negative effects on the booster attitude.

1 COVID-19 infection and vaccination in Australia

On the 24th of May, 2021, the UK, US, and Canada were all estimated to have had more than 50 per cent of their population receive at least one vaccination dose against COVID-19 (Figure 1). By contrast, only 12.6 per cent of Australians had received a single vaccine dose with a far smaller share of the population (1.7 per cent) having received two doses.

If we fast forward to late November, 72.9 per cent of Australians were estimated to have received two COVID-19 vaccine doses (Figure 1), well above the 58.1 per cent estimated for the US, pulling away from the 68.0 per cent estimated for the UK, and converging on the 76.2 per cent double dose vaccination rate estimated in Canada. Even New Zealand (70.4 per cent), which had briefly overtaken Australia after a similarly slow start, had fallen behind in the push to achieve near universal vaccine coverage with Japan the only country amongst the ones listed to be above Australia in double dose vaccination (77.3 per cent) and increasing at a roughly similar rate.

Figure 1 Vaccination rates for selected countries including Australia – December 2020 to December 2021



This is a remarkable achievement over a short period of time, and not one that was in any way predictable at the time the vaccine roll-out was taking place. Not only were COVID-19 hesitancy rates relatively high at the start of the roll-out period and immediately prior (Biddle et al. 2021), but other vaccination rates weren't necessarily higher pre-COVID in Australia compared to other countries. According to the Organisation for Economic Co-operation and Development (OECD),[1] 56.2 per cent of Australians aged 65 years and over in 2019 had received a flu vaccination. This was below the UK, US, New Zealand, and Canada (in that order) for that year. Australia's childhood vaccination rate[2] was similar to or above those countries in 2018, but still

around the OECD average.

At the time of writing, Australia continued to have low confirmed COVID-19 cases relative to the US, UK and Canada, slightly higher cases than New Zealand, and substantially higher cases than Japan. However, recent attention has focused on the Omicron variant, the thirteenth variant of concern identified by the World Health Organisation. Very little information was known about the variant,[3] though initial indicators suggest a high transmissibility rate with a low severity. Emerging evidence also suggests that the new Omicron variant has high breakthrough infection rates among a vaccinated population, though it should be noted that there is significant uncertainty on that issue as well.[4] The Australian policy response to the new variant has been limited to a delay on the opening of borders to non-residents for an initial two weeks, though the policy response may change very quickly. Much more data is required to confirm these two initial indications, including whether the current vaccinations approved for use in Australia have the same effectiveness against Omicron.

One of the policy discussions in Australia that has risen to greater prominence due to the emergence of a new COVID-19 variant is the administration of booster or 'third doses.' The current eligibility for boosters stipulates[5] that 'You are eligible for a COVID-19 booster dose if: you are 18 years and older, and have had your second dose of your primary dose course of COVID-19 vaccination at least 6 months ago.' The Department of Health also advises that 'Booster doses are not mandatory, however they are recommended to maintain immunity against COVID-19.' At the current point in time (as of November 30th, 2021) there had only been 1.74 booster doses administered per 100 Australians, compared to 3.12 in Canada, 12.2 in the US, and 26.7 in the UK.

While there is solid evidence that boosters can benefit the individual who receives it, from a global and regional public health perspective it is unclear whether a limited supply of vaccines should be administered to those who have already received two vaccinations, or whether they should be prioritised for those who are yet to have been vaccinated (Schaefer 2021). Within Australia, however, it no longer appears that vaccine supply presents the same problems that it did in early-mid 2021.

At this current point in time, there are three key research questions related to vaccination in Australia:

- What are the factors associated with such high vaccine uptake?
- What is the expected likelihood of individuals taking a booster or third-dose vaccine and what factors are associated with booster willingness?
  and
- What type messaging can help reduce vaccine hesitance either towards first dose or boosters?

To help answer these questions, in October 2021 the Social Research Centre collected the 48th wave of the ANUpoll series of surveys on behalf of the ANU Centre for Social Research and Methods, which was the ninth wave of the ANU Centre for Social Research and Methods' COVID-19 Impact Monitoring survey program. Respondents are from the Life in Australia™ panel, Australia's only probability-based source of online and offline survey participants.

The October 2021 survey collected data from 3,474 Australians aged 18 years and over. The data collection occurred between the 12th and 26th of October 2021 with 54.0 per cent of the

eventual sample completing the survey on the 13th or 14th of October. The vast majority (96.8 per cent) of interviews were completed online with 3.2 per cent being completed over the phone. More detail on the survey is available in Appendix 1, and the survey data is available for download through the Australian Data Archive (doi:10.80408/H6AQQE).

Surveys had also been conducted with the same group of respondents in January and February 2020, just before the COVID-19 pandemic started in Australia; as well as in April, May, August, October, and November 2020 after the pandemic started to cause major impacts in Australia, as well as during and just after the second wave of infections that were concentrated on Victoria. In 2021, data was collected in January, April and August, which combined allows us to track how outcomes have changed for the same group of individuals from just prior to COVID-19 impacting Australia, as well as during the most impactful times for the country. Questions related to COVID-19 vaccines were asked in August 2020, as well as January, April and August 2021.

