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“Poison” or “protection”? A mixed methods exploration of Australian parents' COVID-19 vaccination intentions

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ARTICLE INFO

Keywords:

COVID-19

Vaccination intentions

Parents

Qualitative survey

ABSTRACT

Objective: The success of COVID-19 vaccination programs relies on community attitudes, yet little is known about parents' views. We aimed to explore the reasons behind Australian parents' vaccine intentions for themselves and for their children.

Method: This mixed methods study relates to Wave 13 (January 2021) of a longitudinal study of Australian parents' experiences during COVID-19 and contained 1094 participants (83% mothers). We used multinomial logistic regression to understand demographic predictors of vaccine intention, and a descriptive template thematic analysis to analyse open-ended questions about parents' reasons for vaccine intentions for themselves and their children.

Results: 64% of Australian parents intend on vaccination, 26% are unsure and 9% intend to decline; 48% intend to vaccinate their children, 38% are unsure, and 14% intend to decline. Relative to those intending to vaccinate, parents unsure (OR = -0.63, 95% CI: 0.46, -0.84, $p = .002$) or not intending (OR = -0.41, 95% CI: 0.24, 0.67 $p < .001$) to vaccinate were more likely to have lower trust in doctors. Similar predictors emerged for parents who did not intend to vaccinate their children (OR = 0.47, 95% CI: 0.31, 0.70, $p < .001$). Qualitative data indicated that many parents had not made a firm decision, including a lack of alignment between intentions and reasons. For example, parents who said 'yes' to vaccination, often then expressed hesitance and a focus on risks in their written response. Reasons for hesitancy for themselves included concerns about testing, side effects, and long-term outcomes. Similar themes were present for children, but parents expressed a strong desire to protect their children, and an eagerness for health information.

Conclusion: Based on prior research and the themes identified here, a multipronged campaign that includes education/promotion, good access to vaccines and role models, is likely to support parents to make informed decisions regarding COVID-19 vaccination.

1. Introduction

Vaccination is a key pillar of the worldwide strategy for mitigating the impact of COVID-19. To be effective, the vaccination program requires high uptake, but this is threatened by vaccine hesitancy around the world [1]. Efforts to mitigate this hesitancy rely on a detailed understanding of the varying views and concerns about the COVID-19 vaccine within the community, and then developing strategies to address these [2]. Parents are an important group to understand in the

context of COVID-19 as they have been strongly impacted by COVID-19 lockdowns, are responsible for the health and safety of the next generation and offer a rich source of insight into the whole family's vaccine intentions [3]. However, we do not adequately understand parents' reasons for COVID-19 vaccine hesitancy or how this relates to their own vaccination intentions for themselves and their children, especially in the Australian context.

Hesitancy and misinformation have accompanied many vaccination roll-outs. For example, hepatitis B vaccination was falsely proclaimed to

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cause multiple sclerosis, the Measles, Mumps, and Rubella (MMR) vaccine was falsely linked to autism, and the Human Papillomavirus virus (HPV) vaccine was thought to encourage a potential increase in risky sexual behaviours [4–6]. These alleged risks, even when disproved, continue to capture the attention of the public, undermining their confidence in vaccinations. Hesitancy towards COVID-19 vaccines is therefore not unexpected, and fuelled by the novelty of vaccines and uncertainty regarding long-term effects [7]. International data have identified certain predictors of adults' COVID-19 vaccine hesitancy, including low income and education, identifying as female, and living with children [1,8]. In a recent study of over 3000 people in Ireland and the United Kingdom, those hesitant about the vaccine were less likely to obtain information about the pandemic from traditional sources and had high mistrust in these sources [9].

However, given that vaccine hesitancy is known to be context specific [10], the results noted above may not generalize globally. In the context of Australia specifically, public health officials continually suppressed and/or eliminated the virus since April 2020 by implementing several public health directives (e.g., mask wearing, social distancing, stay at home orders). However, the success of this approach, along with Australia's current low rate of COVID-19-related deaths, has the potential to increase hesitancy for COVID-19 vaccines. Vaccine hesitancy typically increases in environments where the disease the vaccination protects against is rare, often because of a decreased perception of health threat [11]. Indeed, a lower perception of COVID-19 as a public health threat in Australia has been associated with a reluctance to be vaccinated against COVID-19 [12]. Further still, inadequate health literacy, lower education level, and a lower perceived susceptibility to COVID-19 have also been significantly associated with a reduced willingness to be vaccinated against COVID-19 in Australia [12,13]. This potential for vaccine hesitancy is especially problematic within the current Australian context given recent outbreaks in both New South Wales and Victoria (the most populous states in Australia), with previously successful public health directives unable to eliminate the virus [14]. Public health officials and state governments have now actively focused on substantially increasing COVID-19 vaccination for those aged 12 and older to reduce the risk of spread of COVID-19 within the community [15].

