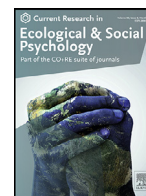




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COVID-19 vaccine intentions in Aotearoa New Zealand: Behaviour, risk perceptions, and collective versus individual motivations

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ABSTRACT

The global SARS-CoV-2 (COVID-19) pandemic presents a pressing health challenge for all countries, including Aotearoa New Zealand (NZ). As of early 2022, NZ public health measures have reduced impacts of the pandemic, but ongoing efforts to limit illness and fatalities will be significantly aided by widescale uptake of available vaccines including COVID-19 booster doses. Decades of research have established a broad range of demographic, social, cognitive, and behavioural factors which influence peoples' uptake of vaccinations, including a large amount of research in the last two years focused on COVID-19 vaccination in particular. In this study, we surveyed people in New Zealand ($N = 660$) in May and June of 2021, at which point the vaccine had been made available to high-risk groups. We explored individual versus collective motivations, finding that people who were hesitant about COVID-19 vaccination scored lower on independent self-construals (how people define themselves) but higher on community identity, weaker but still positive perceived social norms, lower general risk of COVID-19 to New Zealanders and higher vaccine risk for both themselves and others, and lower response-efficacy both for personal and collective benefits. Overall, the findings suggest some benefit of collective over individual appeals, but that generally messaging to encourage vaccination should focus on conveying social norms, risk from COVID-19 broadly, and vaccine safety and efficacy.

Overview of global COVID-19 situation

On the 5th of January, 2020, the World Health Organization (WHO) first released information on a new “viral pneumonia” observed in Wuhan, People’s Republic of China (WHO, 2021). The first vaccines against COVID-19 were administered in December, 2020. At the time of writing in early 2022, confirmed global cases were over 410 million and the death toll was over 5.8 million, despite over 10 billion vaccine doses having been administered. Case rates remain high in many areas, partly reflecting a concentration of vaccines in developed countries, the highly infectious Omicron strain, and fatigue and frustration with public health measures leading to these either being dropped or ignored. Several reports, typically examining excess mortality rates, suggest that both cases and deaths are vastly underreported (Whittaker et al., 2021).

COVID-19 in Aotearoa New Zealand

Aotearoa New Zealand (NZ) reported its first confirmed case of COVID-19 on the 28th of February 2020 (Radio New Zealand, 2021). The country closed its borders to all but citizens and permanent residents on the 19th of March (who had to go through managed isolation

and quarantine from April) and entered a strict “Level 4” lockdown at 11.59pm on the 25th. During this lockdown people were only allowed to leave home if they were an essential worker, going to a supermarket or to seek healthcare, or staying close by to exercise outside. NZ reported its first death from COVID-19 on the 29th of March. There were three considerable outbreaks, in August 2020, February 2021, and an outbreak of the Delta variant which began in August 2021. The arrival of the Omicron variant ultimately led to the loosening of virtually all restrictions.

In October 2020 the government announced its first vaccine pre-purchase agreement. The Pfizer BioNTech vaccine was approved for use in NZ on the 10th of February 2021 and the first doses administered on the 20th (see Table 1 for an overview). The government implemented a framework targeting first those most at risk of getting infected (i.e., border workers then their households), followed by those most likely to experience worse outcomes if they were infected (e.g., older people, those with pre-existing health issues, and communities which typically experience poorer health outcomes). The Janssen, AstraZeneca, and Novovax vaccines have since been given provisional approval with the NZ government having made advanced purchase agreements, but these vaccines were not widely offered in NZ.

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Table 1
Timeline of key dates in NZ's vaccine rollout.

Milestone	Date
First international doses	December, 2020
Pfizer approved for used in New Zealand	10th Feb, 2021
Vaccine available to border and health workers	20th Feb, 2021
Vaccine available to high-risk groups	May, 2021
Data collection for this study	16th May to 6th June, 2021
Vaccine available to general population (ages 60-64)*	28th July, 2021
Vaccine available for those aged 12 to 15	20th August, 2021
Vaccine available for all over 12	1st September, 2021
Rollout of boosters to border & health workers	29th November, 2021
Boosters to general population	17th Jan, 2022
Vaccine available for those aged 5 to 11	17th Jan, 2022

Note. All dates are for the Pfizer vaccine. * = general population proceeded in stages based on age brackets.

At the time of writing, face masks were mandated in many settings including flights and retail and it was a legal requirement for all businesses to display an official QR code for the country's smartphone tracing app. Ongoing government messaging encouraged good hygiene and use of the tracing app. Likely given the low number of cases in the country during the initial vaccine rollout, as well as the apparent success of appeals to act to protect each other during the Level 4 lockdown, the early vaccine promotion material focused primarily on allowing people to either return to more "normal" behaviour or to continue such behaviour as well as the communal benefit of vaccinating. However, print news media presented more arguments for vaccines based on preventing or protecting against disease than on protecting the community (Ashwell & Murray, 2020). Since the time of data collection, vaccine mandates have been introduced (and in 2022, largely removed) for a number of workforces including education, and the Covid Protection Framework - which replaced the Alert Levels system, both now no longer in use - had more lenient restrictions for venues which require patrons to provide their vaccine pass (a scannable QR code available for those who have been fully vaccinated to indicate their status).

In this study, we aimed to identify key factors related to intentions to get, or intentions to not get, the COVID-19 vaccine. Many studies have explored a range of different factors; we focused on collective versus individual motivations, including specific views of individual and collective risks as well as general, individual difference factors such as independent and interdependent self-construals (how people define themselves). We briefly review literature on vaccine intentions, moving from less to more contextually specific, followed by a brief introduction of key study variables not already introduced in the reviewed vaccine literature. As part of this latter section, we provide an overview of NZ's cultural context to help appropriate interpretations of the study findings.

Vaccine intentions and behaviour

Research has examined intentions and actual vaccination behaviour covering a broad variety of motivators and inhibitors for a range of viruses, including influenza A (H1N1), commonly referred to as swine flu. While much earlier work focused on confidence in vaccines and health systems, more recent studies have looked at a larger range of factors including perceptions of disease risk, psychological barriers, and collective responsibility (Betsch et al., 2018; Gray et al., 2012). Research in Canada looked at H1N1 vaccine uptake among pregnant women (Fabry et al., 2011). Although the majority (95%) recognized that the vaccine was recommended, only three-quarters had received it. Women in the study were more likely to have received the vaccine if they trusted health professional advice, believed that the vaccine had been adequately tested, and believed that it would be effective. Information source also related to vaccine uptake, with higher rates among those who used official websites and lower rates among those who used other sites such as mainstream media. Other factors which have been shown to

be relevant for uptake or intentions to receive an H1N1 vaccine include past behaviour, instrumental attitudes, subjective norms, perceived benefits, and worry about catching swine flu (Gray et al., 2012; Myers & Goodwin, 2012; Teitler-Regev et al., 2011; Yang, 2015).

