



Report

DETERMINANTS OF COVID-19 VACCINE HESITANCY IN FIJI

Supported by the Commonwealth Foundation under the "Strengthening Citizen Engagement in COVID-19 Policy and Decision-making" Project



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1.INTRODUCTION

The novel coronavirus, SARS-CoV-2, first emerged in Wuhan, China in December 2019 and its outbreak was declared a Public Health Emergency of International Concern on 30th January 2020, and subsequently, a pandemic on 11th March 2020. Over 185 million have, since, been infected with this novel virus, and more than 4 million people have died of COVID19 globally. The outbreak continues to be a dynamic and evolving pandemic with the emergence of new variants causing second and third waves of infections around the globe.

Fiji recorded its first case of COVID-19 on 19th March 2020. With an elimination strategy early into the outbreak, Fiji was able to control the outbreak with only 18 community cases between 19th March and 18th April 2020, all linked to international travel. A year later, in April 2021, Fiji recorded its first case of community transmitted COVID19 after a breach in quarantine protocols for what would become the second wave of infections that would spiral out of control on Fiji's most populous island. Viti Levu, which is currently the epicentre of the current outbreak, has a total population of 715,325 with, over 378,284 people living in the Central Division (Fiji Bureau of Statistics, 2018). At the time of this publication, Fiji had recorded 46,027 cases and 497 deaths due to COVID19, with 45,957 cases recorded in the second wave alone. The 7-day rolling average of new cases per day was 347 cases or 392 cases per million population per day (Ministry of Health and Medical Services, 2021).

From the outset of the outbreak in March 2020, the health authorities focused on promoting COVID-19 protective behaviours to the public, which included maintaining a physical distance of two metres, hand washing with soap and water for more than 30 seconds, wearing of face masks and avoiding social gatherings. Together with a "hard and fast lockdown", these measures were an effective tool in controlling this spread of the original variant during the first wave; however, many saw these only as interim measures to reduce the spread of the virus and remain COVID-19 contained.

The COVID-19 crisis has had a devastating impact on the Fijian economy. It has severely affected the tourism industry, which directly accounted for around 40% of the GDP. The Fijian economy registered its most significant ever economic contraction of 15.7 per cent in 2020, and is further projected to contract by 4.1 per cent in 2021. This translates into a loss of over \$2 billion in GDP, leading to a significant setback to the development gains realized from the nine years of consecutive economic growth from 2010 to 2018 (Sayed-Khaiyum, 2021). With the economy on life-support, hopes of recovery rested, in large part, on the successful rollout of a safe and effective vaccination programme.

Currently, no curative treatment exists for COVID-19 infection (Huang et al., 2020); however, several vaccines have been developed and approved for emergency immunization, providing a glimpse of hope for preventing the spread of COVID-19 infection

and containing the medical, economic, and social repercussions of the pandemic (Fortner & Schumacher, 2021). Fiji, through the COVAX facility, co-led by the Coalition for Epidemic Preparedness Innovations (CEPI), Gavi and the World Health Organization (WHO), alongside crucial delivery partner UNICEF, became the first country in the Pacific to receive 12,000 doses of AstraZeneca COVID-19 vaccines in March 2021 and began inoculation.

As of 19th August 2021, Fiji had received 60,000 doses from the COVAX facility, over 860,000 of 1 million doses pledged by Australia, 100,000 doses of COVISHIELD AstraZeneca from India,

150,000 doses of Moderna from the US government and 100,000 doses of AstraZeneca of 500,000 doses promised by New Zealand. At the time of this publication, 555,230 adults in Fiji had received at least One dose of the vaccine, and 255,864 had received two doses. This means that 94.6 per cent of the total Fijian population had received at least one dose, and 43.6 per cent are now fully vaccinated nationwide.

Successful vaccination programs can lead to herd immunity or reduced prevalence levels and cushion the health and economic impacts of the pandemic; however, even the availability of highly effective vaccine cannot achieve that unless there is widespread vaccine acceptance. There are many contributing factors to public acceptance and hesitancy of vaccines, including concerns about safety and efficacy, general vaccination attitudes, convenience, sociodemographic characteristics, and the spread of misinformation that is particularly rampant in the case of the COVID-19 pandemic. It is vital to understand public attitudes across Fiji to guide needed communications and engagement strategies to support the rollout of the covenant in vaccines.

This research aims to understand public perception, knowledge, concerns, and acceptance amongst Fijian adults older than 18. This study will help identify knowledge gaps, beliefs, and attitudes of Fijians towards vaccines and provide recommendations for the Government and relevant agencies to implement for a successful rollout of the COVID-19 vaccination programme.

2. LITERATURE REVIEW

Countries around the globe are facing formidable and unprecedented challenges in managing what is now a public health crisis due to COVID-19. In addition to mask mandates, social distancing, hand hygiene, and other public health measures to COVID-19, the global public response has been a massive investment in producing and rolling a safe vaccine (Sharma, 2020). As the number of cases begins to surge once again, even in highly vaccinated countries like the United Kingdom, the United States and Israel after the emergence of the new Delta Variant of Concern (VOC), governments around the globe are racing to vaccinate their citizens. However, even a vaccine with 100 per cent efficacy can have no impact if there's no widespread acceptance and uptake, and the vaccine remains in the vial (Orenstein & Ahmed, 2017). Therefore, this literature review aims to examine factors surrounding vaccine hesitancy in Pacific Island Countries and around the globe.

A safe, effective, and widely acceptable vaccine remains the most viable tool for reducing transmissibility, associated mortality, and morbidity and eradicating infectious diseases (Orenstein & Ahmed, 2017). Dr Edward Jenner's discovery of the smallpox vaccine saw the global elimination of smallpox after a worldwide immunization campaign (Belongia & Naleway, 2003). Vaccines have played a vital role in reducing the prevalence of deadly infectious diseases like 99.9% reduction in polio (Razum et al., 2019) and Measles (Moss, 2009). Vaccines also hold key to ending the COVID-19 pandemic that has swept the world like fire and taken millions of lives and devastated economies, causing much pain and suffering. Several vaccine candidates have been developed and or in development. With the advent of new COVID-19 Vaccines like Pfizer/BioNTech (USA), Moderna (USA), and AstraZeneca/Oxford (U.K.) with the efficacy of over 90% for hospitalization and deaths (Mahase, 2020), (Public Health England, 2021), a large proportion of the population will need to be vaccinated to achieve herd immunity and will play a critical role in reducing stress on health care systems, saving lives, and containing the outbreak. However, the achievement of herd immunity largely depends on the widespread acceptance given by this novel vaccine. However, these would depend, on large part, on widespread acceptance of these novel - and experimental- vaccines.

In 2019, the World Health Organization (WHO) ranked vaccine hesitancy among the ten most essential threats to global health (WHO, 2019). The Scientific Advisory Group for Emergencies (SAGE) Working Group on Vaccine Hesitancy defined 'vaccine hesitancy as delay in acceptance or refusal of vaccination despite the availability of vaccination services'. The Working Group (2015) added that 'vaccine hesitancy is complex and context-specific, varying across time, place, and vaccines. Factors that influence hesitancy are complacency, convenience, and confidence'. A global survey of 13,426 participants on acceptance of COVID-19 vaccines done in 19 countries showed that 71.5% of the participants were 'somewhat likely' to take the COVID-19 vaccine with

higher levels of trust in information from government sources (Lazarus et al., 2020). A separate study on understanding COVID-19 vaccine hesitancy in low-and middle-income countries (LMICs) concluded that acceptance in LMICs was higher (80.3%) than in high-income countries. Participants cited increase personal protection against COVID-19 as a significant driving for getting vaccinated, and medical professionals were the most trusted sources of information regarding the COVID-19 vaccine. The study also elicited that side effects of the novel vaccine were one of the most common causes of vaccine hesitancy in LMICs (Machingaidze & Wiysonge, 2021). Vaccine acceptance was higher in LMIC and countries where citizens had higher levels of trust in central governments (Lazarus et al., 2020) than countries like the United States and

Russia, where vaccination acceptance rates are 64.6% and 30.4%, respectively (Solís Arce et al., 2021).

