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Willingness to Comply With Health Advice on COVID-19 in Rural Australia: Results of a Cross-Sectional Survey

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ABSTRACT

Introduction: Rural populations were particularly vulnerable to COVID-19. However, willingness to comply with health advice varied across population groups and was influenced by perceptions of risk.

Objective: This study aimed to identify the characteristics of the population (e.g., age, gender, First Nations status, perceived vulnerability, efficacy and levels of fear) associated with variations in compliance with health advice in rural Australia to inform health communication strategies for future pandemics.

Methods—Design, Setting and Participants: The study used a cross-sectional online survey of Australian residents aged 18 years and over ($n = 701$) residing in western NSW, Australia. Both bivariate and multivariable analyses were conducted, including multinomial logistic regression modelling.

Results: The characteristics that predicted both intention to comply with health advice and actual behaviour were gender (being female), First Nations status (Aboriginal) and age (older). The lower the perceived risk to the individual, the more likely they were to have limited or no intention to comply with preventative measures. A bivariate correlation analysis determined that there was a small ($r = 0.265$) significant ($p < 0.001$) correlation between intention to comply with preventative measures and the frequency with which people engaged in good hygiene practices.

Conclusions: The results provide a means to identify groups in rural areas that need tailored health communications to encourage compliance with health advice. The members of the community who were less vulnerable to illness, particularly young men, were less likely to comply. In future pandemics, governments could take both a geographic and population group segmented approach to health communications instead of a blanket approach.

1 | Introduction

In 2020, we learned that infections with pandemic potential are a major global risk and a key threat to public health [1]. Rural populations were particularly vulnerable to COVID-19. At the start of the pandemic, the risk of contagion in rural areas was low as the virus spread rapidly through cities. But once it arrived in rural areas, death rates were higher and the social and economic impacts were more serious [2, 3].

The COVID-19 outbreak led to extraordinary public health measures to contain the spread of the virus. Non-pharmaceutical interventions, including social distancing, home quarantine, public education, travel restrictions and

Summary

- What is already known on this subject?
  - COVID-19 had a more serious impact on rural Australian communities than urban communities.
  - Public health recommendations and communications were the same across the country.
  - Public perceptions, compliance and behaviour in response to pandemic health advice vary.
- What this paper adds?
  - Evidence that age, gender, fear and perceptions of vulnerability, including First Nations status, predict both intentions to comply and actual protective health behaviours in rural Australia.
  - Knowledge of how to tailor, who to target and how to frame health communications to encourage compliance with health advice in future pandemics.

rapid adoption of community mitigation strategies, could significantly reduce the rate of transmission of the virus and effectively minimise deaths and serious illness [4–7]. For example, stringent hand hygiene was a specific recommendation from disease control experts [8]. However, not everyone complied with public health advice.

Understanding, knowledge and willingness to comply with such advice vary across population groups and are influenced by perceptions of risk [9]. In Australia, the government's public health approach relied on blanket messaging and the promotion of science-based strategies. There was no tailoring of messages for different geographical areas or specific population groups [10]. There are likely to be socio-demographically defined groups in any population that are more likely to comply with health advice (or not) than others. Four years after the pandemic began, the Australian Government released the findings of an inquiry into the country's COVID-19 response to identify lessons learned in preparation for future pandemics [11, 12]. The inquiry specifically identified the importance of tailored health response measures and public health communications. What is needed is an understanding of how to tailor those communications.

Beliefs about the pandemic and the perceived value of protective health behaviours have significantly impacted compliance with health advice in past pandemics [13, 14]. In relation to the COVID-19 outbreak, several large cross-sectional surveys conducted early in the pandemic examined public perceptions, compliance and behaviour in response to health communications [15, 16]. These studies found that respondents did not always understand why protective health behaviours were required [15] and that lack of health literacy was a factor in the uptake of misinformation as well as creating a lack of confidence in adopting protective behaviours [16]. However, although the studies report findings based on broadly representative samples, the findings do not provide a nuanced understanding of the experience of those in rural and remote settings, nor do they offer advice on how to better target health communications [9]. It is important to understand variations in the community's attitudes and adoption of preventative behaviours during disease outbreaks so that health advice and communication strategies can be more informed and effective during future pandemics. Given the risks to rural communities' health from COVID-19, rural-specific investigations were warranted.