In mid-2020, reported willingness to be vaccinated against COVID-19 ranged between 63% and 88% in a multinational survey (Kerr et al., 2021). Several studies have looked at intentions to receive vaccines for COVID-19 specifically. These studies examine demographic factors such as age and gender (Faasse & Newby, 2020; Karlsson et al., 2021; Latkin et al., 2021; Schwarzinger et al., 2021), behavioural factors such as past vaccine uptake and use of other protective behaviours (Faasse & Newby, 2020; Latkin et al., 2021; Schwarzinger et al., 2021), informational factors including information sources (Faasse & Newby, 2020) and trust in scientists or experts (Faasse & Newby, 2020; Freeman et al., 2021; Kerr et al., 2021), cognitive factors such as outcome expectancy (the belief that the behaviour will lead to the intended or suggested outcome; Anthony et al., 2021; Faasse & Newby, 2020; Freeman et al., 2021); and risk factors such as concern about infection, illness, transmitting to others, and vaccine safety (Anthony et al., 2021; Faasse & Newby, 2020; Karlsson et al., 2021; Kerr et al., 2021; Kwok et al., 2021; Motta et al., 2021; Schwarzinger et al., 2021). Some of this research found significant influences of factors relating to collective motivations (Freeman et al., 2021; Karlsson et al., 2021; Kwok et al., 2021); a recent study explicitly explored the role of community identification, finding that those who more strongly identified with their community had higher willingness to get the vaccine, via a stronger perceived sense of duty to their community (Wakefield and Khauser, 2021). Researchers in the area have recommended public communication focused on altruism (Chou & Budenz, 2020) while others have theorised that collective benefits, despite the small contribution that an individual vaccination makes, lead to a moral obligation and a sense of fairness (Giublini et al., 2018); however, one study demonstrated that perceptions of fairness (and harm) were not related to vaccine hesitancy (Amin et al., 2017).

Some research has been conducted in NZ exploring factors relating to COVID-19 vaccine intentions. In a survey conducted in July 2020, Thaker (2021) found that general hesitancy around vaccines, including lack of confidence and perception of risks, and trust in scientists were related with COVID-19 vaccine intentions. Three-quarters of participants (74%) said that they intended to get a vaccine once it was available, consistent with international levels (between 63% and 88%; Kerr et al., 2021).

The studies described above present a broad range of factors which relate to intentions or uptake of vaccines, including for COVID-19 specifically. While some studies include collective motivations, few focus on these types of motivations and mostly do not directly compare them to individual motivations. Vaccination offers a good opportunity to test the extent to which people are motivated more by individual or collective reasons; vaccines offer some protection to the individual but are more effective when many people are vaccinated. There are also risks

at the individual level (e.g., side effects) and at the collective level (e.g., outbreaks impacting health systems and the economy). To explore individual versus collective motivations, we drew on a number of other factors from behavioural sciences not widely considered in the above vaccine literature.

Other study factors

The following factors were also included in this study as they represent a range of collective factors which have been known to motivate diverse behavior such as preparing for earthquakes, but with no or limited application to the behaviour of vaccination. These factors therefore are well tested and supported measures but represent relatively novel considerations in the domain of vaccine intentions. There are undoubtedly other factors which fit these criteria; however, in order to avoid making the survey excessively long (and thereby risking a high non-completion rate or lower quality responding) we had to limit the number of factors included. These factors are therefore intended to suggest whether overall there is a collective versus individual trend and ideally suggest a limited number of key factors to consider but is by no means intended to be exhaustive.

Inclusion of community in self

Adapted from the Inclusion of Other in the Self scale (Aron et al., 1992), the Inclusion of Community in Self scale (ICS) was developed as a way to measure community connectedness with a single item (Mashek et al., 2007). Participants are presented with a series of pairs of circles with differing amounts of overlap; one of the circles represents themselves and the other represents their community. They select the pair of circles which best reflects to what extent their community is part of their sense of self. As with previous versions of the scale (e.g., Aron et al. 1992; Tropp & Wright 2001), the ICS has been established as a valid and reliable measure (Mashek et al., 2007). Given the benefits to the community of individuals being vaccinated, and the concordant focus on this benefit in NZ messaging, it is important to explore how the extent to which people feel connected to their community might affect their vaccine intentions. Previous research in other domains has found that people are more likely to engage in behaviours which will help their community, such as cleaning waterways, if they identify more strongly with their community (Forsyth et al., 2015). However, authors have suggested that the mechanism for this relationship is the motivation to act in line with common behaviours within the community (Solberg et al., 2010). It is therefore also important to consider the influence of social norms.

Social norms

People's behaviour is influenced by the common behaviour and beliefs of those in their social groups. Norms can be "actual" (i.e., objective strength) or "perceived" (i.e., what an individual thinks the norms are in their social group). Because perceptions of norms are not always accurate (Rimal & Lapinski, 2015), we are interested in this latter type of norms in this study. Within these two broad categories, there are two commonly identified types of norms: descriptive and injunctive. Perceived *descriptive* norms are how commonly an individual thinks a behaviour is carried out by members of their social group; if someone thinks that many people like them engage in a behaviour, then they are more likely to also engage in that behaviour (Cialdini et al., 1990). Perceived *injunctive* norms are beliefs about how strongly and widely approved (or disapproved) a behaviour is; similar to descriptive norms, people are more likely to engage in a behaviour which they think is largely approved of by their social group, and to not engage in a behaviour which is not approved (Cialdini, 2007). It is important to consider these two discrete factors separately as they influence behaviour in different ways (e.g., Hamann et al. 2015; Vinnell et al. 2018).

Independent and interdependent self-construals

Self-construals refer to how people define themselves (Markus & Kitayama, 1991). Those with stronger independent self-construals define themselves as discrete individuals rather than any connections to others being a core part of their sense of self. Those with stronger interdependent self-construals define themselves more by the groups of which they are members. These construals impact people's behaviour, as those who are more independent rely more on their own beliefs and emotions to make decisions than the beliefs and emotions of others (Markus & Kitayama, 1998). They are then more motivated to act in ways which allow them to be direct, achieve their goals, and express uniqueness. In comparison, those who are more interdependent are more likely to behave in ways based on their perceptions of the beliefs, behaviour, and emotions of those in the groups (Markus & Kitayama, 1998), and to act in ways which benefit their groups and help them to fit in. People have both self-construals but to differing extents and differing levels of use in behavioural decision making, depending on factors including cultural and situational context (Kanagawa et al., 2001; Markus & Kitayama, 1991). These concepts, and scales to measure them, have been developed and critiqued over the decades since their initial introduction (e.g., Gudykunst & Lee 2003), but they have been shown to influence a large range of behaviours from willingness to pay for ecotourism (Hwang & Lee, 2018) to colour preferences (Jeon et al., 2020).

Collective efficacy

Collective efficacy refers to the ability of a group of people to work together to achieve a shared goal which benefits all group members (Carbone & McMillin, 2019). This particular factor is relevant in the context of vaccines, as although vaccination offers protection to the individual, it also serves to directly protect those around them (such as those who are particularly vulnerable and/or cannot be vaccinated) by limiting the chances of them spreading disease as well as indirectly by reducing possible spread more widely through communities. Collective efficacy influences a broad range of behaviours, including natural hazard preparation (Becker et al., 2015) and pro-environmental behaviour (Pakmehr et al., 2020).

Aotearoa New Zealand's cultural context

NZ is broadly an individualistic country (Brougham & Haar, 2013) meaning that in theory most people should be more motivated by benefits and risk to themselves than to their family and communities. Approximately 17% of NZ's population are Māori, who tend to be relatively collectivistic (Bennett & Liu, 2018; Brougham & Haar, 2013). However, the ethnic diversity within the country means that it is unlikely that all New Zealanders are more individualistic than collectivistic. Official government communication during the initial stages of the pandemic (in particular the first Level 4 lockdown in mid-2020) made several appeals to New Zealanders' collective identity. These included repeated use of the phrase "team of five million" to describe the population and the reo Māori phrase "he waka eke noa" which translates approximately to "we are all in the same boat" in reference to the idea that the pandemic is a collective, shared experience. These appeals to collective motivations appear to have been successful based on compliance with restrictions during this initial lockdown (although some factors limited ability to follow recommendations such as physical distancing; Gray et al. 2021).