Vaccine acceptance varies across gender, age, and ethnicity. Women are less likely to pursue getting vaccinated when a COVID19 vaccine becomes available to them (Green et al., 2021), with hesitancy more pronounced in minorities based on vaccine safety and effectiveness (Callaghan et al., 2020). Young people compared to older people (Lazarus et al., 2020), those who had a high reliance on social media for COVID19-19 related information, and members from low income, ethnic minority groups (Allington et al., 2021), and lower educational levels showed a higher propensity for refusing to take the COVID-19 vaccine (Schwarzinger et al., 2021).

Contemporary evidence shows that social media and political mistrust breeds vaccine hesitancy and drives conspiracy beliefs. Misinformation thrives in an environment with inconsistencies, lack of communication and transparency (Jennings et al., 2021a). Vaccine acceptance is higher among those who have trust in the government compared to those who do not. Scepticism around COVID-19 deaths and inconsistencies surrounding government response to the pandemic and the role of the World Health Organization (Jennings et al., 2021) are often the underlying reasons cited by those who refuse vaccination. WHO Director-General Tedros Adhanom Ghebreyesus, at the Munich Security Conference on 15th February, described the misinformation spreading through social media platforms as an "infodemic". As people shifted to online platforms for school, work and to remain socially connected while physically distanced, the disinformation through social media became a serious problem for global public health and became a substantial contributor towards vaccine hesitancy (Wilson & Wiysonge, 2020). Social media sites like Facebook, TikTok (Basch et al., 2021) and Twitter are inundated with anti-vaccination content with prior biases such as ethnocultural, religious, or political beliefs modulating the uptake of such content (Puri et al., 2020; Kant, Joariri and Cain, 2020; Kant, Varea and Titifanue, 2021). According to research from Evanega et al. (2020), Donald Trump, former United States President, who continuously downplayed the global pandemic, and Bill Gates made up most of the content on social media regarding COVID-19 and vaccines. It is notable that misinformation and conspiracy theories such as "Bill Gates trying to inject with microchips to track and control people", "new world

order", and "population control" were being propagated with nefarious intent by anti-vaccination groups (Evanega et al., 2020). This type of misinformation will have a lasting impact on vaccine rollout in countries with high consumption of content from digital space instead of traditional media.

Closer to Fiji, a recent online opinion poll by Papua New Guinea's national newspaper found that 77.61% of the respondents would not get vaccinated if a COVID-19 vaccine was made available to them (Munoz, 2021). PNG aims to vaccinate 20 per cent of the population by 2021. The survey further showed that the country was gripped with high levels of misinformation, and there was a lack of trustworthy information regarding the vaccine from the authorities. The survey revealed that local Christian leaders, Family/friends, and the World Health Organization were among the most trusted sources of COVID19 vaccine information in PNG.

Research on COVID19 vaccination in Fiji by the Fiji Women's Rights Movement (FWRM) notes that there is widespread acceptance (83.7%) of vaccines among women for communicable diseases in Fiji. The Fijian Ministry for Health website (74%) was the most common source of information for COVID-19 related information, with social media platforms such as Facebook and Instagram trailing behind at 73%. Many women who participated in this rapid assessment were also exposed to anti-vaccine messages through social media and expressed a range of reasons for vaccine hesitancy, including vaccine safety, distrust in the Government, and negative messages of the vaccine on social media platforms. Religious beliefs were not a significant factor affecting vaccine uptake in women (Fiji Women's Rights Movement, 2021).

While there has been some research on the prevalence of COVID-19 related misinformation in Fiji (See Kant, Joarari and Cain, 2020; Kant and Varea, 2021; Kant, Varea and Titifanue, 2021), there is a general lack of research on vaccine acceptance in Fiji, the impact of information shared through social media and its impact on vaccine acceptance and hesitancy in the Fijian context, and vaccine hesitancy based on population demographics. To better deal with and understand the underlying complexities of the COVID-19 pandemic and vaccine perception in Fiji, this research will provide crucial evidence, fill in the knowledge voids and complement the currently available evidence. Vaccine acceptance and uptake remains at the crux of Fiji's strategy to control the recent outbreak, and achievement of herd immunity, allowing children to get back into classrooms, restart the economy, and return to some level of normalcy.

3. RESEARCH DESIGN

An online survey of 1047 participants in Fiji, over the age of 18, was conducted between 25th June and 10th July 2021. The vaccine survey was conducted shortly after the Fiji Ministry of Health and Medical Services began an extensive vaccine rollout following an uncontrolled escalation of covid cases in Fiji.

The primary research instrument was a semi-structured questionnaire that was administered online. The questionnaire had 18 closed ended questions. The questions were aimed at eliciting responses on attitudes, views and factors which impacted upon an individual's acceptance of a covid vaccine, assessed impact of variables such as confidence in government, trust in local and international medical institutions, trust in experts, religious leaders, including vaccine-related information from both traditional and social media. The questionnaire also contained questions that assessed willingness to accept vaccines based on key demographic variables (age, gender, ethnicity, location, urban/rural and religious beliefs). It also elicited responses on how participants viewed vaccine safety, concerns regarding the COVID-19 vaccine, and what would motivate them to get inoculated with a novel vaccine. It also probed how likely were the participants going to recommend getting the COVID-19 vaccine to others.

The complete questionnaire with question-wording and response option can be found in the Appendix. The research was commissioned by Dialogue Fiji under its "Strengthening Citizen Engagement in COVID-19 Policy and Decision Making" project and funded by the Commonwealth Foundation.

3.1 Ethical Statement

Data collection followed established ethical and data protection standards. Prior to their participation in this online survey, each participant was informed, through an introductory section, that they were taking part in an anonymous COVID-19 vaccine-related survey. Their participation in the survey means that they have given permission for data to be collected used for publication. The principal investigator's name and contact details were also made available to the participants should they needed more information.

3.2 Limitations

The findings only apply to the population we studied. There is no assurance that the same conclusions would be reached in a study with a truly representative sample. Therefore, the results generated cannot be generalized. In addition, another limitation of online data collection is that participants who do not reside in Fiji may have also completed the survey. Since the data was self-reported, there is no guarantee that participants provided accurate demographic or characteristics information. Due to the .

current COVID-19 restrictions, it was challenging to collect data from a sample selected through an appropriate sampling method, which would have been representative of the general population. This, in effect, means that we may not have reached vulnerable groups, including those with lower socioeconomic backgrounds and illiterate. Also, a more significant percentage of the respondents were from a single geographic area, which may impact the generalization of the survey results.

The table below summarises the demographic information of the research participants:

<i>Sample (n = 1047)</i>		<i>n</i>	<i>%</i>
Age	18-24	207	19.8
	25-34	301	28.7
	35-44	290	27.7
	45-54	136	13.0
	55-64	86	8.2
	65+	27	2.6
			100%
Gender	Male	483	46.1
	Female	534	51.0
	I prefer not to say	30	2.9
			100%
Ethnicity	iTaukei	425	40.6
	Indo-Fijian	496	47.4
	Rotuman	36	3.4
	Other	90	8.6
			100%
Religion	Christianity	576	55.0
	Hinduism	332	31.7
	Islam	105	10.0
	Other	34	3.2
			100%
Division	Eastern	45	4.3
	Northern	77	7.4
	Western	393	37.5
	Central	532	50.8
			100%
Location setting	Rural	353	33.7
	Urban	694	66.3
			100%

