Research

Knowledge about COVID-19 vaccines among Aboriginal and Torres Strait Islander people, and attitudes to and behaviours regarding COVID-19 and influenza vaccination: a survey

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The known: Aboriginal and Torres Strait Islander people were among the first groups in Australia to be targeted for vaccination against coronavirus disease 2019 (COVID-19.

The new: Our survey indicated that most Aboriginal and Torres Strait Islander people believed the COVID-19 vaccines to be very or extremely trustworthy (71%) and very or extremely effective (73%), but levels varied by sex and location.

The implications: Health messages in future pandemics should be tailored to the concerns of their target audiences, particularly those of Aboriginal and Torres Strait Islander women and people living in regional and remote areas.

Abstract

Objectives: To assess Aboriginal and Torres Strait Islander people's knowledge about coronavirus disease 2019 (COVID-19) vaccines, and their attitudes to and behaviours regarding COVID-19 and influenza vaccinations.

Study design: Web-based survey.

Setting: Australia (excluding the Northern Territory), 1 October 2021 to 31 May 2022.

Participants: Convenience sample of Aboriginal and Torres Strait Islander people aged 16 years or older living in Australia.

Main outcome measures: Proportions of respondents who reported knowledge about COVID-19 vaccines, and attitudes to and behaviours regarding COVID-19 and influenza vaccinations.

Results: A total of 530 people provided valid survey responses; their median age was 27 years (interquartile range, 23–38 years), 255 (48%) were from urban areas, and 309 (58%) were men. Of the 480 participants (91%) who provided complete survey questions (including sex and location information), larger proportion of men than women believed COVID-19 vaccines were very or extremely trustworthy (219, 79% *v* 124, 61%) and very or extremely effective (212, 76% *v* 138, 68%). The prevalence of COVID-19 vaccination was lower among respondents aged 60 years or older than among those aged 16–29 years (adjusted prevalence ration [PR], 0.81; 95% confidence interval [CI], 0.66–0.99). After adjusting for socio-demographic factors, the association between intention to receive the influenza vaccine and receiving the COVID-19 vaccine was statistically significant (adjusted PR, 1.18; 95% CI, 1.09–1.27).

Conclusion: The high levels of trust in COVID-19 vaccines and their effectiveness indicate that Aboriginal and Torres Strait Islander people are confident about their safety and efficacy and understand the importance of vaccination. The findings also highlight a positive attitude to vaccination and a commitment to preventive health measures among Aboriginal and Torres Strait Islander people.

The initial impact of the coronavirus disease 2019 (COVID-19) pandemic on Aboriginal and Torres Strait Islander people (Indigenous Australians) was similar to that for non-Indigenous people in Australia. By May 2020, 153 Indigenous Australians had tested positive for COVID-19 (2.2% of 6808 confirmed cases in Australia), none of whom had died (there had been 98 COVID-19-related deaths of non-Indigenous Australians).[1] This situation can be partly attributed to the application of lessons learned from the 2009 influenza A virus subtype H1N1 pandemic, in which Indigenous Australians were disproportionately affected.[2-4] The impact of the H1N1 pandemic on Indigenous Australians was disproportionate because of a range of health determinants, including overcrowded housing and high mobility.[5-8] The lessons from the H1N1 pandemic, coupled with persistent social determinants of poor health, meant that action to minimise harm to Indigenous communities during the COVID-19 pandemic was more decisive.[9-12] Leadership by Aboriginal community controlled health organisations (ACCHOs) guided government policy responses and the implementation of these policies in communities.[13,14]

Despite the overall success of the COVID-19 response for Indigenous communities, two factors could influence responses to future pandemics: firstly, the extent to which Indigenous communities accessed and interpreted COVID-19 health messaging; and secondly, the extent to which COVID-19 health messaging influenced the attitudes and behaviours of Indigenous community members in relation to COVID-19 vaccines, and whether they influenced annual influenza vaccinations. Further, it remains unclear whether messaging and actions to prevent the spread of COVID-19, coupled with an upsurge of health misinformation, desensitised people to messages about other vaccines.[15-17] These factors have implications for future pandemics and health messaging strategies for Indigenous communities. Consequently, we examined the knowledge of Indigenous people about COVID-19 vaccines, and their attitudes to and behaviours regarding COVID-19 and influenza vaccinations.