Study aims

We did not formulate hypotheses for this study, as the evidence to suggest one more prominent set of factors (i.e., whether individual or collective motivations would be more prominent) was mixed. The current (at time of data collection) campaign from the government suggests a perspective that people will be more motivated by a collective purpose

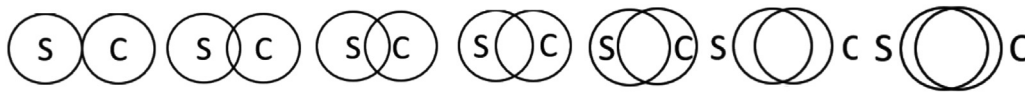


Fig. 1. Inclusion of Community in Self Scale.

and through a desire to see life either return to “normal” or to continue as normal, rather than from an individual purpose or from a perception of risk from COVID-19. This latter assumption is likely based on the fact that, at the time of the study, the largest impacts from the pandemic felt in NZ were restrictions on movement through the border.

Method

Participants

People 16 years or older and currently living in NZ were recruited primarily through social media channels (namely Twitter and Facebook). This did not allow for participant recruitment to target particular demographic quota, but is a useful mechanism to obtain relatively large sample sizes for limited time and financial investment. Seven hundred and twelve people started the survey. One person did not consent, and one indicated that they were below the minimum age (therefore neither progressed to the first question) all other participants provided informed consent. Our study followed the ethics approval process of our host university, Massey University. A further 50 participants who did not answer any questions beyond these screening questions were removed, leaving a final dataset of 660 individuals. Approximately one third of participants identified as men (32.5%) and two-thirds as women (67.4%). Ages ranged from 18 to 83, with a mean of 39 ($SD = 13.93$). The sample was well-educated, with 68.5% of participants holding a university degree. Similarly, participants were fairly well-off, with only 14.2% reporting that their household costs slightly or considerably exceeded their income. Approximately half (55%) were responsible for dependants. Most participants reported between two and four people in their household (71.3%). A quarter (25.4%) reported that they are considered high risk for negative COVID-19 outcomes according to the Ministry of Health, while 27.6% said that someone in their household is high risk. Only 6.3% of the participants have had COVID-19 while 28.5% of the participants who have family overseas said that at least one of those family members have had COVID-19; 50.8% of these participants indicated that they had overseas family members who had been vaccinated.

Data was collected between the 16th of May and 6th of June, 2021, around the time that the vaccine rollout was extended beyond border workers and healthcare to people who are considered at higher risk from COVID-19. At this stage of the survey, the priority vaccine group had been able to be vaccinated for approximately four months.

Materials

Table 2 presents all key survey variables which were answered using 7-point Likert or Likert-type scales.

Inclusion of community in self scale

This single-item scale assesses the amount of overlap participants see between themselves and their community, by selecting one of seven pairs of circles with varying degrees of overlap (see Fig. 1; Mashek et al., 2007).

Other related behaviours

Participants were asked how often (Never, Sometimes, About half the time, Most of the time, Always) they took steps to protect themselves from COVID-19 (relative to the number of times they're in situations where the steps are recommended). These actions were:

- “Wearing a face mask or covering on public transport”

- “Keeping a distance of 2 m from people you don't know (when at Alert Level 2 or higher)”
- “Logging places you visit with the COVID-19 Tracer App or other method”
- “Washing your hands (or sanitising)”
- “Coughing and sneezing into your elbow”
- “Staying home if you are sick”

Participants were also asked:

- “How often do you talk about COVID-19 vaccination with people around you” (Never, Less than once a month, A couple of times a month, Once a week, A couple of times a week, Every day)
- “Where do you get most of your COVID-19 information?” (Government/health officials, Friends, Family, News media, Social media, Other)
- “How often do you get the yearly flu vaccine?” (Never, Some years, Most years, Every year)

Demographics

Finally, participants were asked for a range of demographic information. Beyond the typical questions (age, gender, ethnicity, education, income, responsibility for dependants, and number of people in the household), we asked several questions about personal and family COVID-19 experience:

- if they are considered at higher risk from COVID-19
- if someone in their household is considered at higher risk from COVID-19
- if they have had COVID-19
- if they have family overseas who have had COVID-19
- if they have family overseas who have had a COVID-19 vaccine

Results

Although intentions were measured with a 7-point Likert-type scale, few participants scored below the mid-point so the variable¹ was not treated as continuous. Instead, participants were grouped into four categories to allow for group means comparisons:

- Don't intend to get the vaccine (score of 1 to 4 on the intentions scale; i.e., either do not intend to get the vaccine or intend to *not* get the vaccine), $n = 39$
- Might get the vaccine (score of 5 or 6 on the intentions scale), $n = 113$
- Will get the vaccine (score of 7 on the intentions scale), $n = 319$
- Have already received at least one dose, $n = 112$

Implications of this decision are discussed in the Limitations section. Where possible, Bonferroni corrections were applied to reduce the familywise error rate and a more conservative alpha threshold for significance of .01 was adopted to reduce whole study error rate. These participants are referred to by their groups throughout the results. In all instances, we are referring to *statistical* groups for the purpose of conducting, describing, and interpreting analyses. We cannot say based on our data that the participants in each group are unique from each other, rather than simply varying in degree of their intentions.

¹ Distribution of scores on the intentions scale: 1 (Definitely not) = 10 participants; 2 = 11; 3 = 4; 4 = 14; 5 = 44, 6 = 69; 7 (Definitely yes) = 319, Can't have = 8; Already had = 112

Table 2
Key survey questions.

Scale	Item	"1" label	"7" label	Adapted from
Interdependent self-construal	I maintain harmony in the groups of which I am a member	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	I respect the majority's wishes in groups of which I am a member	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	I respect decisions made by my group	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	It is important to consult close friends and get their ideas before making a decision	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
Independent self-construal	I will sacrifice my self-interest for the benefit of my group	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	I stick with my group even through difficulties	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	I prefer to be self-reliant rather than depend on others	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	I should decide my future on my own	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
COVID-19 collective beliefs	I take responsibility for my own actions	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	It is important for me to act as an independent person	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	My personal identity is important to me	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
	I enjoy being unique and different from others	Strongly disagree	Strongly agree	Gudykunst & Lee (2003)
Anxiety	We are a team of 5 million	Strongly disagree	Strongly agree	Original
	When it comes to COVID-19, we are all in the same boat (he waka eke noa)	Strongly disagree	Strongly agree	Original
	It took everyone in New Zealand to stop COVID-19 from spreading	Strongly disagree	Strongly agree	Original
	It will take everyone in New Zealand getting vaccinated to prevent COVID-19 from spreading	Strongly disagree	Strongly agree	Original
Intentions	It is my responsibility to get vaccinated to help keep myself safe	Strongly disagree	Strongly agree	Original
	It is my responsibility to get vaccinated to help those around me safe	Strongly disagree	Strongly agree	Original
COVID-19 risk perception	How anxious are you about falling ill with COVID-19?	Not at all	A lot	Karlsson et al. (2021)
	How anxious are you about passing COVID-19 on to someone else?	Not at all	A lot	Karlsson et al. (2021)
COVID-19 Vaccine risk	Do you intend to get a COVID-19 vaccine once it is available to you?	Definitely not	Definitely yes	Original
	Please indicate how likely you think each of the following situations are			
	Another large-scale COVID-19 outbreak in New Zealand	Extremely unlikely	Extremely likely	Fasse & Newby (2020)
	You personally contracting COVID-19 (assuming no vaccination)	Extremely unlikely	Extremely likely	Fasse & Newby (2020)
Response-efficacy	Someone you care about in New Zealand contracting COVID-19 (assuming no vaccination)	Extremely unlikely	Extremely likely	Fasse & Newby (2020)
	If you were to contract COVID-19, how serious do you think your symptoms would be?	Not severe at all	Very severe	Fasse & Newby (2020)
	Think of someone you care about . If they were to contract COVID-19, how serious do you think their symptoms would be?	Not severe at all	Very severe	Fasse & Newby (2020)
	In general, how much of a risk do you think COVID-19 poses to New Zealanders?	No risk at all	A great deal of risk	Original
Collective efficacy	How likely do you think it is that you personally would experience negative side effects from a COVID-19 vaccine?	Extremely unlikely	Extremely likely	Faasse & Newby (2020)
	How likely do you think it is that someone you care about would experience negative side effects from a COVID-19 vaccine?	Extremely unlikely	Extremely likely	Faasse & Newby (2020)
	If you were to experience negative side effects of a COVID-19 vaccine, how serious do you think your symptoms would be?	Not severe at all	Very severe	Faasse & Newby (2020)
	Think of someone you care about . If they were to experience negative side effects from a COVID-19 vaccine, how serious do you think their symptoms would be?	Not severe at all	Very severe	Faasse & Newby (2020)
Perceived descriptive norms	In general, how much of a risk do you think COVID-19 vaccines pose to New Zealanders?	No risk at all	A great deal of risk	Original
	Getting a COVID-19 vaccine will keep me safe	Strongly disagree	Strongly agree	Original
	Getting a COVID-19 vaccine will keep those around me safe	Strongly disagree	Strongly agree	Original
	Getting a COVID-19 vaccine will help NZ to return to normal faster	Strongly disagree	Strongly agree	Original
Perceived descriptive norms	Getting a COVID-19 vaccine will help NZ open up the borders sooner	Strongly disagree	Strongly agree	Original
	People in my community can be trusted	Strongly disagree	Strongly agree	Carbone & McMillin (2019)
	People in my community get along with each other	Strongly disagree	Strongly agree	Carbone & McMillin (2019)
	I live in a close-knit community	Strongly disagree	Strongly agree	Carbone & McMillin (2019)
Perceived descriptive norms	People in my community are willing to help each other	Strongly disagree	Strongly agree	Carbone & McMillin (2019)
	People in my community share the same values	Strongly disagree	Strongly agree	Carbone & McMillin (2019)
	Please indicate how likely you think it is that each of these groups will get a COVID-19 vaccine once it is available to them			
	My friends and family	Extremely unlikely	Extremely likely	Vinnell et al. (2021)
Perceived descriptive norms	People in my community	Extremely unlikely	Extremely likely	Vinnell et al. (2021)
	People like me	Extremely unlikely	Extremely likely	Vinnell et al. (2021)
	New Zealanders	Extremely unlikely	Extremely likely	Vinnell et al. (2021)