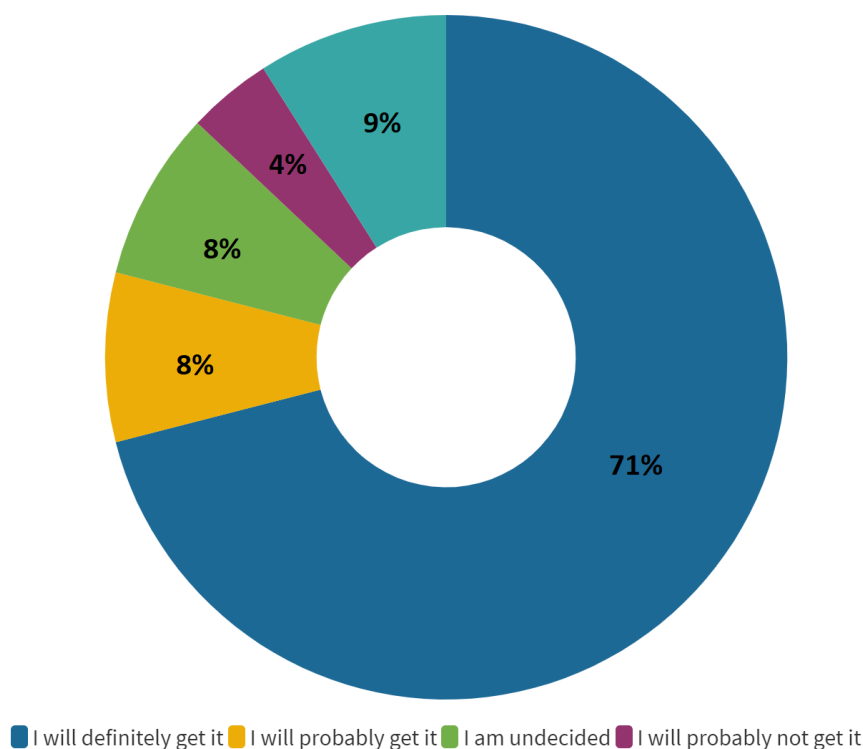
4. RESULTS

4.1 Perceptions on vaccines and getting vaccinated

Willingness to accept of COVID-19 vaccine based on demographics

The majority of respondents indicated that they were willing to accept a COVID-19 vaccine. 71% of the respondents to the survey reported that they would "definitely get" the COVID-19 vaccine, and 8% said they would "probably get" it once it became available to them (see Fig 1). On the other hand, 8% of the respondents were "undecided", 4% would "probably not get" the vaccine, while 9% outright refused COVID-19 vaccination. These numbers varied considerably across demographics — age, gender, ethnicity, religion, and geographical location.

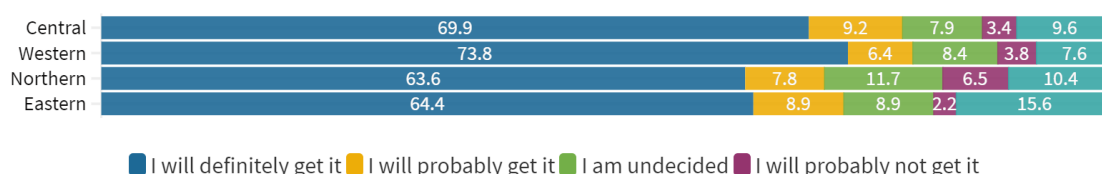
Fig 1: Overall willingness to accept COVID-19 Vaccine



The respondents residing in the Western Division reported the highest willingness to accept (73.8%) the COVID-19 vaccine and had the lowest levels of vaccine hesitancy (7.6%) out of all the four divisions surveyed (see Fig 2). This is also reflected by rapid vaccine uptake in the Western Division, which, as of 29th August 2021, had 103% coverage with at least one dose and 57% coverage with two doses (Tupaia, 2021).

Overall, the Northern and Eastern divisions recorded the lowest vaccine acceptance, at 63.6% and 64.4% respectively, and had the highest rates of vaccine hesitancy. The Northern Division had the most significant proportion of undecided individuals (11.7%).

Fig 2 Reported willingness to accept COVID-19 vaccine by Division



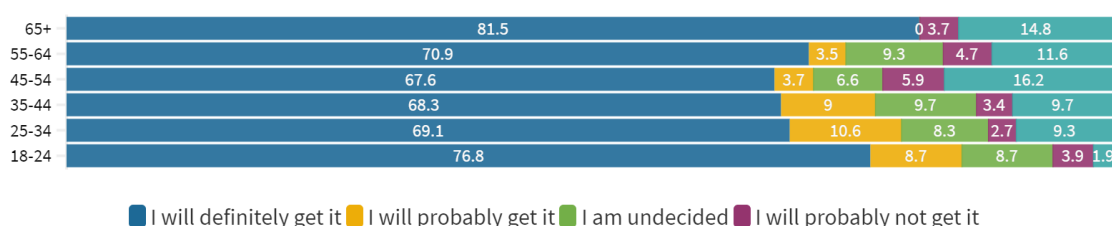
There was no observable difference (or trend) in vaccine acceptance rates in rural and urban centres.

Fig 3 Reported willingness to accept COVID-19 vaccine by setting



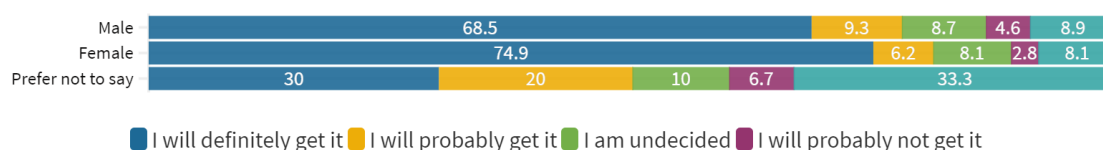
Overall, the reported willingness to accept a new vaccine among different age groups corresponds with their general confidence in the vaccine. Those over 65 years of age reported the highest (81.5%) vaccine acceptance (see Fig 4). However, this result must be interpreted with caution since individuals over 65 only accounted for 2.6% of the respondents. 76.8% of the respondents between the ages of 18-24 years reported they would get the vaccine followed by those between 25-34 years of age (69.1%), 35-44 (68.3%), 45-54 (67.6%). Vaccine hesitancy was highest amongst those aged 45 years or more. Respondents aged between 25-34 and 35-44 were five times more hesitant, and respondents aged 45-54 were eight times more reluctant to take a COVID-19 vaccine when compared with the younger age group of 18 to 24 years. These results show that young individuals are generally more vaccine accepting and less likely to be vaccine-hesitant when compared to the elderly.

Fig 4 Reported willingness to accept COVID-19 vaccine by age



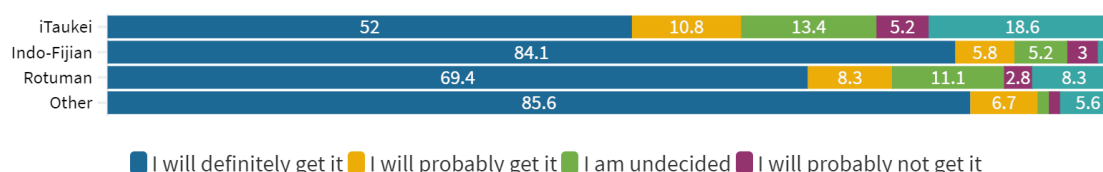
Women are more likely to accept a COVID-19 vaccine (74.9%) than their male counterparts (68.5%). 8.9% and 8.1% of the males and females stated they would "definitely not get" the vaccine, respectively. Vaccine hesitancy was highest (33.1%) amongst respondents who preferred not to state their gender. The vaccine acceptance rates amongst women in this survey is lower than the 83.7% found in Fiji Women's Rights Movement (FWRM) rapid assessment on Fijian Women's Perceptions of COVID-19 Vaccine (FWRM, 2021).

Fig 5 Reported willingness to accept COVID-19 vaccine by gender



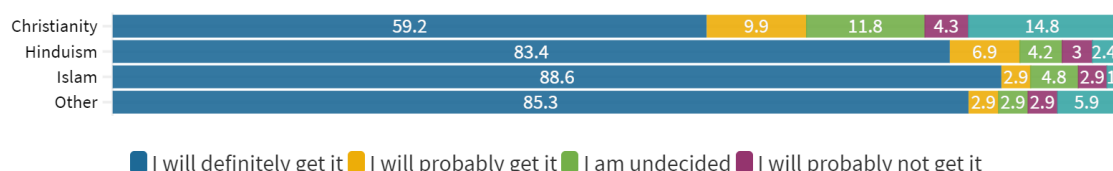
Of the three major ethnicities in Fiji, vaccine acceptance was highest amongst Indo-Fijians (84.1%), followed by Rotumans (69.4%) and iTaukei (52%). iTaukei respondents also accounted for the most significant proportion of vaccine hesitant (18.6%) and undecided individuals (13.4%).