The structure of the remainder of the paper is as follows. In the next section, we analyse the determinants of vaccine uptake, with a particular focus on demographic, socioeconomic and geographic differences. We also include some information on the views of those who have not been vaccinated, including a short survey experiment. In Section 3 we focus on attitudes towards booster vaccination and run a further survey experiment, with Section 4 providing some concluding comments.

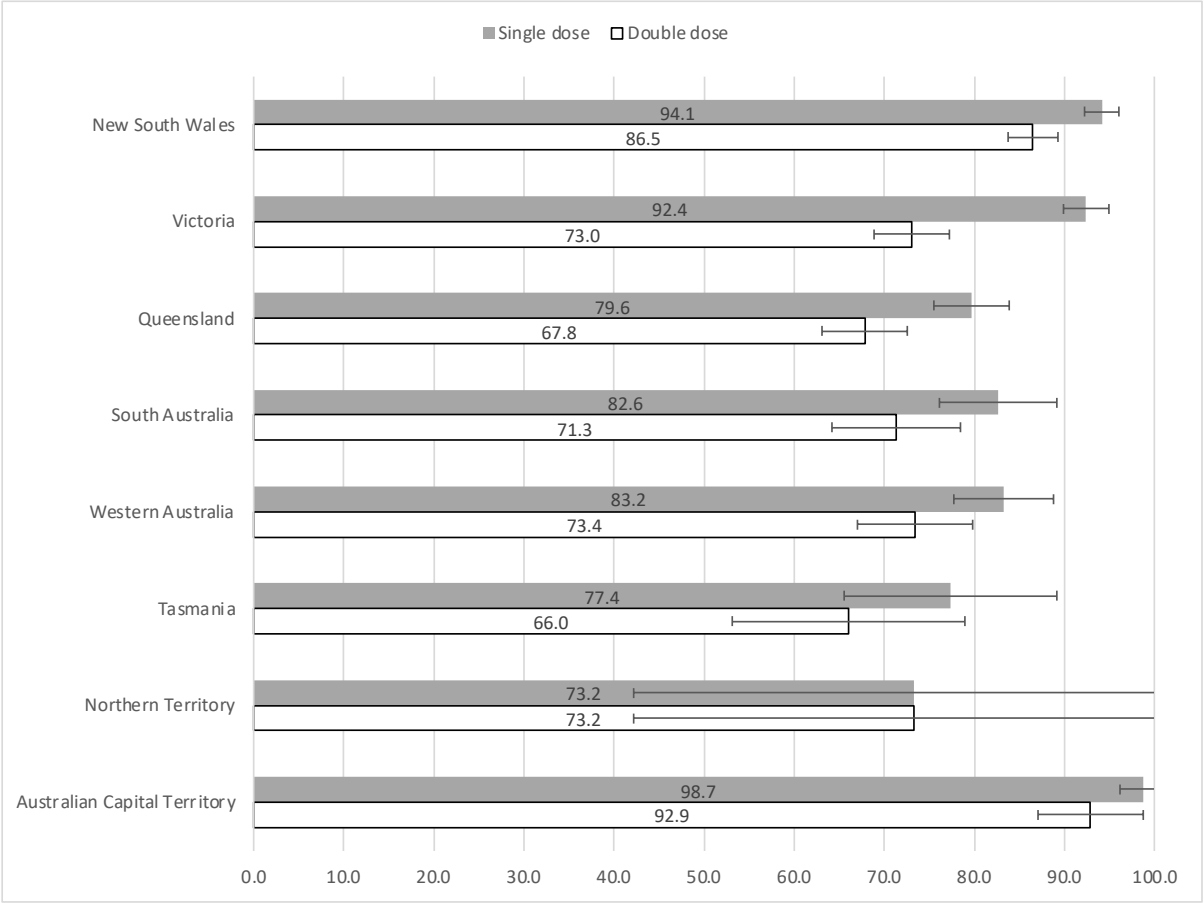
2 Determinants of vaccine uptake

In the October 2021 ANUpoll, 88.4 per cent of the weighted sample of adults aged 18 years and over had received at least one COVID-19 vaccine, with a total of 76.3 per cent having received both doses. This is a higher vaccination rate than the overall population percentage at that point in time presented in Figure 1 due to the focus on the adult population, as well as a potential correlation between those who are willing to participate in online surveys and those who are willing to be vaccinated. However, the change through time from the August 2021 ANUpoll when 57.2 per cent of the weighted sample had received at least one dose (and 32.3 per cent were double dosed) is consistent with the official figures.

Of those who had received at least one vaccination, 57.4 per cent had received the Pfizer vaccine, 39.6 per cent had received Astra Zeneca, 2.1 per cent had received Moderna, 0.2 per cent had received a mixed schedule, and 0.7 per cent did not know what vaccine they had received.