(continued on next page)

Table 2 (continued)

Scale	Item	"1" label	"7" label	Adapted from
Perceived injunctive norms	Please indicate how strongly you think each of these groups approve of getting a COVID-19 vaccine once it is available to them			
	My friends and family	Strongly disapprove	Strongly approve	Vinnell et al. (2021)
	People in my community	Strongly disapprove	Strongly approve	Vinnell et al. (2021)
	People like me	Strongly disapprove	Strongly approve	Vinnell et al. (2021)
Vaccine support	New Zealanders	Strongly disapprove	Strongly approve	Vinnell et al. (2021)
	Do you support the use of COVID-19 vaccines?	Strongly oppose	Strongly support	Original
	Do you support the use of vaccines generally (i.e., for illnesses)?	Strongly oppose	Strongly support	Original

Note. The intentions question also included two further options: "Can't have the vaccine" and "Already had the vaccine".

Demographic differences

Age

Age significantly differed between intentions groups, $F(3, 568) = 14.17, p < .001, \eta^2 = .07$. Those in the "might" group were significantly younger ($M = 32.31, SD = 9.19$) than those in the "don't" group ($M = 45.03, SD = 11.38; t(56.35) = 6.30, p < .001, d = 1.30$), the "will" group ($M = 40.98, SD = 14.12; t(297.87) = 7.34, p < .001, d = 0.67$), and the "have" group ($M = 40.42, SD = 15.72; t(173.44) = 4.67, p < .001, d = 0.63$). There were no other differences between groups on age.

Number of people in the household

The groups also significantly differed on number of people in the household, $F(3, 562) = 7.16, p < .001, \eta^2 = .04$. Those in the "might" group had significantly more people in their household on average ($M = 3.87, SD = 1.53$) than those in the "will" group ($M = 3.09, SD = 1.45; t(416) = 4.78, p < .001, d = 0.53$) and the "have" group ($M = 3.24, SD = 1.63; t(216) = 2.95, p < .01, d = 0.40$).

Dependents

The groups also significantly differed on the proportion of participants who have dependents, $X^2(3) = 13.03, p = .005$, Cramer's $V = .15$. Within the "don't", "might", and "have" groups, the majority of participants have dependents (55.3%, 68.5%, and 57.9%, respectively), compared to a slight minority in the "will" group (48.9%).

High risk

There was a marginally significant difference in the ratio of people who are and are not at a higher risk from COVID-19 between the intentions groups, $X^2(3) = 10.46, p = .015$, Cramer's $V = .14$. A larger proportion of people in the "don't", "might", and "will" groups were not at higher risk, while a larger proportion of the people in the "have" group were at higher risk (28.1% versus 16.3%). This difference likely reflects the prioritization of higher risk individuals for first access to the vaccine at the point at which this data was collected.

Family vaccinated

There was a significant difference in the ratio of participants who had COVID-19 vaccinated family members between the intentions groups, $X^2(3) = 11.94, p < .01$, Cramer's $V = .20$. The proportion of people who had vaccinated family members overseas was larger in the "will" group (66.0% versus 55.2%) and the "have" group (19.0% versus 13.3%). However, some cells in this analysis were around or smaller than $n = 20$ so these results should be interpreted cautiously.

Gender

There was a marginally significant difference in the gender ratio between the intentions groups, $X^2(3) = 9.31, p = .026$, Cramer's $V = .13$. A larger proportion of the participants who identified as women were in the "will" group (59.2%) compared to those who identified as men who were more spread between the "might" (24.6%), "will" (46.2%), and "have" (22.2%) groups. The proportion who were in the "don't" group

was similar between men (7.0%) and women (6.6%). People of other gender identities did not make up enough of the sample to be included in the analysis.

Other factors

There were no significant differences between intentions groups in having higher-risk household members or family who have had COVID-19. Some cell sizes were too small for overall interpretation for income, education, and participants who had had COVID-19.

General individual/collective identity

Means significantly differed between intentions categories for all four variables (see Fig. 2): Inclusion of Community in Self, $F(3, 547) = 7.14, p < .001, \eta_p^2 = .04$; Interdependent self-construal, $F(3, 547) = 8.21, p < .001, \eta_p^2 = .04$; Independent self-construal, $F(3, 547) = 6.06, p < .001, \eta_p^2 = .03$; and Collective efficacy, $F(3, 547) = 11.11, p < .001, \eta_p^2 = .06$.

Inclusion of community in self

Those who might receive the vaccine scored marginally higher on the ICS than those who do not intend to, $p = .038$, and those who strongly intend to, $p < .001$, suggesting a fairly unique trait of the vaccine hesitant identifying more strongly as a member of their community, particularly compared to those who strongly intend to get the vaccine. It is important to note here that "community" was self-defined, so participants might have been primed by the study topic to think of a community to which they belong which has relevance to the vaccine (i.e., a group where vaccine opinions and behaviours are shared between members). It is possible then that those in the "might" group tend to more often be part of communities which share their own hesitancy, potentially explaining why a stronger community identification does not appear to be motivating vaccine uptake.