Fig 6 Reported willingness to accept COVID-19 vaccine by ethnicity



Respondents who followed Islam (88.6%) showed the highest willingness to accept a new COVID-19 vaccine, followed by Others who reported being atheists, agonists (85.3%) and Hinduism (83.4%). Christians reported the lowest levels of willingness (59.2%) and the highest levels of hesitancy. Respondents who reported to be Christians were six times more hesitant than those who followed Hinduism.

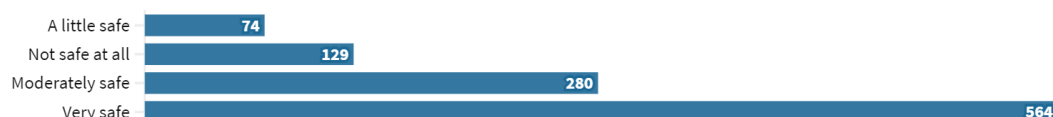
Fig 7 Reported willingness to accept COVID-19 vaccine by religion



Perception of vaccine safety

Of the 1047 participants surveyed, 53.9% (n=564) reported that the vaccines were "very safe", while 12.3% said that the vaccines were "not safe at all" (see Fig 8). Those that reported the vaccine to be "not safe at all" mostly made up the vaccine-hesitant group and declared "I will not get it (vaccine)". 23.3% of the iTaukei respondents said the vaccine was "not safe at all" compared to 16.7% of Rotuman's and 4% of Indo-Fijians. Those identified as Christians made up the largest bloc (19.1%) who reported that the vaccine was "not safe at all" compared to 4.2% Hindus and 2.9% of those with the Islamic faith. Males (13.3%) and individuals between 45-54 (19.1%) were more likely to report unsafe vaccines. The starkest jump in safety concerns could be observed among those who say they would refuse a COVID-19 vaccine if it became publicly available. Indeed, 81% of those who would reject it believe the vaccines are unsafe.

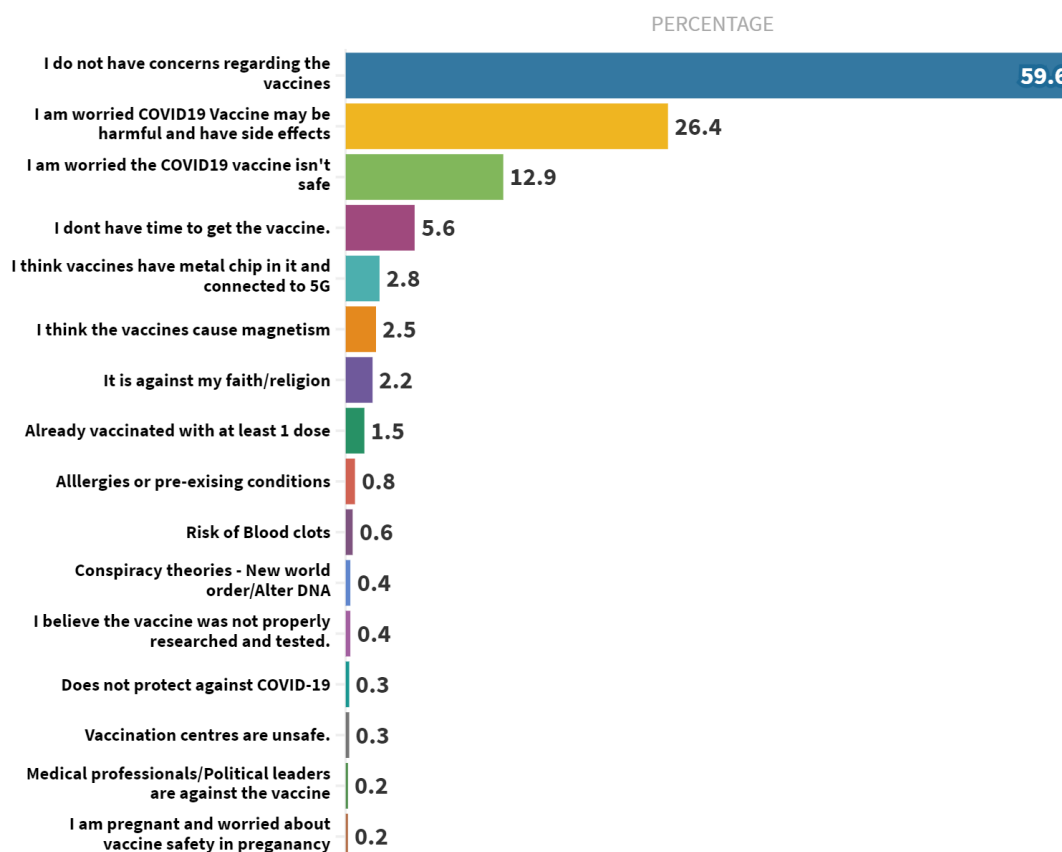
Fig 8 COVID-19 Vaccine safety



Concerns regarding vaccines

Vaccine confidence is influenced mainly by legitimate concerns about its safety and conspiracy theories. A significant proportion (59.6%) of the respondents indicated they had no concerns regarding the novel COVID-19 Vaccines however, 1-in-5 (26.4%) of the respondents raised concerns regarding perceived harmful side effects of the vaccine (see Fig 9). A further 12.89% indicated that the vaccine was not safe, 5.64% stated they did not have time to get vaccinated. A considerable proportion (5.64%) of the respondents believe in one or many CoVID-19 related conspiracy theories, which arguably impact the lower levels of reported willingness to accept a new COVID-19 vaccine. These include beliefs that the COVID-19 Vaccines contain metal chips which will be used as a tracking device by governments and vaccines being connected to 5G networks (2.8%) and Vaccines causing magnetism (2.5%), a theory widely circulated on social media (Facebook, Twitter and TikTok) where vaccinated individuals uploaded videos of magnet sticking to their bodies after getting vaccinated (Kant, 2021), "New World Order" (0.4%).

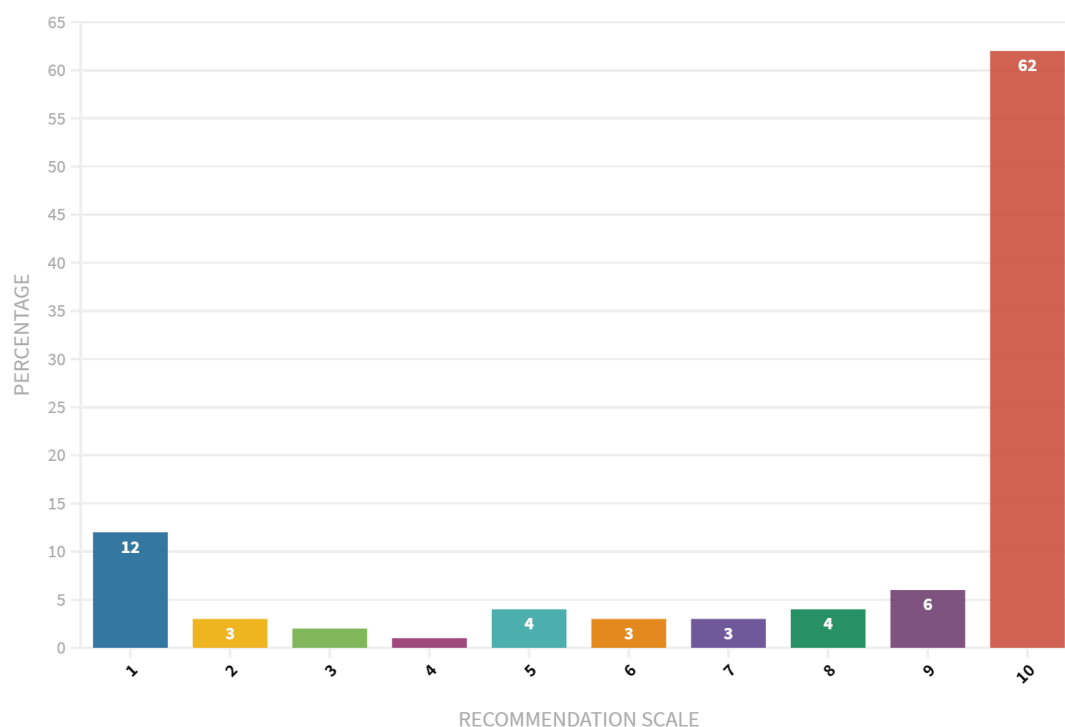
Fig 9: Concerns regarding the COVID-19 Vaccine



Likelihood of recommending others to get vaccinated

Respondents, through this part of the survey, were asked to rate the likelihood of recommending the COVID-19 vaccines to others on a scale of 1 to 10 with 1 being least likely and 10 being very likely. Of the 1047 respondents surveyed across Fiji, 62% of the respondents indicated that they would highly (10) recommend to others to get vaccinated while 12% indicated they would not recommend (1) others to get vaccinated (see Fig 10).