As discussed in a previous paper in this series using the October 2021 ANUpoll data (Biddle and Gray 2021), at the time of data collection three jurisdictions in Australia at that time were emerging from a long period of lockdowns – New South Wales, Victoria, and the Australian Capital Territory (ACT). These jurisdictions also had ongoing high COVID-19 case numbers, relative to previous times in Australia though not compared to most of North America and Europe. The other states and territories at the time had very few COVID-19 cases with the virus not appearing to be circulating within the community. They did, however, have restrictions on travel from the three jurisdictions, with all of Australia essentially closed to international travel. It is not surprising then that there were very different vaccination rates across jurisdictions (Figure 2) with those jurisdictions where COVID-19 was present having much higher vaccination rates than those where perceived risk was much lower.

Figure 2 Vaccination rates by state/territory – October 2021.



Source: ANUpoll: October 2021.

2.1 Factors associated with vaccine uptake

In Table 1, we analyse in more detail the factors associated with vaccine uptake. Because the dependent variable takes one of two values (vaccinated versus unvaccinated) a binary probit model is estimated. Results are presented in the table as marginal effects, or the difference in the predicted probability of being vaccinated for an individual with that characteristic compared to the baseline characteristics, holding all else constant.

As of October 2021, there were four key demographic, geographic, and socioeconomic variables that predicted vaccine uptake. Older Australians (aged 65 years and over) were more likely to have been vaccinated than the base case age group (35 to 44 years) who were in turn more likely to have been vaccinated than those aged 24 to 34 years. These differences are in part due to the vaccine eligibility process in Australia, where the initially limited supply of vaccines was rationed towards older age groups.

The second key determinant of vaccine uptake was education, and particularly post-school qualifications. Specifically, those Australians with a postgraduate degree were estimated to have a vaccination rate that was 3.6 percentage points higher than an otherwise identical person with no qualifications, and a person with a bachelor degree had a vaccination rate that was 2.7 percentage points higher.

The third factor that was associated with vaccine uptake was the socioeconomic characteristics of the area in which a person lived (as measured by the Socioeconomic Indexes for Areas or SEIFA variable). Compared to those who live in an area in the middle part of the socioeconomic

distribution, those who live in the most advantaged area had a vaccination rate that was 3.4 percentage points higher.

Combined, the education and SEIFA results suggest that socioeconomic status matters. There are a number of potential policy responses to these findings. If there is likely to be, as has been experienced in other countries, a 'pandemic of the unvaccinated' then it will be experienced by those with low education and those who live in low socioeconomic areas low income. Other protective measures may be required for these groups. A further policy implication is that messages and targeted policy interventions may benefit from being tested and focused on those groups with low current vaccine uptake. The messenger for these policy interventions may also need to be someone who is trusted or more salient for these groups.

The final set of factors associated with vaccine uptake confirms and expands the jurisdictional analysis in Figure 2. We include three geographic variables based on a combination of state/territory and capital city location. The base case is those that live in one of the three COVID-impacted south-east jurisdictions in a capital city. That is, Sydney, Melbourne or Canberra. We then include variables for those who live in another capital city, those who live in a non-capital city in a different jurisdiction, and those who live outside a capital city, but in New South Wales or Victoria. We show that all three combinations of geography have a lower uptake than the base case, with a 15.1 percentage point lower rate in other capital cities and a 16.2 percentage point lower rate in the rest of those jurisdictions. The difference between regional New South Wales/Victoria and the COVID-impacted capital cities is smaller (5.7 percentage points), but it is still statistically significant. Given many COVID-19 restrictions are set at the state/territory level, including internal mobility, the latter group may be particularly at risk since lockdown restrictions have eased but the virus is circulating in the community. These areas do not have the vaccine-induced immunity that their capital city counterparts do.

In addition to the variables that were statistically significant, it is also important to know those characteristics that do not have a significant relationship. In particular, there was no difference between males and females, no difference between those who speak a language other than English and those who speak English only, and no difference between those who live in the most disadvantaged suburbs and those in the middle part of the distribution. This is despite these variables being significant in previous waves either in terms of vaccine uptake or vaccine willingness and can be seen as a success of vaccine penetration in the Australian context.

2.2 Views of the unvaccinated

Despite there being only a small proportion of Australians who in mid-October had not been vaccinated, a less than 100 per cent vaccination rate can still increase risk of severe disease for the individuals who aren't vaccinated as well as those who are immune suppressed or vulnerable in other ways. Increased transmission among the unvaccinated are of concern, this is particularly the case when the unvaccinated are geographically or socially clustered, which Table 1 showed to be the case. Those who had not been vaccinated were asked 'Would you take a COVID-19 vaccine approved for use in Australia if offered?' with four potential response options – definitely, probably, probably not, and definitely not.