Self-construals

Those who said they will not get the vaccine scored significantly lower on interdependent self-construal than those who might, $p = .013$ (marginal), those who will, $p = .001$, and those who already have, $p = .001$, suggesting that those who see themselves as less connected to those around them are more likely to refuse the vaccine. However, there was no significant difference on interdependent self-construal between those who weakly and those who strongly intend to get the vaccine (i.e., Might vs Will). Interestingly, the hesitant "might" group scored marginally significantly lower on independent self-construal than those who said they will receive the vaccine, $p = .020$, and those who have already received it, $p < .001$. Overall, however, participants scored higher on independent self-construals than interdependent. Together, these findings suggest that generally in New Zealand individualistic appeals may be more useful than collective appeals, as were commonly used to promote the vaccine, as these appeals are not likely to shift self-construals but could align with them to influence behaviour (e.g., Kim et al. 2022). This is particularly the case for those who said they will not get the vaccine, though this raises the question of whether an

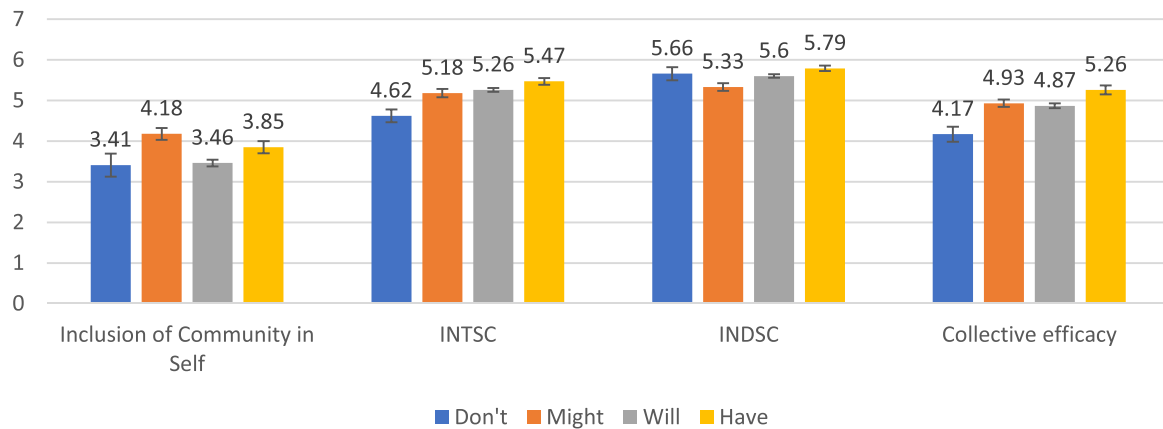


Fig. 2. Mean scores for general collective and individual factors between vaccine intention groups
Note. Scores ranged from a possible 1 to 7. Bars are +/- standard error. INTSC = Interdependent Self Construal, INDSC = Independent Self Construal.

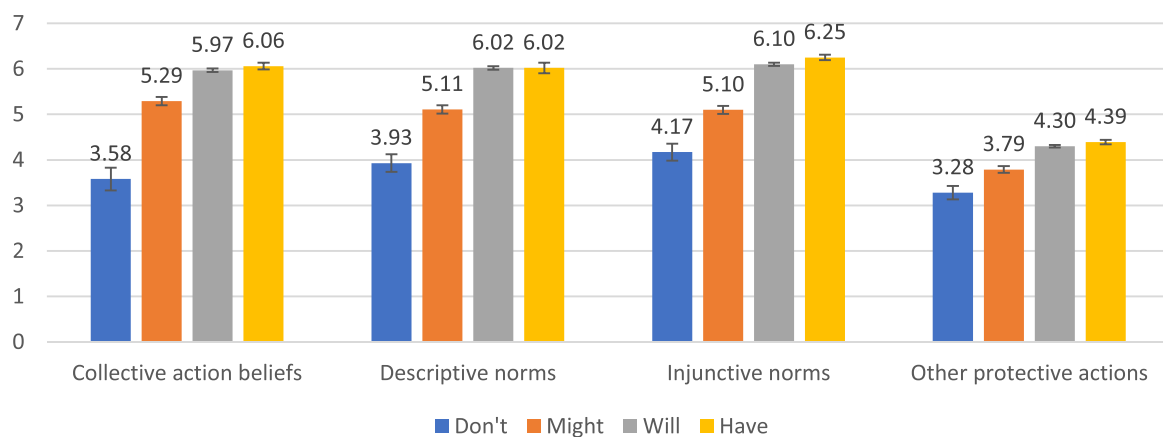


Fig. 3. Mean scores for COVID-19 specific behaviours and behavioural perceptions between vaccine intentions groups
Note. Scores ranged from a possible 1 to 7, except for Other protective actions which ranged from 1 to 5.

intervention targeted at independent self-construals would be capable of motivating these people to get the vaccine.

Collective efficacy

Vaccine refusers scored significantly lower on collective efficacy than those who are hesitant, $p = .001$, those who intend to get the vaccine, $p = .001$, and those who have already had it, $p < .001$. The only other difference is between the “will” and the “have” groups, $p = .003$. It could be that receiving the vaccine (i.e., taking part in a collective effort to address a pressing challenge) led to a small increase in perceptions of collective efficacy. Key here is that perceptions of collective efficacy did not significantly differ between the “might” and “will” groups, suggesting that hesitation around the vaccine may not be due to low perceptions of collective efficacy (and vice versa, that higher collective efficacy motivates vaccine uptake).

Social norms, beliefs, and COVID-19 protective actions

Means significantly differed between intentions categories for all four variables (see Fig. 3): Collective action beliefs, $F(3, 569) = 103.92$, $p < .001$, $\eta_p^2 = .35$; Descriptive social norms, $F(3, 569) = 83.52$, $p < .001$, $\eta_p^2 = .31$; Injunctive social norms, $F(3, 569) = 125.10$, $p < .001$, $\eta_p^2 = .40$; and other protective actions, $F(3, 569) = 51.92$, $p < .001$, $\eta_p^2 = .22$.

Collective action beliefs

Those who say they will not receive the vaccine scored much lower on COVID-19 related collective action beliefs than those who might,

will, or have received the vaccine, all $p < .001$. Crucially, the hesitant group also scored lower than those who will or have already had the vaccine, both $p < .001$, suggesting that such messaging may not be helpful for convincing this group given that these messages have been used widely and repeatedly already.

Perceived social norms

There is a similar pattern for descriptive and injunctive norms, where those who say they will not receive the vaccine think others are less likely to get it too and are less approving of the vaccine than those who might, will, or already have had the vaccine, all $p < .001$. Again, of key interest, those in the hesitant group also scored significantly lower than those in the “will” and “have” groups, both $p < .001$, suggesting that people who are hesitant think fewer others are getting or will get the vaccine, or approve of getting the vaccine. Social norms therefore present a possible target for uptake campaigns.

Other protective actions

The same pattern was again seen for other protective actions, with those who say they will not get the vaccine less often undertaking other actions to protect against COVID-19 than all other groups, all $p < .001$. Importantly, those who are hesitant about the vaccine are also less often undertaking other protective actions than those who will or already have had the vaccine, both $p < .001$. This finding suggests that communication perhaps should not invoke people’s previous COVID-related protection actions as a reason for getting vaccinated. Different to perceived social norms which can be shifted in fairly broad, shallow interventions, communication strategies cannot change people’s previous