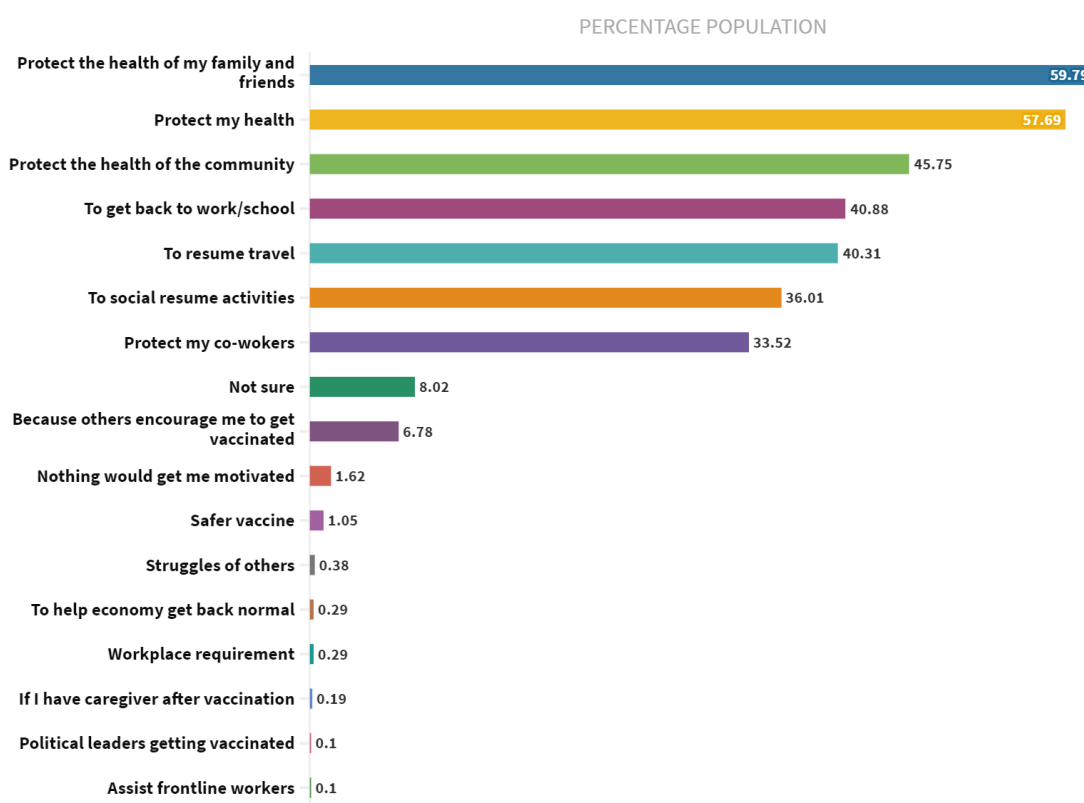
Fig 10: Likelihood of recommending others to get vaccinated



Motivation to get vaccinated

Social networks play an important role in vaccination decision making (Brunson, 2013). Similarly, 49% of the respondents identified protecting themselves, their families, and communities as the significant reason/motivation for getting vaccinated (safeguard the health of family and friends (17.97%) followed by protecting own health (17.34%), the health of the community (13.75%)). A further 12.28% and 12.11% respectively for individuals to return to work/school and resume travel 0.49% of the respondents were determined nothing would get them motivated to get the vaccine. In comparison, 2.14% were not sure, and 0.32% would get vaccinated if a different brand of the vaccine was safer (It is important to note that at the time of administration of this survey, the only vaccine available to Fijians was the Oxford-AstraZeneca vaccine). Few respondents were motivated in the common or national interest and indicated that they wanted to get vaccinated to "help the economy get back to normal" and "assist the front liners". In addition, it is also important to note that the Fijian Government introduced the "no jab, no job" policy after the data was collected.

Fig 11: Motivation to get vaccinated



Subgroups who are vaccine-hesitant

The vaccine-hesitant group (n=135) in this subsection is defined as respondents who reported, "I will not get it (vaccine)" (n=96) and "probably will not get it (vaccine)" (n=39). Sociodemographic characteristics of the vaccine group are shown below in Figure 9.

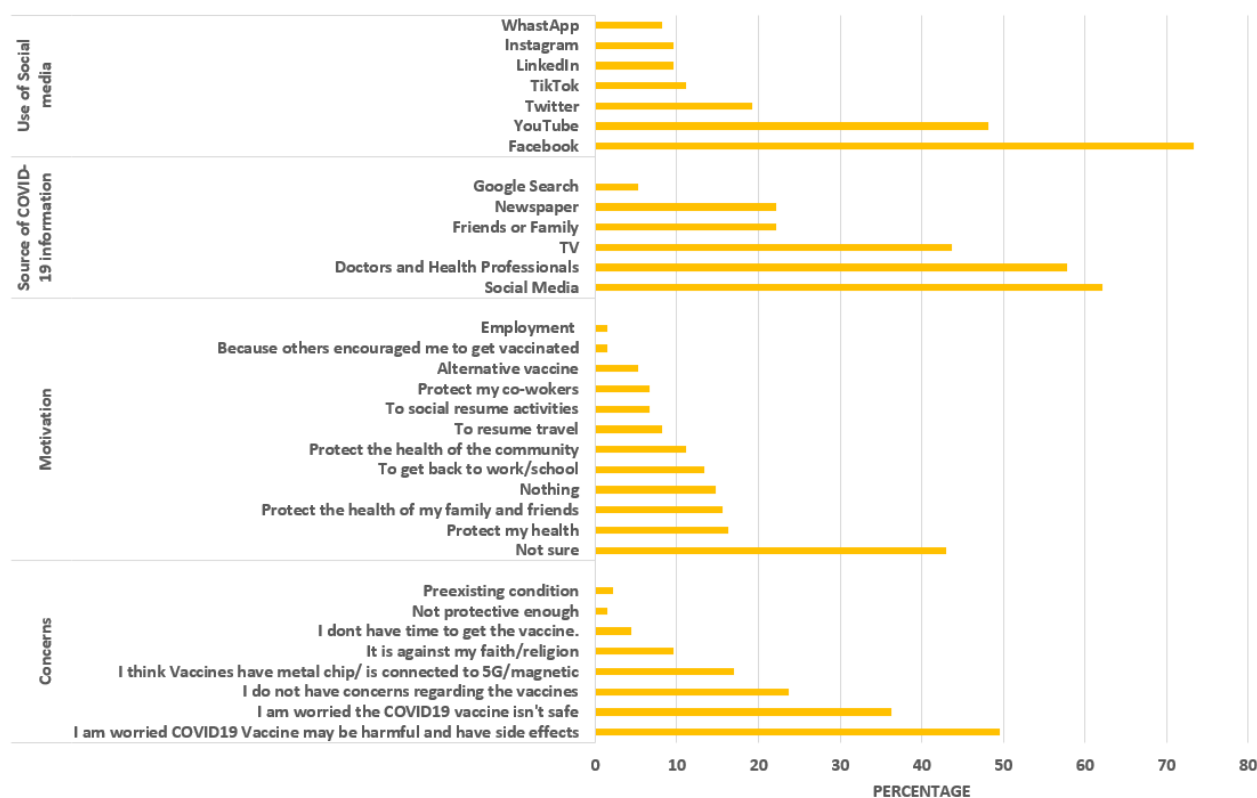
The largest vaccine-hesitant group was between 25-34 and 35-44, comprising 27% and 28%, respectively. Males had higher vaccine hesitancy than females (48% vs 43%), while iTaukei made up 75% of the vaccine-hesitant group compared to Indo-Fijians (18%), followed by Rotumans at 3%. Among the vaccine-hesitant group, 81% followed Christianity, 13% Hinduism, and 3% Islam. Central Division made up the largest cohort (51%) of the vaccine-hesitant group, followed by the Western Division (33%). 61% of vaccine-hesitant lived in an urban area compared to 39% who were rural dwellers.