While there is limited evidence on Australian parents' hesitancy toward COVID-19 vaccines for their children, previous research has examined Australian parents' attitudes towards childhood vaccines more generally. Qualitative research has demonstrated themes such as perceived limitations of Western conceptualisations of health, the desire to search for health evidence independently, and invalidating experiences with health professionals in hesitant parents [16,17]. These themes are mirrored in international evidence [10]. Australian quantitative research on the determinants of the HPV vaccine attitudes lists parental concern about vaccine safety as the primary reason for hesitancy (43%), at the same time pointing to the importance of general practitioners (GPs) in increasing vaccination uptake (61% of parents reported a recommendation from GPs would increase their HPV vaccine acceptance) [18]. Similar themes and attitudes may explain COVID-19 vaccine hesitancy, but there is currently a lack of data to understand the reasons for COVID-19 vaccine hesitancy in Australian parents.

The objective of the current study was to inform the Australian COVID-19 vaccination strategy by investigating the reasons for COVID-19 vaccine intentions in 1094 Australian parents of dependent children. We used quantitative and qualitative data to investigate parents' COVID-19 vaccine intentions for both themselves and for their children, and their reasons for hesitancy.

2. Methods

2.1. Recruitment

The sample was taken from the COVID-19 Pandemic Adjustment

Survey, a longitudinal study investigating the impact of COVID-19 on 2365 Australian families [19]. Parents of children aged 18 and under were recruited via social media (e.g., Facebook, Reddit). During Wave 13 data collection, there were no lockdowns in place throughout the country, but Victorian and NSW residents were required to wear masks. There was substantial media coverage concerning the COVID-19 vaccination trials and the planned national vaccination rollout, but COVID-19 vaccinations had yet to be administered to Australians. The study was approved by the Deakin University Human Ethics Advisory Group (HEAG-H 52.2020). Parents consented to participate prior to completing the baseline survey via an online plain language statement and consent form.

2.2. Measures

For our study, we used data from two waves of the COVID-19 Pandemic Adjustment Survey - Wave 1 (April 8th – April 28th 2020) and Wave 13 (January 18th – February 8th 2021, $N = 1094$, 46% of original sample). Additional information regarding the timing and wording of demographic measures is provided in Supplementary File 1.

Our key outcome of interest, COVID-19 vaccination intention, was measured during Wave 13. We first asked participants, via a categorical item, to indicate whether they intended to vaccinate themselves against COVID-19 once it became available to them ("yes", "no", "uncertain"). To further explore parents' reasoning we then asked an open-ended question: "What is the reason for your decision around vaccine intention for you?" All parents responded to the categorical item, and 95.52% responded to the open-ended question ($n = 1045$). Following the question structure above, parents were asked whether they would vaccinate their children once the COVID-19 vaccination became available for children ("yes", "no", "uncertain"). Parents were then asked: "What is the reason for your decision around vaccine intention for your child?". All parents responded to the categorical item, with 95.16% responding to the open-ended question ($n = 1041$).

For the open-ended questions, parents responded with an average of 15 words for reasons to vaccinate themselves ($M = 15.92$; $SD = 14.94$, range = 1–125), and an average of 12 words regarding vaccinating their child ($M = 12.56$; $SD = 12.48$; range = 1–85). While the number of words per question was small, the large sample size and the use of standardised open-ended questions ensured the data were rich, supported transferability to the population under study, and the identification of consistent patterns in the data [20].

2.3. Analysis

Data analysis was divided into two parts, as both quantitative (the two categorical items that assessed parents COVID-19 vaccine intention for themselves and their children) and qualitative (open-ended responses) data were obtained. In part one, we conducted two multinomial logistic regressions, one for parent COVID-19 vaccine intention (see Table 2) and another for child COVID-19 vaccine intention (see Table 3), using the same variables sourced from Wave 1 (e.g., parent age, parent sex, state) and Wave 13 (e.g., trust in science, satisfaction in government response so far). COVID-19 vaccination intention was regressed on a series of time-invariant (e.g., sex) and aggregations of time-variant (e.g., financial stresses, family members diagnosed with COVID-19) demographic predictors using a multinomial logistic link function. Due to substantial attrition, missing data were replaced through 50 multiple imputations using chained equations in STATA 16.

In part two of our data analysis, we employed a qualitative methodology to analyse the responses to both open-ended questions. Our qualitative methodology employed a critical realistic epistemology, with a focus on describing participants' observable reality [21]. We also drew on a 'descriptive framework' with interpretation based on the surface meaning of words [22], which allowed us to describe parents' varied perspectives comprehensively. In the context of qualitative

methodology, it is important to actively acknowledge how researchers' positions and viewpoints contribute to project conceptualisation and data interpretation (Berger, 2015). We engaged in reflexivity, recognizing the role of team members' background and knowledge in relation to possible biases in our interpretation of the data [23]. Both insider (parents) and outsider (non-parents) perspectives were also drawn upon when analysing the open-ended responses. The diversity of the team's expertise aided in identifying multiple perspectives within the data. This included a medical professional (GDR), and those in developmental psychology (SE, EW), clinical psychology (EW), social psychology (AK, JF), and health psychology (AMW, EK, ML).