This study aims to contribute to the knowledge of future pandemic health communications by understanding which characteristics of the population (e.g., demographics, perceived vulnerability, efficacy and levels of fear) influenced intention to comply and actual compliance with health advice in rural New South Wales, Australia during the COVID-19 pandemic.

2 | Data and Methods

2.1 | Participants and Procedure

The study used a cross-sectional online survey of Australian residents aged 18 years and over residing in western New South Wales (NSW), Australia. Ethics approval was provided by the Aboriginal Health and Medical Research Council of NSW (AH&MRC) [1668/20] to enable the analysis of First Nations responses and the Charles Sturt University Ethics Committee (Approval number H20254). Data collection took place between July and October 2020, when the state experienced a second wave of COVID-19, and masks were not recommended as a protective measure. The participants were recruited through two online survey platforms, Dynata ($n = 315$) and QUALTRICS ($n = 320$). As panel data is non-probability data, quota sampling was employed using age and gender quotas as a means of gauging the representativeness of the data [17]. Further, in recognition of the high proportion of First Nations residents in this area, additional recruitment was conducted through private networks, including the Western NSW Health Research Network, rural Health Councils, community newsletters and in-person meetings with the First Nations community elders who had limited access to, or experience in, using online platforms. A further 66 responses were collected this way ($n = 66$). The final sample totalled $N = 701$ participants. The sample resembled the population of western NSW, although it had a higher representation of females (survey 63.4%, population 50.1%), slightly fewer First Nations respondents (survey 8.6%, population 13%) and overall, a younger cohort [10].

2.2 | Measures

The survey was used during the H1N1 influenza pandemic [18] and adapted for COVID-19 by the research team with the support of a survey design specialist. Additionally, it was pilot-tested by both a focus group and the Aboriginal Reference Group overseeing the project to ensure that the instrument and processes were culturally appropriate for First Nations Australians see details in [10]. The survey was also pilot-tested by each of the panel providers. The survey took approximately 25 min to complete.

Because behavioural intention is considered a predictor of actual behaviour [19], the investigation explored the relationship between fear, perceived efficacy and perceived vulnerability and two dependent variables: (1) intention to comply with

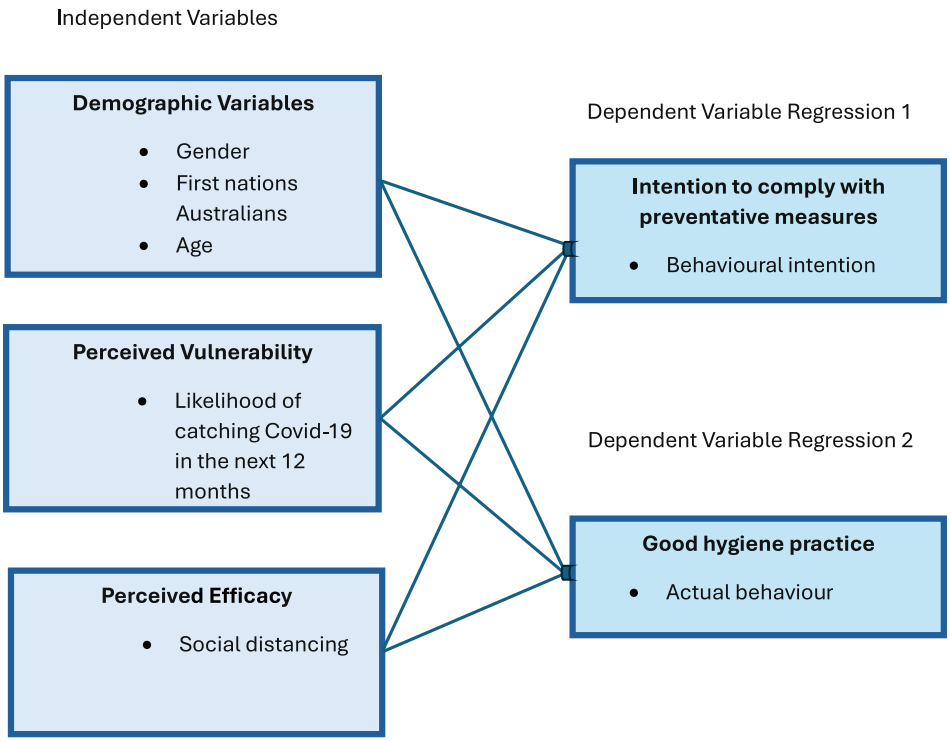

FIGURE 1 | Regression models 1 and 2.

preventative measures (i.e., behavioural intention) and (2) good hygiene practices (i.e., actual behaviour) (Figure 1).