Methods

The author team comprised a Gaangalu man (SS), an Igbo man (VMO), a non-Indigenous man (AS), a Yiman man (JW), a Euralayie and Kooma woman (MT), and a Pitjantjatjara and Nukunu man (JSW).

Study design and recruitment

In this article, we report the results from the Yarning About COVID project, in which a cross-sectional survey was administered to Indigenous people aged 16 years or older during

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1 October 2021 – 31 May 2022. We used a convenience sampling approach to recruit participants for an anonymous survey on the online Qualtrics platform. The survey could be accessed via a QR code included in promotional documents or a link published on the University of Queensland Poche Centre for Indigenous Health website. The survey link was shared by the Poche Centre, the National Aboriginal Community Controlled Health Organisation, and members of the community governance committee established to provide project oversight (from Indigenous health peak bodies, ACCHOs, and Queensland Health). The survey comprised a maximum of 40 questions. The Indigenous health peak bodies and ACCHOs involved in the study design were the Aboriginal Health and Medical Research Council of NSW (AHMRC), the Aboriginal Health Council of South Australia (AHCSA), Kimberley Aboriginal Medical Services (KAMS), the Institute for Urban Indigenous Health (IUIH) the Strategic Communications Branch of Queensland Health, the Queensland Aboriginal and Islander Health Council (QAIHC), the National Aboriginal Community Controlled Health Organisation (NACCHO), and the Australian Indigenous Doctors' Association (AIDA).

Survey design

The survey (Supporting Information) was used to collect information on socio-demographic characteristics, knowledge about COVID-19 vaccines, and attitudes to and behaviours regarding COVID-19 and influenza vaccinations. The survey questions were developed and presented to the Aboriginal and Torres Strait Islander Advisory Group on COVID-19 by two authors (SS, JSW). Members of the community governance committee also reviewed the survey questions. Questions pertaining to general health and chronic conditions were adapted from the Health Assessment Questionnaire[18] and the MOS 36-item short-form health survey.[19]

Sample size

In 2021, the population of Indigenous people in Australia was projected to be 812 000.[20] A sample size of 550 was calculated as being required to detect 50% of the Indigenous population having adequate knowledge of COVID-19 vaccines with a 95% confidence level and 5% margin of error, assuming a 30% non-response rate.

Statistical analysis

Age was categorised into five groups (16–29, 30–39, 40–49, 50–59, and 60 years or older); geographic location was dichotomised as urban (major city) and regional or remote (regional area, country town and remote community); general health was categorised into good to excellent, average, and fair to poor.

Socio-demographic characteristics were stratified by sex. Categorical data are summarised as numbers and proportions, continuous data as medians with interquartile ranges (IQRs). Responses to COVID-19 and influenza vaccine-related knowledge, attitude and behaviour questions were stratified by sex (male, female) and location (urban, regional and remote). Only valid responses were included in analyses; missing data were not imputed. The statistical significance of group differences was assessed in χ^2 tests. Univariable and multivariable robust Poisson regression analyses[21-23] were used to assess relationships of socio-demographic factors and influenza vaccination (covariates) with COVID-19 vaccination, intention to be fully vaccinated against COVID-19, and intention to receive COVID-19 booster vaccines (outcomes). Separate regression analyses were conducted for each of these outcomes. Socio-demographic factors associated with any of the three COVID-19 vaccination outcomes at $P < 0.30$ in univariable models were considered for inclusion in the multivariable model; we included age, sex, location, educational qualification, presence of a chronic condition, general health and previous history of influenza vaccination, even when $P > 0.30$, given evidence that these factors are associated with COVID-19 vaccine uptake.[24] Estimates of the regression analyses are presented as prevalence ratios (PRs) with 95% confidence intervals (CIs). Statistical analysis was conducted in Stata 17. $P < 0.05$ was deemed statistically significant.