Template thematic analysis was employed to identify and understand patterns of meaning across the data (Brooks et al., 2015). The steps involved: (1) SE, AK, BG, and EW read the dataset multiple times to familiarise themselves; (2) SE, BG, and AK carried out preliminary coding of the data; (3) SE, BG and AK discussed coding focusing on the relationships between emerging themes and sub-themes, including integrative themes across parent and child data; (4) SE, AK and EW created the initial coding template; (5) SE, AK, BG, and EW then coded 10% of the data each to check this template (110 different participants each), updating relevant themes and codes that did not adequately fit the data to create a final template. It is usual in template analysis to develop an initial version of the coding template on the basis of a subset of the data before applying it to the entire dataset as the template is iterative and refined across the process [23]; (6) BG then coded the entire dataset using the final template, meeting with SE and AK to discuss the implementation of the template and any changes. AM-W then double coded 10% of the dataset. Consistent with the goal of thematic analysis, which is to understand meaning through words rather than numbers [20], and where inter-rater reliability is deemed inappropriate to this underlying aim [24], formal inter-coding reliability rating was not undertaken. Rather, during step 6, where 10% of the full coding was checked, as AMW came across any data that she did not feel fully matched the code, she engaged in discussion with the main coder (BG) and lead researcher (SE). These discrepancies were minor and did not result in any changes to the template. This checking of 10% of the data is not a required part of template analysis, and was undertaken as an additional step to support the rigour of the process. The qualitative team (SE, AK, AMW, BG and EW) met during the write-up stage to discuss presentation of results, including use of quotes and final themes. GDR then reviewed the findings to ensure coherence from an Australian general practice perspective.

3. Results

3.1. Demographics

Demographic information describing the sample is presented in Table 1. The final sample was broadly representative of the Australian parent population in terms of geographic location, number of children, parents born overseas, and single parent households, but somewhat under-representative of fathers and families with a low income.

3.2. Quantitative investigation of vaccine intentions: multinomial logistic regression

3.2.1. Parent COVID-19 vaccine intention

As shown in Table 2, most parents intended to be vaccinated against COVID-19 (64.3%), with almost one quarter undecided (26.4%), and 9.3% saying they would not be vaccinated. When splitting vaccination intention into the three subgroups (yes, no, uncertain), the multinomial logistic regression (see Table 2) revealed that relative to parents who were intending to vaccinate themselves, those unsure or not intending to vaccinate were less likely to trust doctors. Those unsure were more likely to have lower incomes as well.

Table 1

Demographic characteristics of the sample compared to the Australian population of parents.

	CPAS parents 1094	ABS population
Parent age, m(sd)	39.2 (6.8)	n/a
Child age, m(sd)	8.9 (5.1)	n/a
Parent gender		
Female	903 (83.1%)	54%
Male	181 (16.7%)	46%
Cis female	1 (0.1%)	
Non-binary	1 (0.1%)	
Transgender male	1 (0.1%)	
Child gender		n/a
Male	567 (51.9%)	
Female	519 (47.5%)	
Non-binary	2 (0.2%)	
Transgender male	2 (0.2%)	
Genderfluid	1 (0.1%)	
Transgender female	1 (0.1%)	
Geographic location		
Major Cities of Australia	758 (70.0%)	74%
Inner Regional Australia	246 (22.6%)	17%
Outer Regional Australia	75 (6.9%)	7%
Remote Australia	9 (0.8%)	2%
Aboriginal or Torres Strait Islander	23 (2.1%)	4%
Parent born overseas	175 (16%)	21%
Low household income (<\$52,000 per year)	137 (12.7%)	21%
Single parent household	120 (11.0%)	11%
Number of children living in household		
One child	308 (28.2%)	42%
Two children	514 (47.0%)	39%
Three children	198 (18.1%)	14%
Four or more children	74 (6.8%)	5%
Parent vaccination intention		n/a
Yes	703 (64.3%)	
Unsure	289 (26.4%)	
No	102 (9.3%)	
Parent vaccination intention for child		n/a
Yes	528 (48.3%)	
Unsure	415 (38.0%)	
No	151 (13.8%)	

Data from the Australian Bureau of Statistics summarising characteristics of Australian parents living with a dependent child (usually defined as 0–14 years).

3.2.2. Child COVID-19 vaccine intention

When asked about their willingness to vaccinate their children, almost half of parents indicated they would vaccinate their child(ren) (48.3%), while 38% were undecided, and 13.8% said they would not vaccinate their child(ren). Parents were thus more likely to be undecided or to say no when determining whether they would vaccinate their children compared to themselves. As shown in Table 3, the predictors of parents' intentions for their children were like those for themselves. Relative to parents who were intending to vaccinate their child, those not intending were less likely to trust doctors.