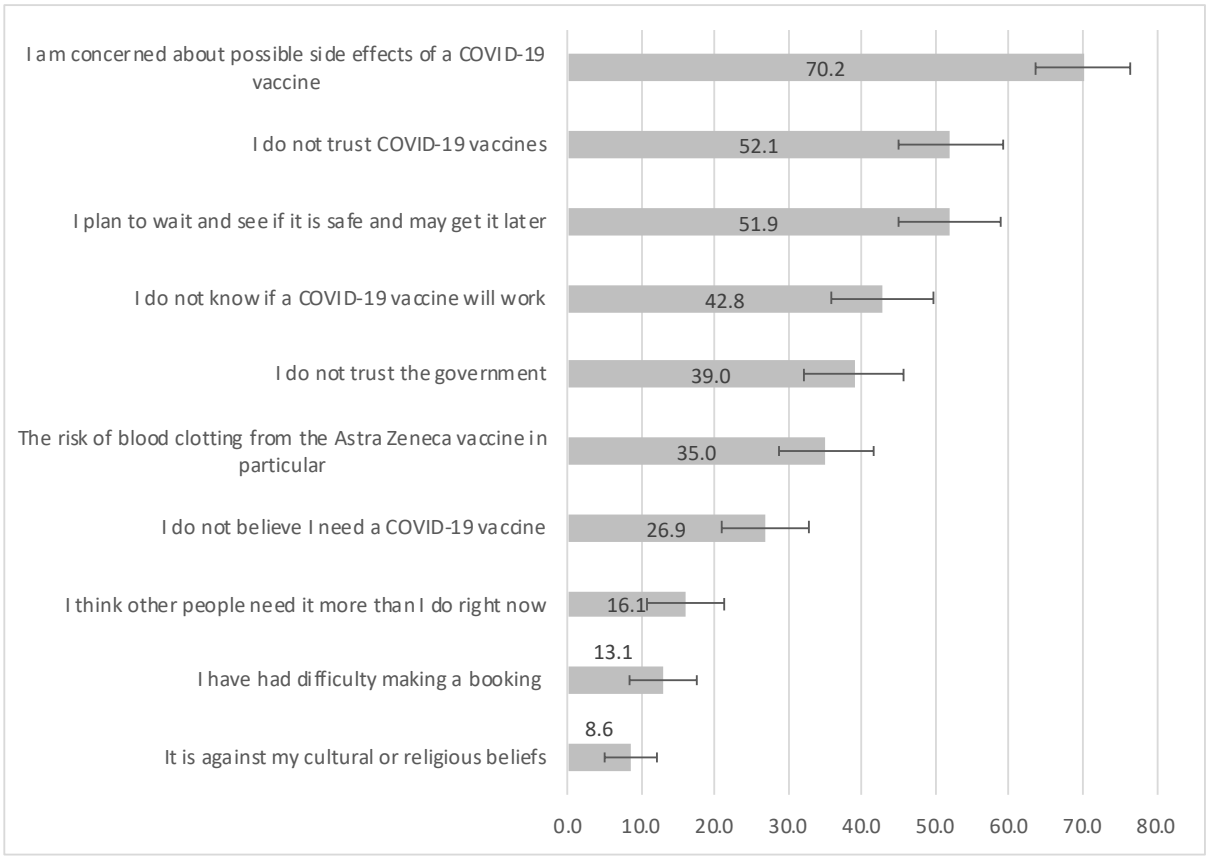
Perhaps not surprisingly given the fact that respondents have had a number of months to be vaccinated, the 291 respondents who were asked about their vaccine willingness were not inclined to get vaccinated. The most common response given by 33.0 per cent of the (weighted) respondents was probably not, with a further 29.9 per cent saying that they would definitely not get vaccinated. This leaves only 29.0 per cent of the unvaccinated who say they

would probably get vaccinated if offered and only 8.1 per cent of the unvaccinated who would definitely get vaccinated.

Among the 8 per cent in the sample who are not vaccinated, concern about side effects of a COVID-19 vaccination was very strong with 54.5 per cent saying they are 'very concerned' and another 25.5 per cent saying they were 'moderately concerned'. The level of concerns about side effects is, as expected, going up over time as the unvaccinated group shrinks. In August (with a much larger share of Australians unvaccinated), 50.0 per cent were moderately or very concerned about side effects and in April when the vast majority of Australians were unvaccinated, 42.1 per cent where voicing similar concerns. A positive take on these changes over time is that, while side effects remain the strongest reason for vaccine hesitance, many who had such concerns in April and August have overcome them and got vaccinated since.

It is not surprising then that the most common reason given for having not been vaccinated when asked directly was that the person was 'concerned about possible side effects of a COVID-19 vaccine', given by 70.2 per cent of those who had not been vaccinated (Figure 3). Aside from the concern about side effects or trust in the vaccine, we find 52.1 per cent who say they 'do not trust COVID-19 vaccines', 51.9 per cent who 'plan to wait and see if it is safe,' and 42.8 per cent who do not know if a COVID-19 vaccine will work. Access appears to be an issue for some as there are 13.1 per cent of respondents who say they had difficulty making a booking with the lowest percentage of respondents (8.6 per cent) saying they have cultural or religious reasons to not get vaccinated.