Ethics approval

The study was approved by the University of Queensland Human Research Ethics Committee (2021/HE001218). the Western Australian Aboriginal Health Ethics Committee (HREC1115), the Aboriginal Health and Medical Research Council of New South Wales Human Research Ethics Committee (1872/21), and the Aboriginal Health Research Ethics Committee of the Aboriginal Health Research Council of South Australia (04-21-959).

Results

A total of 661 people accessed the survey; 113 did not provide consent, and 18 were excluded from the analysis (16 did not include age, one indicated sex as "other", and one was younger than 16 years), leaving a final sample of 530 people. The median age of participants was 27 (IQR, 23–38) years. Overall, 305 survey participants (58%) were aged 16–29 years, and 309 were men (58%). A total of 276 participants (52%) identified as Aboriginal people, 137 (26%) as Torres Strait Islander people, and 117 (22%) as both Aboriginal and Torres Strait Islander people; 255 participants (48%) were from urban areas and 275 (52%) from regional and remote communities. The highest level of education ranged from university (225, 42%) to no education (18, 3%). A total of 384 participants (72%) rated their general health as good to excellent, 115 (22%) as average, and 31 (6%) as fair to poor (Box 1).

Knowledge regarding COVID-19 vaccines, by sex and location

Of the 480 participants (91%) who responded to survey questions about knowledge of, attitudes to, and behaviours regarding COVID-19 and influenza vaccines and for whom sex and location information was provided, 350 (73%) believed that COVID-19 vaccines can slow the spread of COVID-19; 343 (71%) believed that COVID-19 vaccines are very or extremely trustworthy, and 350 (73%) that they are very or extremely effective. A total of 215 men (77%) and 135 women (67%) believed that COVID-19 vaccines can slow the spread of the virus; 219 men (79%) and 124 women (61%) believed the vaccine to be very or extremely trustworthy, and 212 men (76%) and 138 women (68%) believed it to be very or extremely effective (Box 2).

Of the 228 urban respondents, 190 (83%) believed COVID-19 vaccines can slow COVID-19 transmission, as did 160 of the 252 regional and remote respondents (63%). A total of 191 urban respondents (84%) and 152 regional and remote respondents (60%) believed the vaccines to be very or extremely trustworthy; 181 urban respondents (79%) and 169 regional and remote respondents (67%) believed they were very or extremely effective. Overall, 399 of 478 respondents (83%) believed the COVID-19 vaccine was very or extremely important for protecting their community during the pandemic (Box 2).

1 Demographic characteristics of survey respondents, by sex			
Characteristic	Men	Women	Total
Respondents	309	221	530
Age (years), median (IQR)	26 (23–34)	30 (24–42)	27 (23–38)
Age group (years)			
16–29	198 (64%)	107 (48%)	305 (58%)
30–39	53 (17%)	48 (22%)	101 (19%)
40–49	33 (11%)	30 (14%)	63 (12%)
50–59	15 (5%)	21 (10%)	36 (7%)
60 or older	10 (3%)	15 (7%)	25 (5%)
Indigenous status			
Aboriginal	158 (51%)	118 (53%)	276 (52%)
Torres Strait Islander	79 (26%)	58 (26%)	137 (26%)
Aboriginal and Torres Strait Islander	72 (23%)	45 (20%)	117 (22%)
Location			
Major city	161 (52%)	94 (43%)	255 (48%)
Country town	100 (32%)	71 (32%)	171 (32%)
Regional area	43 (14%)	50 (23%)	93 (18%)
Remote community	5 (2%)	6 (3%)	11 (2%)
Highest level of education			
None	13 (4%)	5 (2%)	18 (3%)
Primary school	36 (12%)	24 (11%)	60 (11%)
High school	73 (24%)	59 (27%)	132 (25%)
Technical and further education	51 (17%)	44 (20%)	95 (18%)
University	136 (44%)	89 (40%)	225 (42%)
General health (self-rated)			
Good to excellent	229 (74%)	155 (70%)	384 (72%)
Average	57 (18%)	58 (26%)	115 (22%)
Fair to poor	23 (7%)	8 (4%)	31 (6%)
Chronic health condition			
Yes	119 (39%)	100 (45%)	219 (41%)
No	190 (61%)	121 (55%)	311 (59%)