3.3. Qualitative investigation of vaccine intentions: template thematic analysis

When examining the open-ended questions regarding parents' vaccination intention for themselves and their children, 25.23% (276) of parents responded to the open-ended question regarding their child with the same reasons as for themselves. Specifically, 15 (1.43%) used the word 'again' in their written response, 92 (8.77%) used the words 'same as above' or 'similar as above', and 169 (16.11%) used the words 'as above' or 'see above'. Yet, when examining the quantitative data (vaccine intention: yes, no, uncertain) and qualitative data (reasons for intention) together, there was also evidence of varying intention

Table 2
Multinomial logistic regression of parents' intention to obtain covid-19 vaccine.

	Regression coefficient	95% confidence interval		p	Odds Ratio	95% CI Lower	Upper
		Lower limit	Upper limit				
No ('Yes' Reference category)							
Reporting parent - Female	0.94	-0.77	2.66	0.282	2.56	0.46	14.29
Parent Age	0.01	-0.06	0.08	0.794	1.01	0.94	1.08
Geographical remoteness							
Inner Regional Australia	0.04	-1.07	1.14	0.949	1.04	0.34	3.12
Outer Regional and remote Australia	-0.13	-2.39	2.14	0.913	0.87	0.09	8.49
State							
Victoria	0.92	-0.98	2.83	0.342	2.50	0.37	16.94
Other	0.63	-1.37	2.62	0.537	1.87	0.25	13.73
Did not complete high school	0.50	-1.14	2.14	0.551	1.64	0.31	8.49
Has Partner at wave 1	-0.32	-1.83	1.19	0.679	0.72	0.16	3.28
Mental health Diagnosis	0.46	-1.22	2.14	0.591	1.58	0.29	8.49
Financial deprivation	-0.02	-0.54	0.51	0.948	0.98	0.58	1.66
Income	-0.43	-0.96	0.09	0.105	0.65	0.38	1.09
COVID-19 related finance problems	0.18	-0.23	0.60	0.387	1.19	0.79	1.82
Chronic Health Condition	0.14	-1.51	1.79	0.868	1.15	0.22	5.98
Family members diagnosed w COVID	-0.71	-2.03	0.61	0.289	0.49	0.13	1.84
Trust in doctors	-0.89	-1.39	-0.39	<0.001	0.41	0.24	0.67
Trust in state government	-0.30	-0.76	0.17	0.211	0.74	0.46	1.18
Trust in federal government	0.07	-0.41	0.55	0.770	1.07	0.66	1.73
Satisfaction with Federal Govt response	-0.06	-0.66	0.54	0.849	0.94	0.51	1.71
Satisfaction with State Govt response	-0.19	-0.72	0.34	0.484	0.82	0.48	1.403
Compliance with COVID-19 restrictions	-0.39	-0.85	0.07	0.098	0.67	0.42	1.07
Parent Psychological Distress (DASS total)	-0.08	-0.16	0.01	0.094	0.92	0.85	1.01
Unsure ('Yes' Reference category)							
Reporting parent - Female	-0.15	-0.80	0.50	0.642	0.86	0.44	1.64
Parent Age	0.01	-0.03	0.04	0.718	1.01	0.97	1.04
Geographical remoteness							
Inner Regional Australia	-0.20	-0.78	0.37	0.487	0.81	0.45	1.44
Outer Regional and remote Australia	0.30	-0.62	1.22	0.519	1.34	0.53	3.38
State							
Victoria	0.48	-0.35	1.31	0.254	1.61	0.70	3.70
Other	0.68	-0.15	1.52	0.110	1.97	0.86	4.57
Did not complete high school	0.28	-0.68	1.23	0.568	1.32	0.50	3.42
Has Partner at wave 1	0.18	-0.70	1.06	0.692	1.19	0.49	2.88
Mental health Diagnosis	0.06	-0.79	0.90	0.896	1.06	0.45	2.45
Financial deprivation	-0.14	-0.48	0.20	0.415	0.86	0.61	1.22
Income	-0.40	-0.67	-0.13	0.004	0.67	0.51	0.87
COVID-19 related finance problems	0.00	-0.23	0.22	0.999	1	0.79	1.24
Chronic Health Condition	0.49	-0.33	1.31	0.240	1.63	0.71	3.70
Family members diagnosed with COVID	0.16	-0.28	0.60	0.464	1.17	0.75	1.82
Trust in doctors	-0.46	-0.76	-0.17	0.002	0.63	0.46	0.84
Trust in state government	-0.20	-0.43	0.04	0.104	0.81	0.65	1.04
Trust in federal government	0.03	-0.18	0.24	0.776	1.03	0.83	1.27
Satisfaction with Federal Govt response	0.12	-0.15	0.39	0.374	1.12	0.86	1.47
Satisfaction with State Govt response	0.02	-0.26	0.31	0.882	1.02	0.77	1.36
Compliance with COVID-19 restrictions	-0.14	-0.38	0.10	0.261	0.86	0.68	1.10
Parent Psychological Distress (DASS total)	-0.01	-0.05	0.03	0.604	0.99	0.95	1.03

Boldface used to indicate statistical significance, where *p*-value < .05.

alignment strength. Some parents' qualitative reasoning was highly aligned to their 'yes', 'no', 'uncertain' responses for themselves and their children. Reasons that supported firm 'yes' responses included: "To refuse is unforgivable disgusting selfishness. Refusal potentially means being guilty of manslaughter". The other end of the spectrum aligned to firm 'no' responses, with reasons such as "its poison and for a very small benefit." However, many parents showed minimal alignment between their quantitative response and qualitative reasoning. For example, some parents who indicated an intention to vaccinate themselves and/or their child then provided reasons that reflected concerns about the vaccine's efficacy and safety. Other parents responded 'no', but then described reasons that indicated uncertainty, or a willingness to wait for more information to revise their decision.