Figure 3 Reasons given for not having been vaccinated – Per cent of the unvaccinated population, October 2021



Source: ANUpoll: October 2021.

Encouraging individuals who have not been vaccinated to do so when they make up a very small per cent of the population is going to require very different messages than when focusing on the general population in the early stages of a vaccination roll-out. We also show that there is a potential for a backlash effect with this group. Specifically, before asking the question on vaccine willingness, we randomly assigned four potential messages on the evidence related to the vaccines available in Australia. Around one-third of the sample were not given any message, with one-sixth of the remaining sample given the remaining messages. Our expectations were that there would be a positive or zero impact of these messages, but somewhat surprisingly one of the messages appears to have had a negative impact on vaccine willingness. This can be demonstrated below, which gives the per cent of each of the treatment groups who said they probably or definitely would get vaccinated after receiving the message.[6]

- 37.2 per cent - Control - No message
- 39.1 per cent – Treatment 1a - Professor John Skerritt from the Therapeutic Goods Administration has said that 'The chance of death after a COVID vaccine in general is still well less than one in a million and there are things like being hit by lightning which are more common than that'
- 40.4 per cent – Treatment 1b - The chance of death after a COVID vaccine in general is still well less than one in a million and there are things like being hit by lightning which are more common than that
- 45.0 per cent – Treatment 2a - Unvaccinated people face 11 times the risk of death from the delta variant
- 24.1 per cent – Treatment 2b - According to a recent study in the British Medical Journal 'Unvaccinated people face 11 times the risk of death from the delta variant'

For the group of Australians who were not vaccinated as of October 2021, referring to medical evidence in learned journals may reduce vaccine willingness, especially when compared to a general statement about COVID-19 risk.

3 Attitudes towards boosters

Although the vaccine policy focus in Australia (particularly in October 2021) remains on the unvaccinated, a small proportion of Australians are starting to be eligible for a third dose or booster. In early 2022 this will become even more relevant as the bulk of Australians who got vaccinated in the second half of 2021 reach six months post-second dose.

In the survey, a randomly selected half of those respondents who had been vaccinated were asked: 'If a COVID-19 booster vaccine was recommended, would you…?', with four possible response options. The vast majority (71.9 per cent) of those who were asked the question in this way responded that they definitely would get the booster. A further 22.0 per cent said that they probably would get the vaccine leaving only 1.3 per cent who said they definitely wouldn't and 4.7 per cent who said they probably wouldn't. Although we don't have much data yet on booster uptake, the intention data suggests uptake may be quite high. The remaining 50 per cent of the vaccinated sample were asked the same question, but were split into one of two treatment groups with information give. The first of these randomly assigned treatment groups was told 'Current evidence shows that the immunisation response from the vaccination

reduces over time. A booster vaccination can help bring the protection back up to a very high level.' A slightly higher per cent of those respondents said that they would definitely get the booster (75.1 percent), though the difference was not statistically significant (p-value = 0.230).

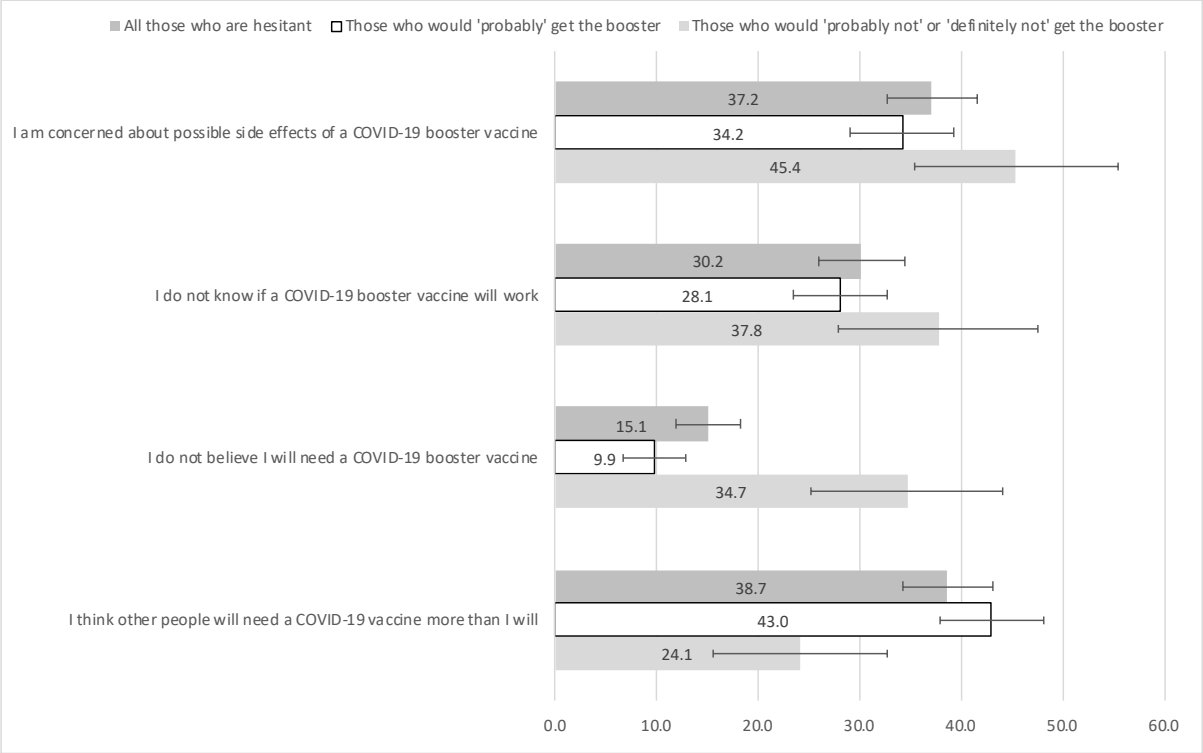
We show again though that information interventions can have a negative impact, even when they intend to increase willingness. The last quarter of the sample were told 'Recently, US President Biden received a COVID-19 booster vaccine.' Of this group 67.1 per cent said they definitely would get the booster vaccine, which was significantly lower than the group without a message (p-value = 0.074). This highlights the need to carefully test messages and only use those that are shown in trials to have a positive impact. This finding indicates that pointing out the benefits of a booster vaccine is more useful than giving (potentially controversial) examples of public figures who have opted for the booster to increase willingness.