2.3 | Statistical Analysis

Descriptive analysis and two multivariable regressions [20] were used to assess the relationship between the independent variables (e.g., demographic, vulnerability, efficacy and fear variables) and two dependent variables (i.e., 'behavioural intention' and 'actual behaviour'). Bivariate analyses using cross-tabulations were performed to determine significant factors with Pearson's chi-squared test and Fisher's exact test [21]. Multinomial logistic regression modelling [22] for multivariable analyses was carried out to determine the influence of selected covariates on first behavioural intention and then actual behaviour.

The significant relationships between a variable and its effects were quantified by calculating the odds ratios with 95% confidence interval measures. In the regression analyses (shown in Table 2), the odds ratio (OR) in favour of'n' and'som' sorts of behavioural intention or practice was estimated for the selected group of covariates to suggest how many times the group of interest is more likely to belong to the target group compared to the reference group, that is, 'full' behavioural intention or actual practice. Two regression models were used separately for each of the two response variables. The −2 Log Likelihood-based chi-squared test [23] was used to check the statistical significance of the fitted model. IBM SPSS version 26 was used in all statistical analyses.

3 | Results

Demonstrating suitability for regression analysis, the results of the background characteristics (i.e., *n* for each category of the independent variables) and cross-tabulations are shown in Table 1. The results reveal a range of significant associations between the seven selected covariates (gender, First Nations status, age, perceived likelihood of getting covid in the next 12 months, perceived efficacy of avoiding people, level of fear and perceived harmfulness of the virus) and the two dependent variables (intention and actual behaviour).

In accordance with the STROBE guidelines [24], we examined the unadjusted estimates for each covariate in relation to the two dependent variables (see Table S1 and analysis in the Supporting Information). Next, we move on to multivariate regression analysis. The results of two regression analyses: (1) intention to comply with preventative measures and (2) actual behaviour are reported below.

3.1 | Intention to Comply With Preventative Measures

First, a regression was run to determine the respondents' intention to comply with preventative measures during the first COVID lockdown (Table 2). Compliance was generally high; therefore, in this regression, full compliance was held constant, and differences between those who had no intention to comply and those who did not fully intend to comply were examined. Gender, age and being a First Nations Australian were all significantly related to levels of compliance, as were the perceived

TABLE 1 | Background attributes and the distribution of variables according to the classification of behaviour intention and actual behaviour.

		Behaviour intention factor								Actual behaviour factor						
		No intention		Some intention		Full intention		*p* (Pearson's chi squared/ Fisher's Exact test)		No actual behaviour		Some behaviour		Full behaviour		*p* (Pearson's chi squared/Fisher's Exact test)
	No. of responses	Count	%	Count	%	Count	%		No. of responses	Count	%	Count	%	Count	%	
Gender																
Male	251	31	12%	112	45%	108	43%	0.007	249	25	10%	84	34%	140	56%	< 0.001
Female	446	33	7%	171	38%	242	54%		447	23	5%	88	20%	336	75%	
First nations																
No	640	58	9%	252	39%	330	52%	0.101	639	42	7%	148	23%	449	70%	0.001
Yes	59	6	10%	31	53%	22	37%		59	6	10%	25	42%	28	48%	
Age																
18–29	147	27	18%	59	40%	61	42%	< 0.001	145	14	10%	47	32%	84	58%	0.016
30–49	233	19	8%	100	43%	114	49%		233	14	6%	61	26%	158	68%	
50–69	221	16	7%	82	37%	123	56%		223	18	8%	44	20%	161	72%	
> 70	96	2	2%	40	42%	54	56%		95	2	2%	21	22%	72	76%	
Likelihood of getting COVID in the next 12 months																
Unlikely	356	41	12%	155	44%	160	45%	0.001	357	30	8%	89	25%	238	67%	0.113
Moderately likely	259	17	7%	91	35%	151	58%		259	12	5%	60	23%	187	72%	
Very likely	62	1	2%	31	50%	30	48%		60	4	7%	21	35%	35	58%	
Efficacy of avoiding people																
Not effective	471	28	6%	187	40%	256	54%	< 0.001	471	31	7%	95	20%	345	73%	0.001
Moderately effective	150	24	16%	68	45%	58	39%		150	13	9%	54	36%	83	55%	
Very effective	46	6	13%	21	46%	19	41%		46	3	7%	16	35%	27	59%	
Fear about COVID																