Against this background of varying intention strength, we identified three themes that synthesised the reasons for parents' vaccine intentions for themselves, and three separate themes that explained intentions for

their children. Each theme is discussed below with corresponding quotes presented in Table 4 and summarized.

3.4. Parent COVID-19 vaccine intention themes

3.4.1. Weighing up risks and benefits

Parents acknowledged that they were making an important, but difficult, decision that required careful consideration of information related to risks and benefits. One participant explicitly summed it up as about the balance of fear: "Essentially it's a fear-based decision. Fear of COVID is greater than fear of vaccine risks".

3.4.1.1. Benefits of getting the vaccine. The main reason for considering vaccination was to protect oneself and one's family. There was also consideration of the moral or social obligation to protect the wider community, with parents noting that vaccination was particularly

Table 3
Multinomial logistic regression of parents' intention to vaccinate their child.

	Regression coefficient	95% confidence interval		p	Odds Ratio	95% CI Lower	Upper
		Lower limit	Upper limit				
No ('Yes' Reference category)							
Reporting parent - Female	0.18	-0.84	1.20	0.723	1.19	0.43	3.31
Parent Age	0.00	-0.06	0.05	0.948	1	0.94	1.05
Geographical remoteness							
Inner Regional Australia	0.36	-0.46	1.19	0.391	1.43	0.63	3.28
Outer Regional and remote Australia	-0.13	-1.83	1.57	0.882	0.87	0.16	4.80
State							
Victoria	1.03	-0.42	2.48	0.164	2.80	0.65	11.94
Other	1.21	-0.23	2.64	0.100	3.35	0.79	14.01
Did not complete high school	0.10	-1.49	1.69	0.900	1.10	0.22	5.41
Has Partner at wave 1	-0.47	-1.74	0.81	0.472	0.62	0.17	2.24
Mental health Diagnosis	-0.05	-1.43	1.32	0.940	0.95	0.23	3.74
Financial deprivation	0.03	-0.45	0.51	0.903	1.03	0.63	1.66
Income	-0.17	-0.59	0.24	0.417	0.84	0.55	1.27
COVID-19 related finance problems	-0.01	-0.35	0.33	0.946	0.99	0.70	1.39
Chronic Health Condition	0.17	-1.18	1.52	0.803	1.18	0.30	4.57
Family members diagnosed with COVID	-0.19	-1.02	0.65	0.659	0.82	0.36	1.91
Trust in doctors	-0.74	-1.14	-0.35	<0.001	0.47	0.31	0.70
Trust in state government	-0.26	-0.63	0.11	0.173	0.77	0.53	1.11
Trust in federal government	0.07	-0.29	0.42	0.718	1.07	0.74	1.52
Satisfaction with Federal Govt response	0.13	-0.30	0.56	0.551	1.13	0.74	1.75
Satisfaction with State Govt response	-0.17	-0.58	0.25	0.438	0.84	0.55	1.28
Compliance with COVID-19 restrictions	-0.26	-0.62	0.09	0.142	0.77	0.53	1.09
Parent Psychological Distress (DASS Total)	-0.06	-0.12	0.01	0.091	0.94	0.88	1.01
Unsure ('Yes' Reference category)							
Reporting parent - Female	0.06	-0.57	0.70	0.844	1.06	0.56	2.01
Parent Age	-0.01	-0.04	0.03	0.733	0.99	0.96	1.03
Geographical remoteness							
Inner Regional Australia	0.18	-0.34	0.71	0.496	1.19	0.71	2.03
Outer Regional and remote Australia	0.63	-0.27	1.53	0.171	1.87	0.76	4.61
State							
Victoria	0.90	0.14	1.65	0.020	2.45	1.15	5.20
Other	0.44	-0.36	1.24	0.282	1.55	0.69	3.45
Did not complete high school	0.33	-0.61	1.27	0.489	1.39	0.54	3.56
Has Partner at wave 1	0.05	-0.80	0.89	0.911	1.05	0.44	2.43
Mental health Diagnosis	-0.38	-1.19	0.44	0.365	0.68	0.30	1.55
Financial deprivation	-0.03	-0.37	0.30	0.850	0.97	0.69	1.34
Income	-0.25	-0.51	0.01	0.055	0.77	0.60	1.01
COVID-19 related finance problems	-0.13	-0.34	0.09	0.242	0.87	0.71	1.09
Chronic Health Condition	0.52	-0.28	1.31	0.206	1.68	0.75	3.70
Family members diagnosed with COVID	0.24	-0.20	0.68	0.283	1.27	0.81	1.97
Trust in doctors	-0.16	-0.45	0.14	0.298	0.85	0.63	1.15
Trust in state government	-0.20	-0.42	0.03	0.085	0.81	0.65	1.03
Trust in federal government	-0.01	-0.21	0.20	0.952	0.99	0.81	1.22
Satisfaction with Federal Govt response	0.17	-0.08	0.42	0.186	1.185	0.92	1.52
Satisfaction with State Govt response	-0.01	-0.29	0.26	0.936	0.99	0.74	1.29
Compliance with COVID-19 restrictions	-0.17	-0.41	0.07	0.170	0.84	0.66	1.07
Parent Psychological Distress (DASS Total)	0.00	-0.03	0.04	0.799	1	0.97	1.04