IQR = interquartile range. ◆

Attitudes to and behaviours regarding COVID-19 and influenza vaccines, by sex and location

Of the 480 respondents, 334 (70%) said they normally receive the influenza vaccine each year, and 355 (74%) intended to receive it or had already received it. A total of 452 respondents (94%) had received a COVID-19 vaccine, and 302 of 450 respondents (67%) had received it at an Indigenous health service. Further, 366 of 478 respondents (77%) said they intended to be fully vaccinated against COVID-19, including 202 of 228 urban respondents (89%) and 164 of 250 regional and remote respondents (66%). A total of 336 respondents (70%) were prepared to receive a COVID-19 vaccine booster dose each year (Box 3).

Associations between COVID-19 vaccination outcomes and influenza

In the adjusted analysis, the prevalence of COVID-19 vaccination was not significantly lower in regional and remote areas than in urban areas (adjusted PR, 0.96; 95% CI, 0.91–1.004). The prevalence of COVID-19 vaccination were significantly lower in the oldest age group (60 years or older) than in the youngest age group (16–29 years; adjusted PR, 0.81; 95% CI, 0.66–0.99). The association between intention to receive the influenza vaccine and receiving the COVID-19 vaccine was statistically significant (adjusted PR, 1.18; 95% CI, 1.09–1.27) (Box 4).

The prevalence of the intention to be fully vaccinated against COVID-19 was lower among respondents from regional and remote areas than those in urban areas (adjusted PR, 0.82; 95% CI, 0.74–0.90). Respondents who identified as being of average health were less likely to be fully vaccinated than those who reported good to excellent health (adjusted PR, 0.85; 95% CI, 0.74–0.99). Intention to be fully vaccinated against COVID-19 was more frequent among those who intended to receive the influenza vaccine (adjusted PR, 1.49; 95% CI, 1.26–1.76) (Box 4).

The prevalence of the intention to receive COVID-19 vaccine booster doses each year, after adjusting for influenza vaccination status and other socio-demographic factors, was lower among women than men (adjusted PR, 0.79; 95% CI, 0.71–0.89) and respondents living in regional or remote areas than among those in urban areas (adjusted PR, 0.86; 95% CI, 0.76–0.96). Respondents in older age groups reported the intention to receive booster doses more frequently than those aged 16–29 years, but the difference was statistically significant only for people aged 30–39 years (adjusted PR, 1.20; 95% CI, 1.07–1.36). Prevalence of the intention to receive COVID-19 vaccine boosters was higher among those who intended to receive the influenza vaccine (adjusted PR, 1.66; 95% CI, 1.36–2.02) (Box 4).

Discussion

We found that Indigenous respondents to our survey had a high level of trust in COVID-19 vaccines and were well informed about the effectiveness of vaccines for minimising COVID-19 symptoms and slowing transmission. A key finding is that most respondents believed COVID-19 vaccines can slow the spread of COVID-19, congruent with the conclusions of a recently published qualitative study that found Indigenous people valued COVID-19 vaccines as a means for protecting their communities.[25] Survey respondents' preference for using Indigenous health services for vaccination are also consistent with the findings of the earlier study, which concluded that vaccine uptake is ideally led by an Aboriginal health service or trusted local clinician.[25] These consistencies reflect the important role of Indigenous health services in establishing awareness about COVID-19 and building trust with clients using culturally responsive health information to protect their communities.[9]