(Continues)

TABLE 1 | (Continued)

	No. of responses	Behaviour intention factor: No intention Count	%	Some intention Count	%	Full intention Count	%	*p* (Pearson's chi squared/Fisher's Exact test)	No. of responses	Actual behaviour factor: No actual behaviour Count	%	Some behaviour Count	%	Full behaviour Count	%	*p* (Pearson's chi squared/Fisher's Exact test)
Never	318	43	14%	141	44%	134	42%	<0.001	317	29	9%	83	26%	205	65%	0.086
Sometimes	344	20	6%	136	40%	188	55%		343	17	5%	85	25%	241	70%	
Always	37	1	3%	6	16%	30	81%		37	2	5%	5	14%	30	81%	
Perceived harmfulness																
Not harmful	59	14	24%	26	44%	19	32%	<0.001	59	3	5%	15	25%	41	70%	0.111
Moderately harmful	204	24	12%	102	50%	78	38%		204	14	7%	64	31%	126	62%	
Very harmful	436	26	6.0%	155	36%	255	59%		435	31	7%	94	22%	310	71%	

likelihood of catching the virus, efficacy of avoiding people, fear and perceived harmfulness of the virus.

The analysis found that males were 1.5 times (95% CI, 1.01–1.13) more likely (than females) to intend only partial compliance and 2.3 times (95% CI, 1.18–4.40) more likely to have no intention to comply with preventative behaviours. Compared to non-First Nations Australians, First Nations Australians were 52% (95% CI, 0.23–0.99) less likely to indicate a partial intention to comply and 70% (95% CI, 0.10–0.97) less likely to have no intention to comply with preventative measures.

When compared to those 70 years and older, the youngest respondents [18–29] were 10.1 times (95% CI, 2.10–48.86) more likely to have no intention to comply, while people between the ages of 30 and 49 were 4.5 times (95% CI, 0.94–21.63) more likely to indicate only partial intention to comply with preventative measures.

Perceived vulnerability was measured by asking people how likely they thought they were to contract COVID-19 in the next 12 months. The regression examined how those who did not think they would catch the virus or believed they were moderately likely to catch it differed from those who fully expected to catch the virus in the next year. Those who thought they were unlikely to contract COVID in the next 12 months were 12.1 times (95% CI, 0.96–87.20) more likely to have no intention to comply than those who expected to catch the virus in the next year. Meanwhile, those who thought it was moderately likely were 9.2 times (95% CI, 0.96–87.20) more likely to have no intention to comply.

Respondents who thought avoiding people was an ineffective way to avoid COVID (75%, 95% CI, 0.09–0.73) were less likely to indicate no compliance with preventative measures. In contrast, those who never felt afraid about COVID were 10 times (95% CI, 1.05–94.33) more likely to have no intention to comply than those who were afraid all the time and 4.3 times (95% CI, 1.62–11.15) more likely to intend to comply only some of the time. Those who thought COVID was not harmful to their health were 2.8 times (95% CI, 1.05–7.53) more likely not to intend to comply and 2 times (95% CI, 0.98–3.96) more likely to intend to comply only sometimes than those who thought it was very harmful to their health. Finally, those who thought COVID was moderately harmful to their health were twice as likely (95% CI, 1.33–3.04) to intend to comply some of the time.

In regression 2 (Table 2), actual behaviour was examined. Respondents were asked how often they practised good hygiene behaviours. Those who engaged in good hygiene practices all the time were the reference category compared to those who reported engaging either in good hygiene practices none of the time or only some of the time. In this regression, gender, age and identifying as First Nations Australians were all significantly related to behaviour as were levels of fear, perceptions of harm and the perceived effectiveness of avoiding people as a means of prevention from contracting the virus.

Like compliance intention, males were 3 times (95% CI, 1.51–5.75) more likely than females to report practising good hygiene none of the time. First Nations respondents were 52% (95%

TABLE 2 | Multivariate regression 1 intention to comply and regression 2 actual compliance by seven selected covariates.