3.1 Booster hesitancy

As booster vaccinations might be become a key tool to manage the pandemic especially with the new Omicron variant we take a closer look at reasons for hesitancy to get a booster vaccine. For respondents who did not answer that they would 'definitely get the booster vaccine' we followed up with a question about their possible concerns. We ask about concerns around side effects, efficacy of the third dose, the perceived need for a booster vaccine and if they believe others need the vaccine more (Figure 4).

The top concern among respondents who will 'probably get the booster' was that others need the vaccine more (43.0 per cent) followed by side effects (34.2 per cent) and not knowing whether the booster will work (28.1 per cent). Only 9.9 per cent of those who said that they would probably get the booster believed that there was no need for a booster vaccine. Among the small group of respondents in our sample who were not inclined to get the booster vaccine in the future, the leading concern was the side effects of the third dose (45.4 per cent) followed by concerns about the efficacy or the need for a third dose of a vaccine (37.8 per cent and 34.7 per cent respectively). Only a small proportion of those who said they probably or definitely would not get the booster (24.1 per cent) listed other people needing the vaccine as a reason for their hesitancy.

Figure 4 Reasons for hesitancy about booster vaccinations, by level of hesitancy, October 2021



Source: ANUpoll: October 2021.

3.2 Factors associated with booster willingness

Despite the reasonably high rate of booster willingness identified in the survey, with waning immunity and new variants emerging it will be necessary to ensure that there is as high an uptake as possible. Analysis of the factors associated with willingness suggests there are some groups that may need targeted (and evidence-based) encouragement to opt-in to the booster shot. We estimate two models (using the ordered probit model) with the first model including the demographic, socioeconomic, and geographic areas introduced earlier as well as the treatments described above. The second model is estimated on the longitudinal sample only and includes in addition their vaccination status as of August 2021 as well as vaccine willingness for those who weren't vaccinated in August. Results are presented in Table 2.

Focussing on Model 1 there is greater willingness to receive a booster compared to the base case for females, older Australians (55 years and over), and potentially those who live in the most advantaged areas (though the p-value is 0.109, so the difference is not quite statistically significant). On the other hand, compared to the base case those who speak a language other than English at home and those who have not completed Year 12 were less willing to get a booster. It appears that as the vaccine roll out has progressed that gaps with those latter two groups in terms of first dose vaccination have declined. However, those with low education and who speak a language other than English still spent longer unvaccinated than the rest of the population. It is important that this does not occur with regards to boosters.

In Model 2 we control for vaccine uptake in August 2021, as well as willingness/hesitancy for those who weren't vaccinated then. The first thing to note is that the age and year 12 education variables are no longer significant. This gives some evidence that these differences were due to vaccine history. The August 2021 questions are, however, quite interesting

themselves.

Those who had not been vaccinated in August 2021 were collectively less willing to receive a booster vaccine if recommended than those who had by that stage been vaccinated. This could reflect the understandable view that if a person was still only one-or two months post second dose or even had not had their second dose then a booster seems less necessary. It may also reflect that those who had not been vaccinated by August were less willing to get vaccinated, even if they ended up doing so. Supporting this interpretation, within the group of people who had not been vaccinated in August, those who were more hesitant when asked then were less willing to get the booster when asked in October 2021. There may need to be stronger, or targeted messages to those who obtained their first and second dose with less willingness (perhaps because of concerns about side effects or a lower perceived efficacy).

4 Concluding comments

Australia has been remarkably successful in increasing COVID-19 vaccine uptake in a short period of time. After a very slow start due to supply constraints as well as early concerns about COVID-19 vaccine hesitancy rates, Australia now has a higher vaccination rate than the UK, the US, New Zealand, and most of continental Europe.