The high level of trust and effectiveness attributed to vaccines by the survey respondents in this study reinforces the crucial role of ACCHOs in designing and delivering public health messages for Indigenous communities. Existing evidence suggests that although public health messages and campaigns exert small to moderate effects on knowledge, beliefs, attitudes, and behaviours, these effects translate into significant societal impacts when the accumulated effects of message repetition and wide reach are taken into consideration.[26,27] Given that 29% of respondents did not have a high trust in COVID-19

2 Knowledge of COVID-19 vaccines, by sex and location of respondents*

	Sex			Geographic location			
Survey item	**Men**	**Women**	$P^{\dagger}$	**Urban**	**Regional or remote**	$P^{\dagger}$	**Total**
Do you think COVID-19 vaccines can slow the spread of COVID-19?	278	202	0.005	228	252	< 0.001	480
Yes	215 (77%)	135 (67%)		190 (83%)	160 (63%)		350 (73%)
Unsure	59 (21%)	55 (27%)		34 (15%)	80 (32%)		114 (24%)
No	4 (1%)	12 (6%)		4 (2%)	12 (5%)		16 (3%)
How trustworthy are COVID-19 vaccines?	278	202	< 0.001	228	252	< 0.001	
Not/slightly trustworthy	5 (2%)	13 (6%)		5 (2%)	13 (5%)		18 (4%)
Moderately trustworthy	54 (19%)	65 (32%)		32 (14%)	87 (35%)		119 (25%)
Very/extremely trustworthy	219 (79%)	124 (61%)		191 (84%)	152 (60%)		343 (71%)
How effective are COVID-19 vaccines?	278	202	0.003	228	252	< 0.001	
Not/slightly effective	4 (1%)	15 (7%)		5 (2%)	14 (6%)		19 (4%)
Moderately effective	62 (22%)	49 (24%)		42 (18%)	69 (27%)		111 (23%)
Very/extremely effective	212 (76%)	138 (68%)		181 (79%)	169 (67%)		350 (73%)
Do you think Aboriginal and Torres Strait Islander people should be a priority group for the COVID-19 vaccine?	278	202	0.17	228	252	< 0.001	
Yes	185 (67%)	144 (71%)		178 (78%)	151 (60%)		329 (69%)
Unsure	86 (31%)	57 (28%)		45 (20%)	98 (39%)		143 (30%)
No	7 (3%)	1 (0%)		5 (2%)	3 (1%)		8 (2%)
Is there a COVID-19 vaccine available to you now?	278	202	0.63	228	252	0.09	
Yes	216 (78%)	164 (81%)		190 (83%)	190 (75%)		380 (79%)
Unsure	58 (21%)	36 (18%)		35 (15%)	59 (23%)		94 (20%)
No	4 (1%)	2 (1%)		3 (1%)	3 (1%)		6 (1%)
Who do you think should get the COVID-19 vaccine?	309	221		255	275		530
Children	34 (11%)	22 (10%)	0.70	25 (10%)	31 (11%)	0.58	56 (11%)
Teenagers	51 (17%)	32 (14%)	0.53	38 (15%)	45 (16%)	0.64	83 (16%)
Adults	54 (17%)	60 (27%)	0.008	42 (16%)	72 (26%)	0.007	114 (22%)
Elders	25 (8%)	24 (11%)	0.28	21 (8%)	28 (10%)	0.44	49 (9%)
Everyone	176 (57%)	110 (50%)	0.10	163 (64%)	123 (45%)	< 0.001	286 (54%)
Nobody	1 (< 1%)	3 (1%)	0.18	0	4 (1%)	0.05	4 (1%)
How important do you think the COVID vaccine is to protect your community?	276	202	0.003	228	250	< 0.001	478
Extremely important	155 (56%)	77 (38%)		142 (62%)	90 (36%)		232 (49%)
Very important	81 (29%)	86 (43%)		61 (27%)	106 (42%)		167 (35%)
Moderately important	32 (12%)	32 (16%)		22 (10%)	42 (17%)		64 (13%)
Slightly important	7 (3%)	5 (2%)		3 (1%)	9 (4%)		12 (3%)
Not important	1 (< 1%)	2 (1%)		0 (0%)	3 (1%)		3 (1%)
Should people who are vaccinated with the COVID-19 vaccine be able to travel more freely than people who have not been vaccinated?	276	202	0.22	228	250	0.003	
Yes	171 (62%)	118 (58%)		154 (68%)	135 (54%)		289 (60%)
Unsure	69 (25%)	46 (23%)		50 (22%)	65 (26%)		115 (24%)
No	36 (13%)	38 (19%)		24 (11%)	50 (20%)		74 (15%)