Boldface used to indicate statistical significance, where p-value <.05. The regression model adjusted for the presence of parent comments in the qualitative data regarding children not being on the COVID-19 vaccination schedule (and thus not eligible to receive a vaccine); and also whether parents directly mentioned a lack of research/clinical data to support vaccination in children. This coding did not significantly contribute to the model for either category.

important for those with immunodeficiency conditions to prevent the ill effects of COVID-19. Participants also noted the importance of vaccination in "stopping the spread", achieving herd immunity, reducing the severity of COVID-19 symptoms, and to "eradicate" COVID-19. Although participants tended to be knowledgeable about basic science concepts, it was a common misunderstanding that the vaccination would eradicate COVID-19. In addition to protection, the vaccination was also identified as playing an important role in returning to normality. Parents reported that they would agree to vaccination to resume travel, to prevent lockdowns and the use of masks, as well as for employment reasons. For parents who identified benefits associated with vaccination, fear of COVID-19 health and economic disruptions were greater than concerns they had about the vaccine: "Risks of adverse outcomes are much higher with infection than vaccine."

3.4.1.2. Risks. Of primary concern was testing and side effects, with participants feeling that testing and approval had been "rushed"; they were being treated as "guinea pigs"; there had been insufficient review and oversight of the vaccine process; and concerns about vaccine ingredients. Two parents even used the example of thalidomide to express their worries over side effects of a drug that was initially touted by the government and medical profession as "safe". Unknown interactions with medications and medical conditions were also cited as risks to consider. For participants who primarily wrote about concerns, the fear of vaccine risks seemed to outweigh the fear of COVID-19. Being at low risk of contracting COVID-19, believing COVID-19 "wasn't that bad" and alternative views such as vaccines containing "aborted fetuses" and "poison" were not common, but still cited by some parents as reasons for hesitance.

Table 4
Quotes illustrating themes for parents and children.

Parent Themes	Exemplar Quotes
Weighing up risks and benefits	‘I think the benefits, both individually and collectively hugely outweigh any risks.’ (Metro Melbourne), Father ‘There is little evidence to prove the benefits outweigh the risks.’ (Far North QLD), Mother
Benefits	‘I will do anything reasonably safe to protect myself and vulnerable people in the community.’ (Alice Springs NT), Mother ‘It’s the only way to expect life to resume as we knew it without suffering huge numbers of cases like in the USA and UK.’ (Metro Adelaide), Mother
Risks	‘Don’t believe it is necessary, not tested for safety, not even sure whether covid is as big an issue as is being said.’ (Regional QLD), Mother ‘I’ve had an known reaction to the flu vaccine so we have to make sure I won’t react badly.’ (Metro Melbourne), Mother
Sitting on the sidelines	‘I believe it has been rushed. I’d rather wait a bit longer to see if there are any long term issues from a rushed vaccine.’ (Metro Brisbane), Mother ‘Wait to see how it goes in the rest of the world. Side effects would be the biggest concern.’ (Regional QLD), Mother ‘We are lucky we don’t have to go first as Australia is not in a crisis. We have time to make a considered decision as a country and as parents.’ (Metro Melbourne), Mother
Whom to trust?	‘If it is recommended by the medical professionals and regulators charged with the assessing the risks and benefits, then we will follow their advice. If we are having car trouble, we seek an expert mechanics advice, rather than listen to members of the general public who have read a couple of article and think they are handy.’ (Metro Brisbane), Father ‘Vaccines save lives (you can quote me... im an RN).’ (Central QLD), Father ‘I dont trust that Big Pharma and those who profit of it have the best interests of the general population at heart. And there is a long history to show that government and pharmaceutical companies put profit before lives.’ (Metro Melbourne), Mother
Child Themes	Exemplar Quotes
Vaccine risks are higher and benefits lower for children	‘I’m willing to take ... myself as the benefits outweigh the risks, but unsure about this balance for my children.’ (Metro Melbourne), Mother ‘Am contemplating if it’s better for them to just get the virus rather [than] the vaccine.’ (Metro Melbourne), Mother ‘I don’t particularly want them to be guinea pigs. Will it affect their fertility? Will it have unintended consequences?’ (Regional VIC), Mother
To parent is to protect	‘I’m pro preventative care, I want to protect their future and the future generations.’ (Metro Adelaide), Mother ‘My children have received every other vaccine I don’t see how this one is any different.’ (Regional VIC), Mother ‘Children are the least likely to contract and spread so while it is new maybe we should protect them from potential side effects’ (Metro ACT), Mother
The guidance void	‘There hasn’t been much information about children being vaccinated or the recommendation to do so ... If it is recommended then I will get them vaccinated.’ (Metro Melbourne), Mother ‘I will probably get my children immunised as well, a friend cast doubt in my mind about whether it might cause long term issues for children, however, I’m sure once it’s come out and eventually become available I will speak to other friends in the medical field and feel more confident about vaccinating my children against COVID 19.’ (Metro Melbourne), Mother