	Intention to comply with preventative measures[a]						Good hygiene practice[a]					
	No intention to comply			Some but less than full intention to comply			None of the time			Some but not all of the time		
Characteristic[b]	Odds ratio	95% CI	Significance (*p*)	Odds ratio	95% CI	Significance (*p*)	Odds ratio	95% CI	Significance (*p*)	Odds ratio	95% CI	Significance (*p*)
Male	2.28***	(1.18, 4.40)	0.014	1.5**	(1.01, 2.13)	0.047	**2.95****	(1.51, 5.75)	0.001	2.32	(1.54, 3.51)	< 0.001
First Nations Australians	0.30c**	(0.10, 0.97)	0.044	0.48**	(0.23, 0.99)	0.047	0.58	(0.18, 1.91)	0.372	0.47**	(0.23, 0.99)	0.046
18–29 years of age	**10.12****	(2.10, 48.86)	0.004	1.12	(0.60, 2.07)	0.726	**8.77*****	(1.79, 42.92)	0.007	1.94*	(0.98, 3.86)	0.058
30–49 years of age	4.5*	(0.94, 21.63)	0.061	0.96	(0.55, 1.68)	0.882	4.08*	(0.84, 19.71)	0.081	1.07	(0.56, 2.05)	0.837
50–69 years of age	2.57	(0.54, 12.34)	0.238	0.9	(0.52, 1.55)	0.699	4.27*	(0.94, 19.50)	0.061	0.98	(0.52, 1.86)	0.948
Unlikely to get COVID in the next 12 months	**12.1****	(1.27, 114.85)	0.03	0.94	(0.46, 1.92)	0.87	1.74	(0.38, 8.00)	0.48	0.88	(0.40, 1.92)	0.749
Moderately likely to get COVID in the next 12 months	**9.2****	(0.96, 87.20)	0.054	0.79	(0.39, 1.60)	0.511	1.1	(0.23, 5.13)	0.912	0.82	(0.38, 1.78)	0.618
Avoiding persons with COVID is not effective	**0.25*****	(0.09, 0.73)	0.012	0.78	(0.39, 1.57)	0.493	0.8	(0.21, 2.96)	0.732	0.50*	(0.25, 1.02)	0.056
Avoiding people with COVID is moderately effective	0.9	(0.30, 2.73)	0.848	1.11	(0.52, 2.37)	0.788	1.15	(0.28, 4.72)	0.844	1.08	(0.51, 2.28)	0.85
I never feel afraid about COVID	**10.0****	(1.05, 94.33)	0.045	**4.25*****	(1.62, 11.15)	0.003	2.19	(0.45, 10.57)	0.33	2.35	(0.805, 6.835)	0.118
I sometimes feel afraid about COVID	5.1	(0.52, 49.37)	0.164	**3.68*****	(1.44, 9.41)	0.007	1.05	(0.22, 5.02)	0.953	2.22*	(0.78, 6.30)	0.136
COVID is not harmful for my health	2.81**	(1.05, 7.53)	0.04	1.97*	(0.98, 3.96)	0.056	0.26*	(0.05, 1.19)	0.081	0.99	(0.48, 2.08)	0.985
COVID is moderately harmful for my health	1.3	(0.62, 2.71)	0.489	2.01****	(1.33, 3.04)	0.001	0.75	(0.35, 1.62)	0.469	1.56*	(0.98, 2.48)	0.06

(Continues)

TABLE 2 | (Continued)

Characteristic[b]	Intention to comply with preventative measures[a]						Good hygiene practice[a]					
	No intention to comply			Some but less than full intention to comply			None of the time			Some but not all of the time		
	Odds ratio	95% CI	Significance (p)	Odds ratio	95% CI	Significance (p)	Odds ratio	95% CI	Significance (p)	Odds ratio	95% CI	Significance (p)
Model fit: −2 Log Likelihood	613.1						571.43					
Chi-squared	108.02****						83.52****					

[a]Reference category is full intention to comply.
[b]Omitted categories not shown (i.e., reference class for each independent variable).
[c]A value less than one indicates a negative relationship.
*$p<0.10$.
**$p<0.05$.
***$p<0.01$.
****$p<0.001$.

CI, 0.23–0.99) less likely to practise good hygiene only some of the time (i.e., more likely to do it all the time). Compared to those over 70, respondents aged 18–29 years were 8.8 times (95% CI, 1.79–42.92) more likely to report engaging in good hygiene practices none of the time.

Compared to those who thought it was very effective, those who thought avoiding people was not effective were 50% (95% CI, 0.25–1.02) less likely to report using good hygiene practices only some of the time. Those who felt afraid of COVID sometimes were 2.2 times (95% CI, 0.45–10.57) more likely to engage in good hygiene practices some of the time than those who felt afraid all the time. Compared to those who thought COVID was very harmful, those who thought it was not harmful were 74% (95% CI, 0.05–1.19) less likely to report not engaging in good hygiene practices.