Fig 12: Sociodemographic characteristics of vaccine hesitant respondents (n = 135)



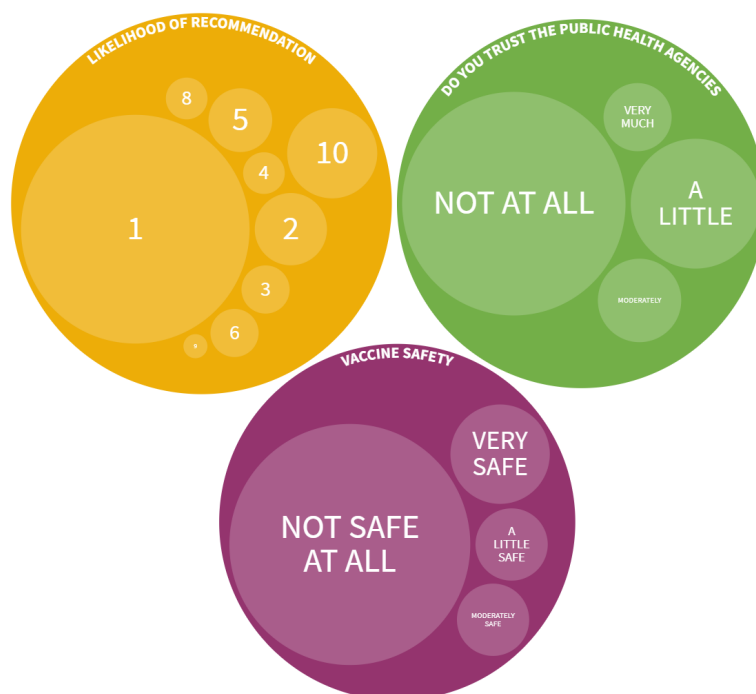
Scepticism about the safety of the COVID-19 vaccine is also higher among people who use social media as a trusted source of information, and those who believe in COVID-related conspiracy theories. 50% of the Vaccine hesitant group reported that the COVID-19 vaccine may be harmful and had side effects further; 36% indicated that the vaccine wasn't safe. 17% of the respondents believed in some conspiracy theory - Vaccines have a metal chip, Vaccines are connected to 5G, and vaccines cause magnetism. When asked what would motivate them to get the vaccine, 43% said they were not sure, 16% reported protecting their health, and a further 16% indicated they would be motivated to get the vaccine to safeguard their family's health friends. A significant 15% of the vaccine-hesitant group reported nothing would encourage them enough to get vaccinated. Moreover, 62% of this group obtained vaccine-related information from social media, with Facebook (73%) being the most popular source of information amongst social media platforms. In addition, 58% of the vaccine-hesitant group received usual COVID-19 and vaccine-related information from doctors and health professionals, followed by television (44%).

Fig 13: Factors associated with COVID-19 vaccine hesitancy among respondents (n = 135)



Vaccine acceptance and uptake stems from trust. When queried on the level of trust they had in public health agencies, 85% of those in vaccine-hesitant groups indicated little to no confidence. In comparison, only 15% indicated moderate to high levels of trust as shown in Fig 11. In addition, when asked to rate the likelihood of recommending the COVID-19 vaccine to others on a scale of 1 to 10, with one (1) being least likely and ten (10) being highly likely, 67% rated one on the scale followed by 2 (7%). Only 10% indicated they were highly likely going to recommend others to get vaccinated. Of the 135 vaccine-hesitant individuals, 85% reported little to no trust in public health agencies.

Fig 14: Vaccine safety, trust in public health agencies and likelihood of recommending to others among vaccine hesitant group (n-135)

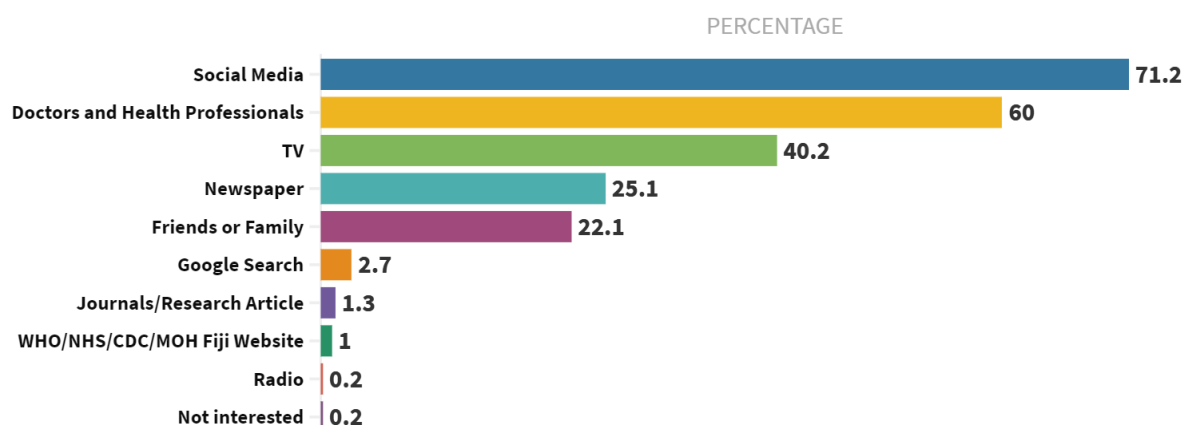


4.2 Sources of information

COVID-19 vaccine-related sources of information

Respondents in this part of the survey were allowed to choose more than one option. Of the 1047 respondents surveyed from all four Divisions in Fiji, 71.2% mentioned social media as one of their main COVID-19 and COVID-19 vaccine-related sources of information, followed by doctors and health professionals (60%), television (40.2%), newspaper (25.1%), family or friend (22.1%) and radio, one of the widely available news media across Fiji was the last ranked medium for COVID-19 related information at 0.2%. Google search, journals/research articles, online information from health bodies were ranked 2.7%, 1.3% and 1%, respectively.

Fig 15: Source of information



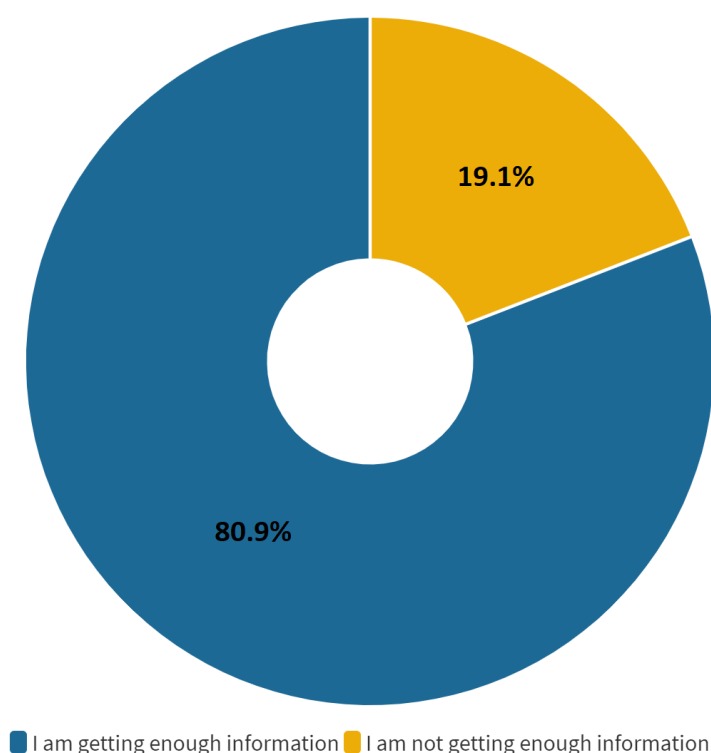
Subgroups most likely to mention social media:

- 54% were women, while 44% were men.
- 79% were between the ages of 18-44.
- 47% were Indo-Fijians vs 41% iTaukei
- 50% were from the Central Division, 38% from the West, followed by the Northern and Eastern divisions at 7% and 4% respectively.
- 72% reported they would get the vaccine vs 8% who said reported they would not get the COVID-19 vaccine.
- Facebook (93%) was the most relied information social media platform for COVID-19 related information, followed by YouTube (28%), Twitter (25%) and Instagram (16%). TikTok, LinkedIn, WhatsApp and Snapchat were 8%, 5%, 3% and 2% respectively.
- 60% did not have any concerns regarding the vaccine, while 29% said vaccines may be harmful and have side effects.
- 6.3% believed in some conspiracy theories, and 15% said the vaccine isn't safe.
- 82% were getting enough information, while 18% did not.