Table 4 (continued)

Parent Themes	Exemplar Quotes
	‘I’d love more information from medical professionals, along with examples of doctors children receiving it. I’m concerned we aren’t aware of any long term side effects or complications in child development. We all know the thalidomide horror story.’ (Metro Sydney), Mother

Quotes are verbatim.

3.4.2. *Sitting on the sidelines*

Participants who were unsure about their intentions expressed a desire to “wait and see” before making a firm decision about whether to be vaccinated against COVID-19. Having insufficient information prevented these parents from making a clear decision about real risks versus benefits of getting vaccinated. Some parents said their decision “depended” on unavailable information, including further safety data. Several parents expressed that they wanted to see what happened in the rest of the world first and, in that sense, Australians were “lucky” to go last.

3.4.3. *Whom to trust?*

Participants noted which institutions or professions they trusted when trying to understand the risks and benefits of the COVID-19 vaccine. Some parents wrote about distrust in organisations such as the government, media, and science in portraying accurate information and using ‘coercion’ or ‘force’ in vaccination. However, the resounding message from participants was that they firmly placed their trust in science, including experts and the process itself (such as regulation, conduct of trials, and dissemination of information). Parents with prior positive experience with vaccination trusted science, whereas parents who claimed prior negative experiences tended to be more sceptical. Participants who identified as healthcare workers often talked about placing their unequivocal trust in science: ‘I’m a biologist and understand immunity’, but several healthcare workers questioned the vaccine, stating they might get the vaccine but still had safety concerns.

3.5. *Child COVID-19 vaccine intention themes*

3.5.1. *For children, vaccine risks are higher and benefits are lower*

Although parents also went through the process of weighing risks and benefits for their children, there was a much greater focus on risks for children. Parents wrote about concerns for children’s development in terms of long-term side effects, including later problems with their child’s health and fertility, which was not as emphasised when they considered the potential side effects for themselves. Parents of babies and toddlers were particularly concerned about safety and the impact of vaccination on the child’s physical and mental development, commenting they would not feel comfortable vaccinating young children for fear of disrupting their normal development. In contrast, parents of older adolescents saw their children as more adult-like in their ability to make their own decisions: “My children are old enough to decide for themselves. I will talk through the pros and cons with them and let them decide.”

In calculating risk, parents also referred to government and media reports, which suggested that many medical professionals thought COVID-19 was less severe in children. Some parents commented that COVID was not a concern for children as it did not result in high mortality or severe symptoms in children, or that “kids don’t get any symptoms anyway”. The perceived higher severity of vaccine side effects, paired with the perception that COVID-19 was not particularly dangerous for children, appeared to tip the balance towards a focus on risks when it came to determining whether children should be vaccinated against COVID-19.

3.5.2. To parent is to protect

A consistent response was that parents aimed to protect their children, with the words 'safety' and 'protect' used repeatedly. However, the way parents perceived they should protect their children varied according to their vaccination intentions. Hesitant parents often explained that their desire was to protect their children from the threat of vaccine adverse reactions. In contrast, parents who were more supportive of the vaccine for their children saw protection as ensuring their child avoided the illness itself, including symptoms and potential long-term effects of COVID-19: "I'd like my kids to be protected from COVID19". Indeed, many of these latter parents viewed the COVID-19 vaccine as one part of a larger vaccine program that protected children from several types of diseases and illnesses: "My kids don't have polio, no kid in Australia has polio. There's a reason for that." For such families, familiarity with the existing childhood vaccination schedule may support a ready adoption of the COVID-19 vaccine.

When it came to parents discussing vaccinations for vulnerable children (e.g., those who were immunocompromised or those with pre-existing medical conditions), there was similarly a divergence in protection according to vaccine intention. Parents who were supportive of the vaccine who had children with health issues saw the vaccine as providing their children with additional and needed immunity, while more hesitant parents felt their child's ill health would be further compromised by the vaccine. These findings indicate the need for clear, evidence-based information for parents of medically vulnerable children.