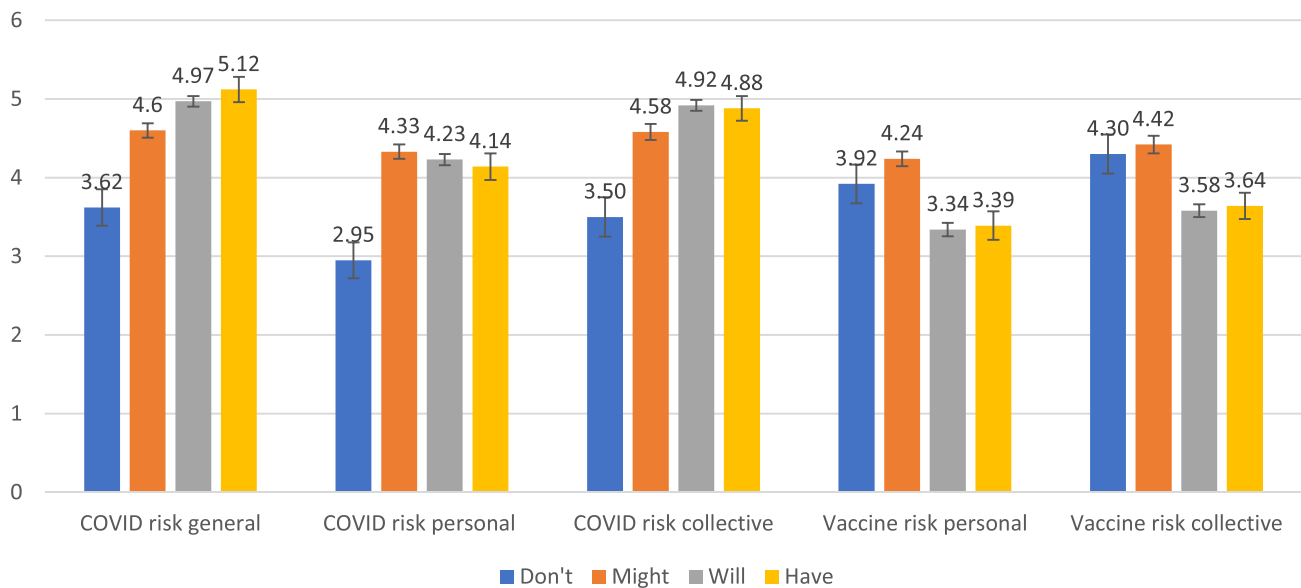


Fig. 4. Mean scores for COVID-19 and vaccine risk perceptions between vaccine intentions groups.

behaviour. However, this finding does suggest that underlying principles of efforts to encourage other protective actions may be applicable to encouraging COVID-19 vaccines, given the apparent relationship between other actions and vaccination intentions.

COVID-19 and vaccination risk perceptions

Mean scores differed between intention categories for all five risk components (see Fig. 4): General COVID-19 risk, $F(3, 544) = 16.72$, $p < .001$, $\eta_p^2 = .08$; personal COVID-19 risk, $F(3, 544) = 12.01$, $p < .001$, $\eta_p^2 = .06$; collective COVID-19 risk, $F(3, 544) = 14.97$, $p < .001$, $\eta_p^2 = .08$; personal COVID-19 vaccine risk, $F(3, 544) = 11.03$, $p < .001$, $\eta_p^2 = .06$; and collective COVID-19 vaccine risk, $F(3, 544) = 10.64$, $p < .001$, $\eta_p^2 = .06$.

COVID-19 disease risk

Those who said they will not receive the COVID-19 vaccine saw significantly lower general risk from COVID-19 than those in all three other groups, all $p < .001$. Interestingly, those in the hesitant group saw marginally significantly less risk compared to those who have had already had the vaccine, $p = .018$, but not those who said they will have the vaccine, $p = .055$. This suggests that perceptions of risk of COVID-19 may not be the difference between those who somewhat intend to get vaccinated and those who strongly intend to get vaccinated. However, both of these tests are technically non-significant, so the difference suggested here should be tested further with a larger sample size. Those in the “don’t” group saw significantly lower personal and collective risk from COVID-19 than those in all other groups, all $p < .001$. However, there was no significant difference between any of the other groups for either personal or collective risk, suggesting that low levels of perceived risk from COVID-19 is not a key factor in vaccine hesitancy (though might be in vaccine refusal).

COVID-19 vaccine risk

Interestingly, while vaccine refusers appear to perceive more risk from the vaccine than those who have or will have the vaccine, the difference from the “will” group was only marginally significant for collective risk, $p = .022$, and non-significant for personal risk. The difference from the “have” group for both personal and collective vaccine risk was non-significant. However, those in the “might” group scored significantly higher for both personal and collective vaccine risk than

those in the “will” and “have” groups, both $p < .001$, suggesting that information about the safety of the vaccine is important to communicate. This finding is key, as it suggests that reassuring those who are hesitant about the safety of the vaccine may help to increase the strength of their intention and translate that intention into behaviour.

Vaccine response efficacy

Mean scores significantly differed between the intentions groups on all three types of response efficacy (see Fig. 5): personal, $F(3, 568) = 150.53$, $p < .001$, $\eta_p^2 = .44$; collective, $F(3, 568) = 133.90$, $p < .001$, $\eta_p^2 = .41$; and general, $F(3, 568) = 101.32$, $p < .001$, $\eta_p^2 = .35$.

Participants who said they will not receive the COVID-19 vaccine saw the vaccine as significantly less effective than those in the “might”, “will”, and “have” groups. Crucially, those in the “might” group saw the vaccine as significantly less effective than those who said they will or have had it, while these latter two groups did not differ. This pattern was found for all types of response efficacy: personal (“Getting a COVID-19 vaccine will keep me safe”), collective (“Getting a COVID-19 vaccine will keep those around me safe”), and general (an average of “Getting a COVID-19 vaccine will help NZ to return to normal faster” and “Getting a COVID-19 vaccine will help NZ open up the borders sooner”). This suggests that communication of the benefits of the vaccine, regardless of what those benefits are, could be effective. Evidence from behaviour change research and practice suggests that it is easier to strengthen a somewhat positive attitude than to change an attitude from negative to positive (McKenzie-Mohr, 2011). Communication efforts targeting more specific communities could therefore identify a limited number of these beliefs which are held positively but weakly to strengthen.

Support for vaccination

Mean scores significantly differed between the intentions categories for both support of the COVID-19 vaccine specifically, $F(3, 558) = 190.28$, $p < .001$, and other vaccines generally, $F(3, 558) = 61.64$, $p < .001$ (see Fig. 6). As expected, those in the “don’t” group were significantly less supportive of the COVID-19 vaccine than those in all three other groups, all $p < .001$, and, importantly, those in the “might” group also scored lower than those in the “will” and “have” groups, both $p < .001$. The pattern was slightly different for vaccine support generally, with both the “don’t” and the “might” group scoring significantly lower than the “will” and “have” groups, all $p < .001$, but not

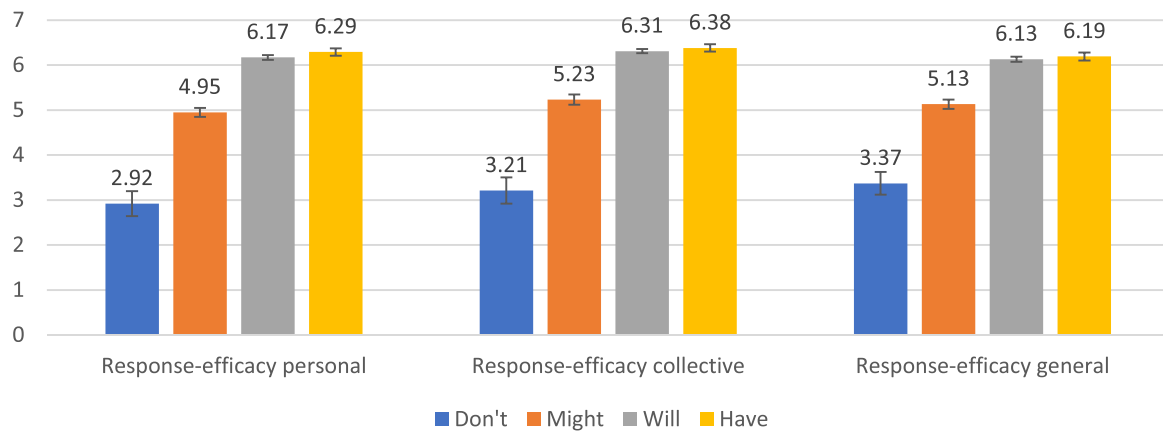


Fig. 5. Mean scores for general, personal, and collective response efficacy of COVID-19 vaccination.