Information on COVID-19 Vaccines

WHO Director-General Tedros Adhanom Ghebreyesus at the Munich Security Conference on 15th February labelled the inundation of online platforms with epidemic related information as an "infodemic", which posed a severe problem for public health. WHO defines infodemic as "too much information including false or misleading information in digital and physical environments during a disease outbreak which causes confusion and risk-taking behaviours that can harm health. It also leads to mistrust in health authorities and undermines the public health response (WHO,2021). We asked respondents to indicate how much information they were receiving regarding COVID-19 vaccines. Of the 1047 participants, 81% indicated (Fig 15) they were getting enough information, and only 19% stated they were not getting enough information.

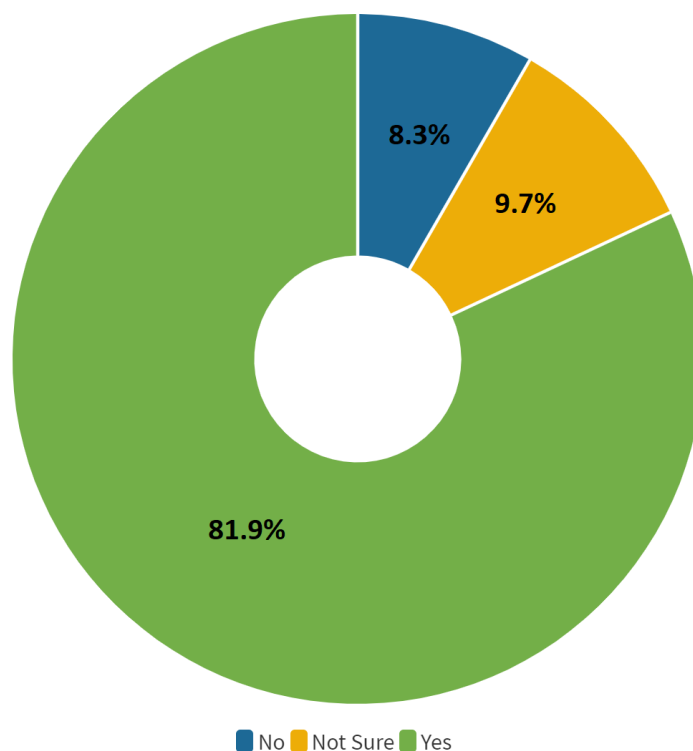
Fig 16: Amount of information on COVID-19 vaccines



Access to accurate, timely information

Overall, 81.9% of the respondents indicated they knew where to access accurate, timely information about COVID-19 vaccines. A further 9.7% were unsure, while 8.3% of the participants did not know where to access accurate, timely information.

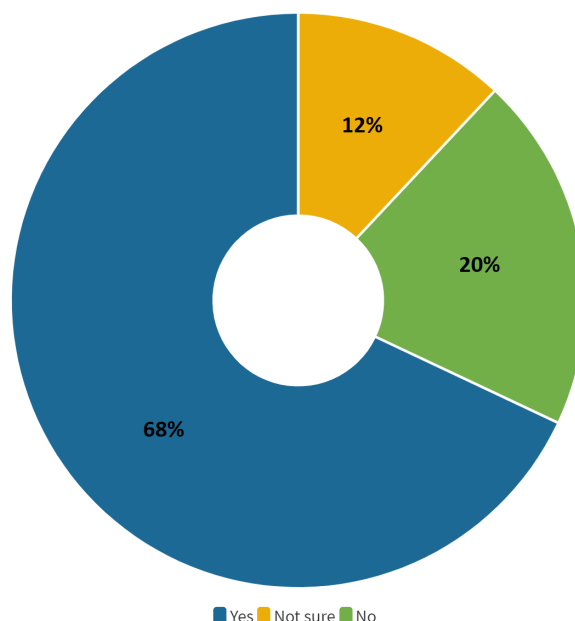
Fig 17: Access to timely accurate information



Exposure to general vaccine unverifiable vaccine-related information

In the survey, respondents were asked to share whether they believed they had been exposed to any information about COVID-19 vaccines (e.g., on the news, on social media, or from friends and family), which they could not determine was true or false. Survey data shows that 2-in-3 (68%) respondents report having seen or heard at least some information about COVID-19 Vaccines that they could not verify was true or false, with 20% reporting not having seen or heard any such information. In comparison, 12% of the respondents were unsure.

Fig 18: Exposure to general vaccine unverifiable vaccine-related information



Subgroups who mentioned being exposed to unverifiable vaccine related information

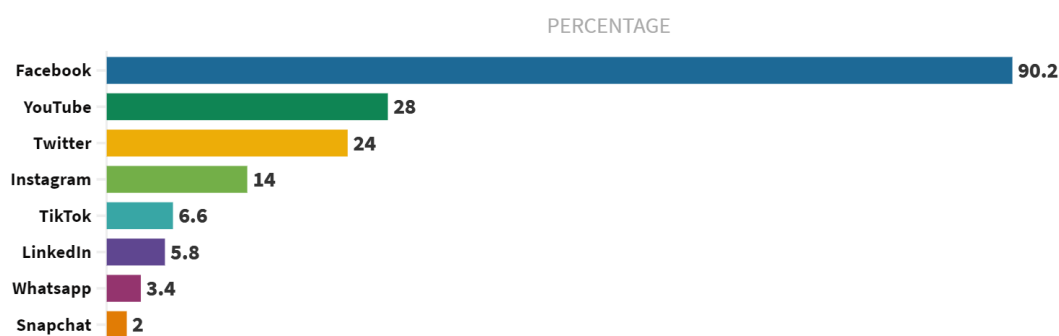
Of the 68% who reported exposure to COVID-19 vaccine-related information which they could not be determined was true or false:

- 73.6% cited social media as their primary source for COVID-19 vaccine-related information, followed by doctors and health professionals (60%), T.V. (39.5%), newspaper (24.3%), and friends and families (23.8%).
- Facebook (90.7%) was the most widely used social media platform amongst this group.
- Those among the ages of 25-34 had higher exposure to COVID-19 vaccine-related information compared to 18-24 years (20%), 35-44 years (26.2%), 45-54 years (12.8%) and 10.5% of those 55 years or older. This data consequentially reflects that the exposure to COVID-19 vaccine-related information is highest amongst the age group with the most active social media users in Fiji.
- 50% described the vaccine as very safe, 29.3% moderately secure, while 8.7% and 11.7% described COVID-19 vaccines as a little safe and not safe at all, respectively.
- Demographically, there was no observable difference between the two genders (47.3% vs 49.8% females) or the two major ethnic groups (44.3% vs 43.6% Indo-Fijians).
- Amongst this cohort, 76.8% reported intention to get vaccinated, 13.1% were hesitant, while 10.1% were undecided.
- The majority were from the Central Division (50.1%), followed by Western (36.6%), Northern (8.2%), and Eastern (5.2%).

Use of social media for COVID-19 and vaccine-related news

As shown in Fig 18, social media (71.2%) was the most frequently cited source for COVID-19 related information. In this survey section, respondents were asked to select social media platforms they used for COVID-19 news. Of the 1047 respondents, overwhelmingly, social media giant Facebook (90.2%) was the most mentioned platform, followed by YouTube (28%), Twitter (24%), Instagram (14%), TikTok (6.6%), LinkedIn 95.8%), WhatsApp (3.4%) and least used platform, Snapchat (2%).