COVID-19 = coronavirus disease 2019. * Numbers of respondents are provided for each question. † χ^2 tests by category, except "Who do you think should get the COVID-19 vaccine?" (χ^2 test by response). ◆

3 Attitudes to and behaviours regarding COVID-19 and influenza vaccines, by sex and location*

	Sex			Geographic location			
Survey item	**Men**	**Women**	**$P^{\dagger}$**	**Urban**	**Regional or remote**	**$P^{\dagger}$**	**Total**
Do you normally get the flu shot each year?	278	202	0.006	228	252	0.05	480
Yes	192 (69%)	142 (70%)		163 (71%)	171 (68%)		334 (70%)
Sometimes	77 (28%)	41 (20%)		47 (21%)	71 (28%)		118 (25%)
No	9 (3%)	19 (9%)		18 (8%)	10 (4%)		28 (6%)
Will you get the flu shot this year?‡	278	202	< 0.001	228	252	0.007	480
Yes*	205 (74%)	150 (74%)		179 (79%)	176 (70%)		355 (74%)
Unsure	69 (25%)	35 (17%)		36 (16%)	68 (27%)		104 (22%)
No	4 (1%)	17 (8%)		13 (6%)	8 (3%)		21 (4%)
Have you received the COVID-19 vaccine?	278	202	0.63	228	252	0.014	480
Yes	263 (95%)	189 (94%)		221 (97%)	231 (92%)		452 (94%)
No	15 (5%)	13 (6%)		7 (3%)	21 (8%)		28 (6%)
Which is your preferred COVID-19 vaccine?	278	202	0.008	228	252	0.10	480
AstraZeneca	100 (36%)	62 (31%)		76 (33%)	86 (34%)		162 (34%)
Moderna	117 (42%)	70 (35%)		80 (35%)	107 (42%)		187 (39%)
Pfizer	61 (22%)	70 (35%)		72 (32%)	59 (23%)		131 (27%)
Where did you get your vaccine?	261	189	0.38	221	229	0.014	450
Indigenous health service	182 (70%)	120 (63%)		161 (73%)	141 (62%)		302 (67%)
Non-Indigenous health service	67 (26%)	59 (31%)		48 (22%)	78 (34%)		126 (28%)
Other	12 (5%)	10 (5%)		12 (5%)	10 (4%)		22 (5%)
Do you intend to get fully vaccinated with the COVID-19 vaccine?	276	202	0.25	228	250	< 0.001	478
Yes	219 (79%)	147 (73%)		202 (89%)	164 (66%)		366 (77%)
Unsure	55 (20%)	53 (26%)		26 (11%)	82 (33%)		108 (23%)
No	2 (1%)	2 (1%)		0	4 (2%)		4 (1%)
Are you prepared to have a COVID-19 vaccine booster each year?	276	202	< 0.001	228	250	< 0.001	478
Yes	212 (77%)	124 (61%)		185 (81%)	151 (60%)		336 (70%)
Unsure	60 (22%)	65 (32%)		39 (17%)	86 (34%)		125 (26%)
No	4 (1%)	13 (6%)		4 (2%)	13 (5%)		17 (4%)