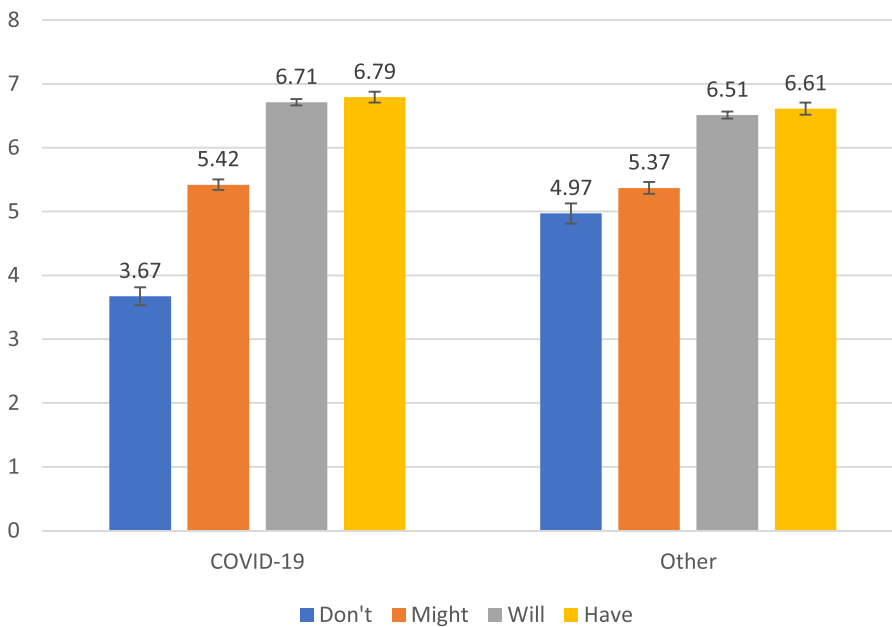


Fig. 6. Mean scores for support of COVID-19 vaccines versus vaccines for other diseases or illnesses between intention groups.

significantly different from each other. This suggests that general attitudes towards vaccines contribute to hesitancy about the COVID-19 vaccine in particular, but that there may be specific contextual factors which contribute to refusal (as opposed to hesitancy) for the COVID-19 vaccine different to other vaccines. However, it is also important to note that even those in the “don’t” group were either neutral or vaguely supportive; support for the COVID-19 vaccine did not differ from the midpoint of the scale, $t(38) = 0.99, p = .16$, and was significantly above the midpoint for support of other vaccines, $t(38) = 3.07, p < .01$. Those in the “might” scored above the midpoint for both COVID-19 vaccines, $t(109) = 15.63, p < .001$, and other vaccines, $t(111) = 14.37, p < .001$.

Discussion

Summary of results

Demographics. There were few strong differences in demographic factors between the intentions groups. Those in the “might” group who are hesitant about the vaccine were significantly younger than all other groups (consistent with higher intentions among older people in previous research; Karlsson et al. 2021) and on average had more people in their household (although logically this should increase intention to get vaccinated, as larger households both increases the likelihood

of contracting COVID-19 as well as the possibility of infecting a close other). Other demographic differences, such as proportion of people in each group at higher risk of COVID-19 could be due to the staged nature of the rollout prioritizing people who are more risk from serious illness if they were to become infected. Interestingly several previous studies found significant differences between men and women; most found higher intentions among women than men (Fasse & Newby, 2020; Karlsson et al., 2021; Schwarzinger et al., 2021), although other studies found that women were less likely to intend to get a COVID-19 vaccine (Latkin et al., 2021), including in NZ (Thaker, 2021). Research in the area of risk communication suggests that women tend to have higher risk perceptions and to be more likely to take action to prevent or mitigate that risk (see for example the proposed “white male effect”; Finucane et al., 2000), although gender differences are largely inconsistent or non-evident in risk-related fields such as natural hazard research (Becker et al., 2015).

Collective factors

Those who are vaccine hesitant scored marginally lower on independent self-construals compared to those who said they will receive the vaccine and significantly lower than those who have already had it, suggesting that those who see themselves more as individuals are more likely to get the vaccine. Counter to assumptions, people might be rely-

ing on their own, existing attitudes when deciding whether to get vaccinated. Supporting this suggestion, there were no differences between these groups for individual versus collective risk (of either COVID-19 or the vaccine) as well as the finding that those in the “might” group did not score higher on interdependent self-construals or collective efficacy (except compared to the “wont” group).

This “might” group, however, scored significantly higher on the Inclusion of Community in Self scale than all other groups. Higher scores compared to the “don’t” group is consistent with previous findings that collective factors such as community identification are positively related with uptake intentions (e.g., [Freeman et al. 2021](#); [Kwok et al. 2021](#); [Wakefield and Khauser, 2021](#)). The primary purpose of behavioural interventions is typically to create “will” intentions, rather than “might” intentions. However, shifting people who will not engage in positive behaviours such as getting vaccinated to maybe engaging in those behaviours could also be treated as a positive outcome of any intervention efforts, as it would then be more likely that other influences could prompt those people to act.

The “might” group also scoring higher than the “will” group suggests a non-linear relationship between intentions and community identification. Some factors relevant to risk communication and prevention/mitigation behaviour tend to be parabolic rather than linear such that higher levels on the factor does not necessarily translate into more behaviour (i.e., both low and high levels have a similar impact on risk-related perception and behaviour; [Solberg et al., 2010](#)). It is possible that previous work has found a linear relationship because the analyses were designed to only identify linear relationships. This finding therefore suggests that further work focusing on a limited number of factors should consider non-linear relationships. However, the reason for our findings being inconsistent with previous research can not be confidently concluded based on the current data.

Complicating any potential explanation of this difference is that those who will likely get the vaccine did not differ on interdependent self-construal, a measure conceptually similar to the ICS, than those who might get the vaccine. The former asked participants about their relationship with their group(s) rather than their community. It is possible that people consider their role within the groups to which they belong differently than they do their community. Further, people might see their community as less homogenous, particularly on questions such as vaccination, than the groups they considered for the interdependent self-construal scale, resulting in a consistent impact on intentions of self-construal but not of inclusion of community in self. However, again, it is not possible to reach a firm conclusion based on the data here. This question could be explored in future research, to inform whether there is a difference between appealing to people to consider their group or to consider their community.

Social and behavioural factors

Across all social factors (collective action beliefs, descriptive and injunctive social norms, and frequency of engaging in protective actions against COVID-19), the “don’t” group scored lower than all others, and, importantly, the “might” group scored lower than the “will” and “have” groups. This is broadly consistent with previous research showing positive relationships between vaccine intentions or uptake and past behaviour, other protective actions, and social norms ([Faase & Newby, 2020](#); [Latkin et al., 2021](#); [Myers & Goodwin, 2012](#); [Schwarzinger et al., 2021](#); [Yang, 2015](#)). While the findings around social norms could inform communication campaigns, the positive relationship between other protective actions and vaccine intentions reflects an ongoing challenge in other risk areas whereby it is easier to encourage people who have done one action to undertake a further action than it is to encourage people who have done nothing to do something (captured in social science theories such as Bandura’s triadic reciprocal determinism; [Bandura, 1989](#)).

Given that the collective action beliefs considered in this survey are largely comprised of messages which have been used widely and repeat-

edly (such as the appeals to the “team of 5 million”), it is unlikely that efforts to increase the communication of these to the vaccine hesitant will lead to large changes. However, this group perceived positive (i.e., above the midpoint of the scale) descriptive and injunctive norms. Given that it is easier to strengthen an attitude or perception than to change valence (i.e., from negative to positive), it is possible that communication of either or both types of norms to the vaccine hesitant could increase uptake. This suggestion is discussed further in the following section.