3.5.3. The guidance void

Parents uncertain about giving the COVID-19 vaccine to their children were waiting for clear advice. The lack of information offered by the Australian government about the role of children in the COVID-19 vaccine rollout during the time this data was collected (January 2021) appeared to create a vacuum, with parents eager for advice and therefore turning to other sources to fill this informational void. The most common source was friends and family, suggesting that without expert advice from trusted medical groups, parents would instead turn to trusted individuals in their social network. This sometimes resulted in potential misinformation, including the propagation of fears over long-term side effects. Similarly, many parents who indicated they typically followed health advice about their children's other vaccinations appeared reluctant to decide what to do without the shared responsibility of authorised medical advice. The fact that children were not currently listed on the COVID-19 vaccination schedule also meant that some parents had not yet given thought to their intentions for their children.

4. Discussion

Our data, from a large study of 1094 Australian parents, describe the views of parents regarding COVID-19 vaccination for themselves and their children. Approximately a quarter of our sample were unsure whether they would get a COVID-19 vaccine, while even more (38%) were unsure whether they would vaccinate their child. Our findings highlight the importance of going beyond simple 'yes' and 'no' questions and asking open ended questions, since our quantitative data revealed few reliable indicators of vaccine hesitancy, yet our qualitative data yielded rich information regarding parents' intentions. For example, quantitative data indicated a clear vaccine intention (whether yes or no), but then parents expressed a mix of positive views and concerns that offered room for change in their decision-making for both themselves and their child.

Our qualitative analysis also provided detailed concerns held by parents about vaccination, including concerns about testing timeframes, potential side effects, and lack of data on long-term outcomes. The focus on safety is consistent with recent data from the UK and Canada, where safety was identified as a paramount issue in COVID-19 vaccine

hesitancy [25,26]. Healthcare workers may address this point as, although COVID-19 vaccine development has been faster than usual, it has not been less thorough [27]. Parent concerns regarding long-term vaccine side-effects for children were high, especially for infants and young children. Overall, the risks of the COVID-19 vaccine were felt to be higher and the risks of COVID-19 lower for children, which is consistent with previous research documenting this phenomenon when the disease prevalence is low [11], as has been the case of COVID-19 in Australia. The main benefits of the vaccine that parents identified for themselves and their children were being able to get back to normal, and for individuals, communities and children to be protected. Universally, parents were eager to protect their children, although this meant different things depending on parents' vaccine intention. Parents were also eager for more information about their child's role in the COVID-19 vaccination schedule.

We identified various sources of trust and mistrust in parents, including the notion that COVID-19 is not serious. Most parents, however, expressed trust in mainstream information, suggesting that public health campaigns are likely to be effective. Our quantitative data triangulated the qualitative data regarding trust, showing that lower trust in doctors predicted COVID-19 vaccine hesitancy. This observation has serious implications for reducing vaccine hesitancy, since GP recommendations are key influencers in improving vaccine uptake [18]. It is also important that medical professionals and the government are transparent in their advice, as mistrust of the medical profession is a predictor of parent hesitancy for vaccinating their children [28].

Qualitative data provided information to leverage in campaigns to increase vaccination intention in the parent population. It is likely that uncertain parents, where qualitative reasons did not strongly match vaccine intentions, and parents who see benefits in the COVID-19 vaccine for returning to normality, are most likely to benefit from informative public health campaigns and support from health professionals to increase confidence in the COVID-19 vaccination program. When it comes to vaccinating children against COVID-19, it is vital that parents are provided clear advice [29,30]. As the Australian government has only recently supplied commentary on COVID-19 vaccinations for children, parents may be susceptible to misinformation, increasing vaccine hesitancy, as they are likely to turn to their social networks and the media for guidance instead [31]. Research on HPV vaccines has shown anti-vaccine social media is associated with increased parental vaccine hesitancy and with decreased children's HPV vaccination rates, while pro-vaccine content has no significant association with either [32]. A qualitative exploration of parents' views towards mumps and rubella vaccination identified that parents who distrusted government sources trusted other parents [33]. Honest but positive, community-oriented, campaigns relying on other parents as role models [34] might support the uptake of the COVID vaccines by Australian parents, especially for those who mistrust the government and science.

Most of our sample appeared to be actively considering the COVID-19 vaccine. Now that Australia's COVID-19 elimination strategy is no longer feasible, with the national plan tied to high rates of COVID-19 vaccination, knowledge is urgently needed about how to support Australian parents to increase their COVID-19 vaccination rates for themselves and their children. Despite this need, research evidence for specific strategies addressing vaccine hesitancy are lacking. Research does, however, suggest that strategies involving solely education or promotion result in minimal benefit [29,30,35]. Thus, effective public health vaccination campaigns are likely to address multiple components, combining education/promotion, good access to vaccines, legislation, and role models [29,30,36]. International and Australian research indicates that multi-component approaches to increasing vaccination uptake are most effective [37].

Acknowledgements

The current study was funded through the Centre for Social and Early

Emotional Development, a Strategic Research Centre at Deakin University.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychores.2021.110626>.

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