These findings reflect those of the previous regression, showing that compared to individuals who reported engaging in good hygiene practices all the time, those who felt less at risk were more likely to report that they never or only sometimes engaged in good hygiene practices. Moreover, a correlation analysis between the two response variables revealed there was a weak ($r=0.265$) significant ($p<0.001$) association between them.

4 | Discussion

This study identified several variables that influenced intention to comply with preventative measures and the frequency with which respondents engaged in good hygiene practices. The factors that determined protective health-related intentions to comply and actual behaviour in the rural setting were related to age, gender, fear and perceptions of vulnerability, including First Nations status. Overall, these results suggest that the lower the perceived risk to the individual, the more likely they were to have limited or no intention to comply with preventative measures. For these reasons, some groups, particularly young, non-First Nations males, may have required a different form of motivation to increase their intention to comply. Perceptions of risk from the disease have been identified as a key factor in health advice compliance [9]. Similarly, in this study, if respondents' perceptions were that they were not vulnerable to catching the disease in the next 12 months, they were 12 times more likely to have no intention to comply.

Risk perceptions and intention to comply varied by population group. First Nations communities who were most at risk from COVID-19 were most likely to comply with health advice, but health communications did not provide geographically specific advice that included local support services and resources [16]. First Nations Australians are a significant proportion of the rural population with different risk factors and concerns than those of non-First Nations Australians [10]. Younger people did not feel vulnerable or afraid and were more likely to say they had no intention to comply. In contrast with a large study that did not examine rural populations specifically [25], age was a significant factor in intention to comply in this study. Rural populations are typically older and have poorer health than urban populations, so the risk from COVID-19 was increased in rural Australia [3, 10]. However, intention did not always match actual

behaviour. For example, some people only reported engaging in good hygiene practices sometimes, even if they fully intended to comply. There might have been practical reasons for that that we do not know about, such as a lack of access to hand sanitiser in rural settings. Franzen and Wöhner [26] note that there are frequent differences in intention to comply and actual compliance in individual health-related behaviour, such as exercising. However, the impetus to comply for the good of the community in relation to COVID-19 risks could be expected to be different but is still not well understood [20, 27].

Rural and remote populations worldwide generally have less access to healthcare than urban populations. However, in Australia, public health services do provide hospitals and community health centres in all regions. For example, the Western NSW Local Health District, which covers most of the region where the survey was conducted, operates health services in thirty-nine communities, including large hospitals, multi-purpose services, and clinics [28]. Aboriginal Community-Controlled Health Services [29] also operate in many of these locations. These health services and their staff understand their communities and know how to communicate with them. It is reasonable to suggest that health communications could be tailored and targeted to specific groups via existing health promotion programmes if local and regional health services were provided with information about whom to target and why.

The survey reports on a relatively small sample from a specific rural region of Australia. However, it is the only survey we are aware of that investigates the rural population group when COVID-19 began to impact Australia. A qualitative component to the study could have provided guidance on how to better target health communications. This is a limitation of the current results. However, the results suggest that the key group in rural Australia needing tailored health communications to encourage compliance with health advice is young men. The members of the community who were less vulnerable, particularly young men, were less likely to comply with advice. A lack of compliance puts the collective group at greater risk [27]. While this could be viewed as self-interest, it could also be a lack of understanding of the potential impacts of non-compliance, given that the pandemic was unprecedented for most people. In future pandemics, the Australian Government could adopt both a geographically targeted and population group segmented approach to health communications instead of a blanket approach.

Author Contributions

Julaine Allan: conceptualisation, funding acquisition, methodology (equal), writing – original draft, writing – review and editing; **Jodie Kleinschafer:** conceptualisation, funding acquisition, methodology (equal), project administration, data analysis (equal), writing – review and editing; **Teesta Saksena:** conceptualisation, methodology (equal), writing – review and editing; **Azizur Rahman:** methodology, data analysis (equal), writing – review and editing.

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Disclosure

The authors have nothing to report.

Ethics Statement

Ethics approval was provided by the Aboriginal Health and Medical Research Council of NSW (AH&MRC) (1668/20) to enable the analysis of First Nations responses and the Charles Sturt University Ethics Committee (H20254).

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Table S1:** ajr70078-sup-0001-TableS1.docx.