Despite this success, there is still variation in vaccine uptake across Australia. Vaccine rates are lower in the states territories that did not experience significant lockdowns during the third wave of COVID-19 infections in Australia, namely Queensland, South Australia, Western Australia, Tasmania and the Northern Territory. The overwhelming concern for the remaining unvaccinated are the side effects. While informing this group about the benefits and risk of the vaccine and the danger of the virus remains a policy focus, we show that they type of messaging chosen for this purpose is key to its success. Well intended messages referring to the sources of medical evidence had adverse effects on vaccine willingness in our sample. Simpler messages around the benefits and risk of the vaccine appear more helpful.

More importantly from a public policy perspective, we also find that education and the socioeconomic status of the area in which a person lives to be important determinant of vaccine uptake. If there is likely to be, as has been experienced in other countries, a 'pandemic of the unvaccinated' then it will be experienced by those with low education and those who live in low socioeconomic areas. This is even more of a concern as we find that the unvaccinated are geographically and socially clustered which would worsen a potential spread of current or future COVID-19 variants. Until socioeconomic differences in vaccination rates are eliminated, it is hard to conclude that the vaccine roll-out has been a complete success.

With the discovery and sequencing of the Omicron variant of SARS-CoV-2, as well as the ongoing impact of the Delta variant, attention in Australia and around the world has focused to a certain extent on waning immunity and the need for boosters. Fortunately, we find that in October 2021 Australians were very willing to receive a COVID-19 booster when it is recommended for them to take one – 71.9 per cent of vaccinated adults say that they would definitely take a booster vaccine when recommended. We find that an information intervention in the form of a simple message about the booster can increase but also decrease the willingness to get the third dose, depending on the content of that message. Getting the message right will be important in forming attitudes.

Not all Australians have the same willingness to receive a booster vaccine. In our analysis we show that males, younger Australians, those who live outside of advantaged areas, those who

have not completed Year 12, those who speak a language other than English, and those who have had their first dose vaccination relatively recently are all less willing to receive their 'third dose' of the COVID-19 vaccine. The main concern to get a booster are still possible side effects. Evidence-based targeting of interventions to these groups may be necessary to ensure that immunity disparities do not emerge in 2022 and beyond.

Appendix 1 About the survey

Data collection for the October 2021 ANUpoll commenced on the 12th of October 2021 with a pilot test of telephone respondents. The main data collection commenced on the 13th of October and concluded on the 26th of October. The final sample size for the survey is 3,474 respondents. 54.3 per cent of the sample had completed the survey by the 14th of October and the average interview duration was 21.7 minutes.

There was a large increase in longitudinal attrition compared to previous waves of data collection. Of those who had completed the August 2021 survey, 86.7 per cent (N=2,717) had completed the April 2021 survey. However, of those who had completed the October 2021 survey, only 69.3 per cent (N=2,407) had completed the April 2021 survey

The Social Research Centre collected data online and through Computer Assisted Telephone Interviewing (CATI) in order to ensure representation from the offline Australian population. Around 3.2 per cent of interviews were collected via CATI. The contact methodology adopted for the online Life in Australia™ members is an initial survey invitation via email and SMS (where available), followed by multiple email reminders and a reminder SMS. Telephone non-response of panel members who have not yet completed the survey commenced in the second week of fieldwork and consisted of reminder calls encouraging completion of the online survey.

The contact methodology for offline Life in Australia™ members was an initial SMS (where available), followed by an extended call-cycle over a two-week period. A reminder SMS was also sent in the second week of fieldwork.

A total of 4,329 respondents were invited to take part in the survey, leading to a wave-specific completion rate of 80.2 per cent. Taking into account recruitment to the panel, the cumulative response rate for this survey is around 7.0 per cent.

Unless otherwise stated, data in the paper is weighted to population benchmarks. For Life in Australia™, the approach for deriving weights generally consists of the following steps:

1. Compute a base weight for each respondent as the product of two weights:
    a. Their enrolment weight, accounting for the initial chances of selection and subsequent post-stratification to key demographic benchmarks
    b. Their response propensity weight, estimated from enrolment information available for both respondents and non-respondents to the present wave.
2. Adjust the base weights so that they satisfy the latest population benchmarks for several demographic characteristics.

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (2021/430).