COVID-19 = coronavirus disease 2019. * Numbers of respondents are provided for each question. † χ^2 tests by category. ‡ Respondents were asked to tick yes if they had already received the influenza vaccine. ◆

vaccines, embedding strategies that address historically rooted inequities will be pivotal in increasing trustworthiness during future vaccination programs. This may include development of partnerships, use of multilingual materials, co-leadership with local community leaders, and employment of Aboriginal health workers.[28-31]

Despite the generally high level of knowledge about COVID-19 vaccines we found, knowledge and attitudes varied by sex. For example, a smaller proportion of women than men believed that COVID-19 vaccines can slow the spread of the virus, and women were less trusting of COVID-19 vaccines and their efficacy. This finding is consistent with reports that women are significantly more likely than men to express hesitancy about COVID-19 vaccination and, to a lesser extent, to refuse vaccination altogether.[32] The difference may reflect perceptions that vaccines negatively affect fertility, pregnancy, and breastfeeding.[33] Female respondents' attitudes and beliefs regarding COVID-19 possibly reflect a variety of factors not adequately considered by health messaging. They may also indicate that a larger

4 Relationships between COVID-19 vaccination status, intention to be fully vaccinated againt COVID-19, and intention to receive COVID-19 booster vaccines with socio-demographic factors and influenza vaccination status: multivariable robust Poisson regression analysis

Characteristic	COVID-19 vaccination Adjusted prevalence ratio (95% CI)	Intention to be fully vaccinated for COVID-19 Adjusted prevalence ratio (95% CI)	Intention to receive COVID-19 booster vaccines Adjusted prevalence ratio (95% CI)
Respondents†	452/480 (94%)	366/478 (77%)	336/478 (70%)
Sex			
Men	1	1	1
Women	0.99 (0.95–1.04)	0.94 (0.85–1.03)	**0.79 (0.71–0.89)**
Location			
Urban	1	1	1
Regional or remote	0.96 (0.91–1.004)	**0.82 (0.74–0.90)**	**0.86 (0.76–0.96)**
Age group (years)			
16–29	1	1	1
30–39	1.02 (0.98–1.07)	1.08 (0.97–1.21)	**1.20 (1.07–1.36)**
40–49	1.01 (0.95–1.08)	0.93 (0.80–1.08)	1.04 (0.88–1.22)
50–59	0.93 (0.83–1.04)	1.05 (0.88–1.25)	1.20 (0.99–1.46)
60 or older	**0.81 (0.66–0.99)**	1.12 (0.91–1.39)	1.19 (0.89–1.59)
Educational qualification			
None	0.92 (0.77–1.11)	0.71 (0.43–1.17)	0.86 (0.51–1.45)
Primary school	1	1	1
High school	1.02 (0.94–1.10)	0.96 (0.76–1.20)	1.04 (0.81–1.34)
Technical and further education	1.06 (0.97–1.16)	1.17 (0.93–1.45)	1.24 (0.96–1.60)
University	0.98 (0.91–1.07)	1.19 (0.98–1.45)	1.21 (0.96–1.53)
General health			
Poor to fair	0.94 (0.82–1.07)	0.87 (0.69–1.10)	0.86 (0.64–1.16)
Average	1.03 (0.98–1.08)	**0.85 (0.74–0.99)**	0.94 (0.80–1.10)
Good to excellent	1	1	1
Chronic health condition			
Yes	1.02 (0.98–1.07)	1.01 (0.91–1.13)	0.96 (0.85–1.09)
No	1	1	1
Will you get the flu shot this year?			
No or unsure	1	1	1
Yes	**1.18 (1.09–1.27)**	**1.49 (1.26–1.76)**	**1.66 (1.36–2.02)**

COVID-19 = coronavirus disease 2019. * Univariable robust Poisson regression analyses of the relationship between COVID-19 vaccination outcomes and influenza vaccination status and socio-demographic characteristics are reported in the Supporting Information, table 1. † Denominator: number of respondents to question; numerator: number who responded yes. Bold: statistically significant (confidence interval does not include 1). ◆

proportion of women than men use social media for health-related information, which would mean that women are more exposed to misinformation spread on online networks.[34-36] The attitudinal difference between men and women was also evident with respect to their intentions to receive an annual booster dose (men, 77%; women, 61%).