Risk

Those who say they will not get the vaccine saw less risk from COVID-19 across all three factors (personal, collective, and general), consistent with previous research ([Karlsson et al., 2021](#); [Kwok et al., 2021](#); [Motta et al., 2021](#); [Schwarzinger et al., 2021](#)). Of particular interest, those in the “might” group did not differ from the “will” or “have” groups for personal or collective risk but did score lower on general risk. This suggests that efforts to communicate the general risk of COVID-19 to New Zealanders (rather than the individual or someone they are close to) might be effective. [Karlsson et al. \(2021\)](#) found that perceptions of illness severity generally, but not personally, were associated with intentions; together with our findings, this suggests that exploring different dimensions of risk, including who is being perceived as at risk, is important to understand people’s motivation for prevention and mitigation actions.

Consistent with previous findings that perceptions of vaccine safety are positively related with intentions ([Fabry et al., 2011](#); [Freeman et al., 2021](#); [Karlsson et al., 2021](#); [Kwok et al., 2021](#); [Thaker, 2021](#)), those in the “might” group saw more risk on both vaccine risk factors compared to the “will” and “have” groups. These findings suggest that messages which communicate the safety of the vaccine, both for the individual and for those they care about, might also be effective.

Response efficacy

Response efficacy (related to outcome expectancy and instrumental attitudes) has repeatedly been shown to be a key factor motivating risk prevention and mitigation actions in other areas such as natural hazard preparedness ([Vinnell et al., 2021](#)). Across all three response efficacy factors (personal, collective, and general), the same pattern as above was found, where the “might” group scored lower than the “will” and “have” groups (and the “don’t” group scored lowest of all), largely consistent with previous research ([Fabry et al., 2011](#); [Freeman et al., 2021](#); [Yang, 2015](#); see [Faase & Newby 2020](#), for an exception). As with social norms, the “might” group scored above the scale midpoint, suggesting that they do hold positive perceptions of response efficacy, but these perceptions are less positive than those who say they will and those who have already had the vaccine. This suggests that efforts to communicate the benefits of the vaccine, regardless of whether it is to keep them safe, other people safe, or to help life return to normal, might be effective. If a particular community is the intended audience for messaging, it would be useful to undertake further research to identify if one particular benefit would be more useful for that community.

Vaccine uptake

Previous research demonstrated between 63% and 88% of people were willing to receive a COVID-19 vaccine ([Kerr et al., 2021](#)); a survey in NZ found 74% of participants would get a vaccine once it was available ([Thaker, 2021](#)). In our survey, slightly over half (54%) said that they would definitely receive a vaccine. However, when all participants who responded above the midpoint were considered, this rose to 73.1% where above the midpoint represents those more likely than not to get the vaccine. While it is difficult to compare between our findings and those of [Thaker \(2021\)](#) given the latter study used a dichotomous yes/no measure, these findings are similar. However, in our study we also asked if participants had already received at least one dose. When these participants were considered, 92% of participants either had positive intentions to get the vaccine or had already had a COVID-19 vaccine. At time

of writing, 95% of the eligible population in NZ had received at least one dose and 93% were fully vaccinated (Ministry of Health, 2022). This suggests that studies of COVID-19 vaccine intentions might have underestimated the percentage of people who would end up being vaccinated.

Limitations

Related to the above point, one of the limitations of this study is the lack of a perfect relationship between intentions and behaviour. Intentions are considered one of the best predictors of actual behaviour and are substantially easier to measure (Vinnell et al., 2021), but as indicated it cannot be assumed that intended levels will exactly reflect actual behaviour. This limitation, and the finding that vaccine intentions were considerably lower than actual uptake, provides an important caveat for interpreting future work measuring intentions. Also related is the issue of general high levels of vaccine acceptance in NZ. This meant that the sample was skewed significantly towards people who might or will get a COVID-19 vaccine, with few participants being outright refusers. However, the small group of vaccine refusers are unlikely to be motivated to be vaccinated by public education and advertising campaigns. Thus, although any findings relating to this group need to be interpreted with caution, this group is not the core focus of this research. Rather, evidence suggests that the main differences of interest are between those who **might** and those who will be vaccinated, as those who are hesitant are more likely to be swayed by public campaigns (McKenzie-Mohr, 2011) and should therefore be the focus of research efforts.

This main focus on differences between those who weakly intend and those who strongly intend to get the vaccine (i.e., might vs. will) partially but not completely mitigates one of the main limitations of this study. The plan was to treat intention to get the vaccine as a continuous variable, using regression to test which of our explanatory variables associated with intention. However, very few participants did not intend to get the vaccine. We believe that grouping participants based on intention scores, essentially transforming the variable from seven potential groups (one for each point on the Likert scale) to three groups allowed for more robust analyses. We acknowledge that this limits the nuance in the data and therefore limits the certainty of our conclusions. Grouping and labelling individuals may imply a conceptual assumption that participants in each of the statistical groups are unique from those in the other groups, rather than varying from others in the degree of their intent. This assumption does reflect real world approaches to behaviour interventions, however, were people who have moderate intentions to undertake a behaviour (i.e., are not likely to convert that intention into action without intervention, but with intervention are likely to act) are identified and communicated to as a homogenous group (e.g., McKenzie-Mohr, 2011). Little literature has considered this question in detail, however, so it poses a possibility for future research which would be useful within and beyond the current context of vaccination intentions.

Further, it is possible that people who are neutral about getting the vaccine (i.e., scored 4) would differ from those who intend *not* to get the vaccine (i.e., scored 1 to 3) but due to the sample size we chose to group these participants together to allow them to be included in the analysis, as the groups would have been too small to include had they been separated. Again, the focus here is on the differences between those who might and those who will get the vaccine, as this is an effective way to inform uptake campaigns. There were also some demographic differences between the groups; however, these differences were generally small and/or marginally significant. Given the limits on inference and statistical robustness mentioned above demographic factors were not controlled for in the analyses. Future work with a larger sample size could explore whether factors such as age, objective risk status, and perceived/self-reported risk status influence intentions to get vaccines. For example, although the proportion of people who were high-risk versus not high-risk was only marginally significantly different between groups, it is possible that because when the survey was conducted the

vaccine was only available to high-risk groups that these participants thought more concretely about getting vaccinated than those for whom vaccination was not yet a possibility (and therefore more abstract; see for example construal level theory: Trope & Liberman, 2010).

Given the national level of this scale, it is unlikely that the findings would generalise to all types of communities in NZ. Any efforts which intend to target messaging at a specific group should undertake further work to identify which factors are most relevant for that group. Finally, it is unclear the extent to which these patterns would be found for other vaccines and for other behaviours where small actions of individuals lead to a collective benefit beyond the sum of the individual benefits.

Recommendations

Based on our findings, there are several recommendations that can be made for campaigns aimed to increase uptake of COVID-19 vaccination in NZ. While current uptake levels are high, the vaccination programme is ongoing with a recent rollout of booster doses and future booster doses are likely to be required. Thus, further efforts will be needed to encourage people to continue receiving vaccination doses. While our study was able to identify individual and collective factors which might influence intention to get a COVID-19 vaccine and could inform uptake campaigns, these campaigns should still be pilot tested both to ensure that the factors identified here are causally related to intention and that there is potential to increase vaccination behaviour. These efforts could consider crafting messages targeted to younger people, appealing to community identity, presenting *both* descriptive and injunctive norms, and presenting clear information about the general risk posed by COVID-19 paired with information about the benefits and safety of vaccines.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Data will be made available on request.

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