Appendix 2 Regression Tables

Table 1 Factors associated with having been vaccinated in October 2021 – Marginal effects

Explanatory variables	Marginal effect	Signif.
Female	-0.013	
Aged 18 to 24 years	-0.009	
Aged 25 to 34 years	-0.042	**
Aged 45 to 54 years	0.000	
Aged 55 to 64 years	0.015	
Aged 65 to 74 years	0.041	***
Aged 75 years plus	0.047	***
Indigenous	-0.038	
Born overseas in a main English-speaking country	0.011	
Born overseas in a non-English speaking country	0.001	
Speaks a language other than English at home	-0.019	
Has not completed Year 12 or post-school qualification	-0.032	
Has a post graduate degree	0.036	**
Has an undergraduate degree	0.027	**
Has a Certificate III/IV, Diploma or Associate Degree	-0.015	
Lives in the most disadvantaged areas (1st quintile)	-0.004	
Lives in next most disadvantaged areas (2nd quintile)	0.004	
Lives in next most advantaged areas (4th quintile)	0.016	
Lives in the most advantaged areas (5th quintile)	0.034	***
Lives in a capital city outside NSW, Victoria or the ACT	-0.151	***
Lives outside of a capital city outside NSW, Victoria or the ACT	-0.162	***
Lives outside of a capital city in NSW or Victoria	-0.057	***
Probability of base case	0.947	
Sample size	3,323	

Source: ANUpoll, October 2021

Notes: Probit Regression Model, with results presented as marginal effects, or the difference in probability compared to the base case. The base case individual is male; aged 35 to 44 years; non-Indigenous; born in Australia; does not speak a language other than English at home; has completed Year 12 but does not have a post-graduate degree; lives in neither an advantaged or disadvantaged suburb (third quintile); and lives in Sydney, Melbourne or Canberra. Coefficients that are statistically significant at the 1 per cent level of significance are labelled ***; those significant at the 5 per cent level of significance are labelled **, and those significant at the 10 per cent level of significance are labelled *.

Table 2 Factors associated with booster willingness in October 2021

Explanatory variables	Model 1		Model 2	
	Coeff.	Signif.	Coeff.	Signif.
Not vaccinated in August and said 'definitely wouldn't'			-1.635	***
Not vaccinated in August and said 'probably wouldn't'			-2.022	***
Not vaccinated in August and said 'probably would'			-1.033	***
Not vaccinated in August and said 'definitely would'			-0.345	***
Treatment 1 – 'Current evidence shows…'	0.086		0.041	
Treatment 2 – 'Recently, US President Bident received …'	-0.141	*	-0.203	**
Female	0.133	**	0.195	***
Aged 18 to 24 years	-0.080		0.196	
Aged 25 to 34 years	0.029		0.070	
Aged 45 to 54 years	0.062		-0.026	
Aged 55 to 64 years	0.284	***	0.011	
Aged 65 to 74 years	0.386	***	0.130	
Aged 75 years plus	0.414	***	0.023	
Indigenous	-0.093		-0.039	
Born overseas in a main English-speaking country	-0.012		-0.046	
Born overseas in a non-English speaking country	0.017		0.011	
Speaks a language other than English at home	-0.316	***	-0.370	***
Has not completed Year 12 or post-school qualification	-0.215	**	-0.082	
Has a post graduate degree	0.179		0.208	
Has an undergraduate degree	0.092		0.163	
Has a Certificate III/IV, Diploma or Associate Degree	-0.148		-0.011	
Lives in the most disadvantaged areas (1st quintile)	0.048		0.099	
Lives in next most disadvantaged areas (2nd quintile)	-0.034		-0.048	
Lives in next most advantaged areas (4th quintile)	0.093		0.167	
Lives in the most advantaged areas (5th quintile)	0.175	*	0.272	**
Lives in a capital city outside NSW, Victoria or the ACT	0.154		0.380	**
Lives outside of a capital city outside NSW, Victoria or the ACT	0.077		0.168	
Lives outside of a capital city in NSW or Victoria	-0.020		-0.092	
Cut-point 1	-0.057		0.038	
Cut-point 2	0.033		-0.008	
Cut-point 3	-2.064		-2.418	
Sample size	3,032		2,101	

Source: ANUpoll, October 2021

Notes: Ordered Probit Regression Model. The base case individual is male; aged 35 to 44 years; non-Indigenous; born in Australia; does not speak a language other than English at home; has completed Year 12 but does not have a post-graduate degree; lives in neither an advantaged or disadvantaged suburb (third quintile); and lives in Sydney, Melbourne or Canberra. Coefficients that are statistically significant at the 1 per cent level of significance are labelled ***; those significant at the 5 per cent level of significance are labelled **, and those significant at the 10 per cent level of significance are labelled *.

References

Biddle, N., B. Edwards, M. Gray and K. Sollis (2021). "Change in vaccine willingness in Australia: August 2020 to January 2021." *medRxiv preprint*: doi: https://doi.org/10.1101/2021.02.17.21251957

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Endnotes

[1] https://data.oecd.org/healthcare/influenza-vaccination-rates.htm
[2] https://data.oecd.org/healthcare/child-vaccination-rates.htm#indicator-chart
[3] https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/omicron-variant
[4] https://www.wsj.com/articles/omicron-cases-at-norway-christmas-party-provide-clues-on-new-variants-spread-11638554033
[5] https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/getting-your-vaccination/booster-doses
[6] In order to test the statistical significance of the treatment effects, we estimate an ordered probit model, controlling for the respondent's vaccine willingness in August 2021. Treatment 2b is significantly different from the control group (p-value = 0.032) whereas all other differences are not significant