Knowledge and attitudes about COVID-19 vaccines also differed by location: 84% of urban respondents believed the vaccine to be very or extremely trustworthy, but only 60% of regional and remote respondents; and 79% of urban respondents believed vaccines were effective, compared with 67% of regional and remote respondents. This variation by location was consistent with the lower proportions of respondents in regional and remote locations who received influenza and COVID-19 vaccines after accounting for age, education, general health, and absence of chronic health conditions. Our finding that willingness to be fully vaccinated with a COVID-19 vaccine was less prevalent among regional and remote respondents than urban respondents is consistent with evidence from Bangladesh.[37] This may reflect negative experiences during COVID-19 vaccination programs, such as illness, miscarriage, or death, being more acutely experienced in smaller communities. Lower rates of COVID-19 or knowledge of COVID-19 in communities in rural locations may also result in people perceiving a lower need for vaccination.

Finally, we found that intentions to be fully vaccinated against COVID-19 and receive booster doses was not more prevalent among respondents with university education than respondents with primary school education. Reports from Bangladesh and Saudi Arabia that trust and understanding of the efficacy of COVID-19 vaccines was associated with socio-economic factors, such as education and employment status[37,38] suggest that public health campaigns need to be tailored to communities of different socio-economic status.

Our study was based on a sizeable cross-section of Indigenous people in Australia, including engagement with both men and women and people from diverse geographic locations. Further, the project was overseen by a diverse group of Indigenous experts who comprised the community governance committee, ensuring the accountability of the Indigenous research team during project design and implementation and provided opportunities for the research team to seek the expertise of community governance committee members.

Limitations

Study limitations included possible sample bias, as people with greater health literacy and understanding and access to reliable sources of information about COVID-19 were more likely to participate. Education levels were higher than in other surveys of Indigenous people,[39] which could indicate that our unweighted convenience sample was not representative of all Indigenous people. Very few participants resided in remote communities. In addition, differences in how respondents interpreted their geographic location at the time of the survey are possible. Moreover, an anonymous self-selecting survey cannot produce a representative sample, and our findings may not be generalisable to all Indigenous people.

The research team developed and received ethics approval to offer a hard copy version of the survey and an offline digital version on secured iPads, but these formats would have required significant resources from partner services. At the time of the survey, Aboriginal Medical Services were already in the process of beginning COVID-19 vaccination and protecting their communities from the pandemic; consequently, no services were prepared to administer the survey face-to-face. However, many services still shared the posters and QR codes for the online survey. Delivering the survey online enabled people to access the survey during COVID-19 lockdowns, but was also a barrier for some community members, illustrated by the few responses from remote communities.

Conclusion

We found that Indigenous people have a high level of trust in COVID-19 vaccines, which is essential for promoting vaccine acceptance and uptake. Their knowledge about the effectiveness of vaccines in reducing COVID-19 symptoms and slowing virus spread could promote vaccination rates. The high vaccination rate indicates a positive attitude to vaccination and a commitment to preventive health measures. These findings could be attributed to the openness of Indigenous communities to reasonable and well timed public health messages, especially when led by Indigenous people and Indigenous organisations. However, public health messages must address the concerns of all community members, particularly women and those living in regional and remote communities. As ACCHOs are evidently trusted, they should be consistently engaged to deliver effective and timely services in future pandemics. As 23% of respondents were unsure whether they intended to become fully vaccinated against COVID-19, hesitancy should be further investigated and be considered by tailored messaging.

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Data sharing: The data for this study will not be shared, as we do not have permission from the participants or ethics approval to do so. ■

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Supporting Information

Additional Supporting Information is included with the online version of this article.