Fig 19: Social media platforms used for COVID-19 related news



Subgroups most likely to believe in disinformation

In the survey, respondents were asked to share concerns regarding the COVID-19 vaccine and were allowed to choose multiple options. 45 of the 1047 respondents reported believing in one or more conspiracy theories. 5.64% of the concerns were popular (debunked) conspiracy theories regarding COVID19 vaccines (Vaccines contain a metal chip and is connected to 5G networks (2.8%), Vaccines causing magnetism (2.5%), and other theories like population control and "New World Order" (0.4%)).

Of those who reported believing one or more theories,

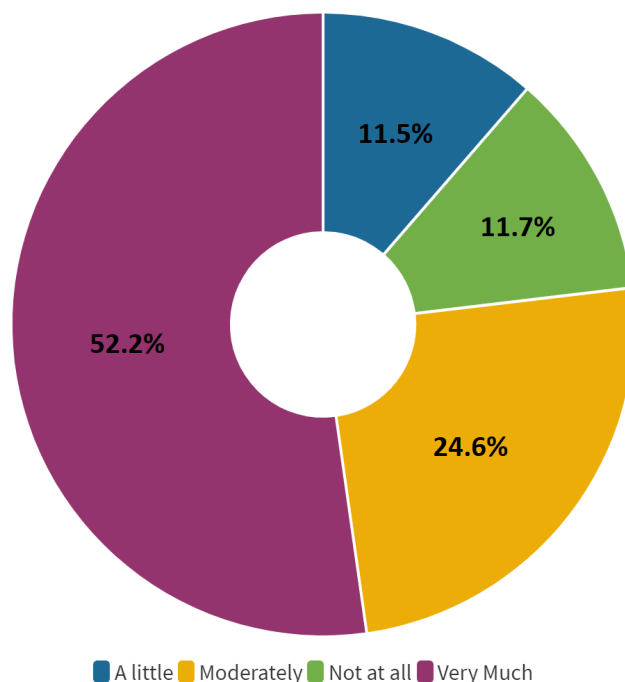
- Vaccines containing metal chips and connected to 5G conspiracy theories were most widely accepted amongst those who believed in disinformation (64.4% vs 57.8% who thought vaccines cause magnetism).
- One respondent commented, "it is forced mass vaccination", while another responded, "I am afraid it will mess with my DNA".
- 57.8% were between the age of 35 (18-24 (26.7%), 25-34 (31.1%), followed by 42.2% over 35 years of age.
- Males (53.3%) believed in vaccine-related conspiracy theories more than females (35.6%).
- Among different ethnicities, iTaukei (71.1%) believed in conspiracy theories more than Indo-Fijians (17.8%) and Rotuman's (8.9%).
- 80% of those who reported believing in one or more conspiracy theories were Christians vs 11.1% Hindus and 4.4% those who followed Islam.

- 51.1% were from the Central Division, followed by Western Division (20%), Northern (6.7%) and Eastern Division (2.2%).
- Those living in the urban (57.8%) were more likely to believe in conspiracy theory than those in rural settings (42.2%).
- Vaccine hesitancy was highest among this group compared to the general population. 26.7% vs 48.9% vaccine acceptance. 24.4% were undecided.
- Of those who reported believing in conspiracy theories, 51.1% said the vaccine was not safe at followed by very secure (24.4%), moderately safe (13.1% and a little safe (11.1%).
- 77.8% reported little to no trust in the public health agencies, while only 22% reported some trust in these agencies (moderate trust (13.3%), "a lot" (8.9%)
- 80% of the respondents mentioned social media as their primary source of information, followed by T.V. (44.4%), doctors and health professionals (33.3%), friends & family (31.1%), and newspapers (26.7%)
- News sources (57.8%), social media (53.3%), and World Health Organisation (51.1%) were the top three (3) trusted sources of information. Only 28.9% of those who believed in conspiracy theories trusted the Fijian Government.
- Every respondent who reported believing in conspiracy theory said using Facebook (100%) for COVID-19 related information. 48.9% accessed YouTube, while 17.8% used Instagram and TikTok.

4.3 Trusted information sources on COVID-19 vaccine

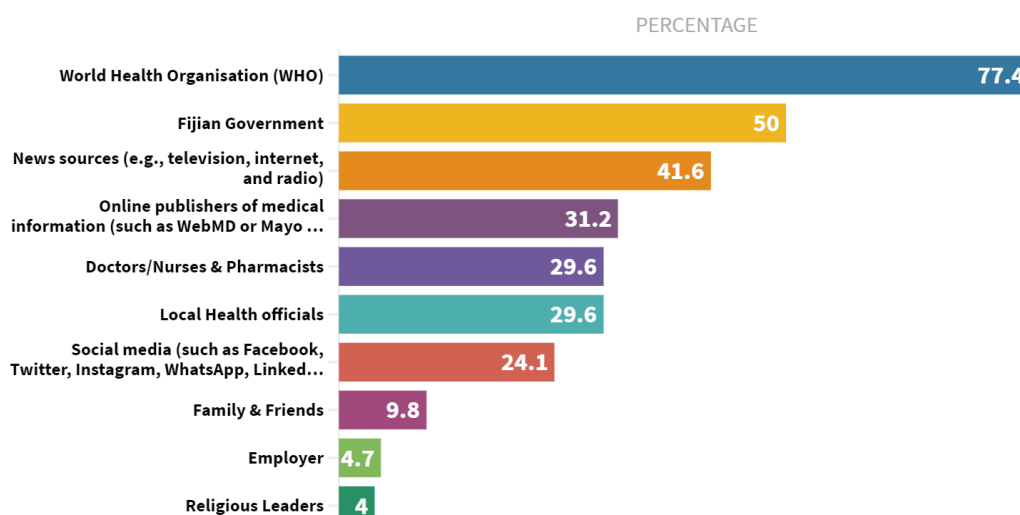
Of the 1047 respondents, only 547 (52.2%) showed high confidence in the public health agencies that recommended getting a COVID-19 vaccine in Fiji (see Fig 19). 24.6% had moderate levels of trust, while 23.1% had little to no trust at all (11.4 % a little trust, 11.75% not at all).

Fig 20: Trust in public health agencies



In this section of the questionnaire, respondents were asked to choose three (3) most trusted sources of information about COVID-19 Vaccines (see Fig 20). Of the 1047 respondents, 77% (n=810) mentioned World Health Organisation as one of their most trusted sources for information about the COVID-19 vaccine, followed by the Fijian Government (50%), news sources (41.6%), online medical websites such as WebMD (31.2%) and doctors, nurses, and pharmacists (29.6%) and local health officials (29.6%) and social media (24.1%).

Fig 21: Trusted sources of information about COVID-19 vaccines



5. DISCUSSION

Vaccination is recognized as an effective way to reduce and eliminate the burden of COVID-19. However, the success of a vaccination programme depends on the willingness of the population to be vaccinated. This study used an online self-administered questionnaire and collected responses across Fiji. Out of the 1047 respondents, the COVID-19 vaccine acceptance rate in Fiji was 78% - "definitely get" (71%), "probably get" (8%), significantly higher than the vaccine hesitance rate of 13%.

For this study, age, ethnicity, gender, religion, geographical location significantly influenced vaccine acceptance. While there was no observable difference in vaccine acceptance between the rural and urban settings, there was a significance difference in attitudes amongst respondents from different divisions in Fiji. The Western Division had the highest levels of vaccine acceptance compared to the other divisions, which is also reflected in the comparatively higher levels of vaccine uptake in the division, as evident from the Ministry of Health and Medical Services data (Tupaia, 2021). In addition, individuals below the age of 24 were more likely to take the vaccine compared to other age groups, which, were more likely to be vaccine hesitant. While vaccine acceptance is highest amongst the elderly population (over 65-year-olds), this is most likely due to the limitations of the study methodology, as the elder age group tends to have lower levels of access and expertise to use smartphones and the internet. The online administration method, which was the only feasible method for data collection given the statutory restrictions, meant that most of the respondents were from age groups which were more techno-savvy, and only 2.6% of the respondents were above 65 years of age.

Moreover, females generally had higher vaccine acceptance (74.9%) rates compared to males. Notably, a recent local study by the Fiji Women's Rights Movement, while not specific to COVID-19 vaccines, showed that there was a widespread acceptance (83.7%) of vaccines among women for communicable diseases (Fiji Women's Rights Movement, 2021). Amongst the major ethnic groups in Fiji, COVID-19 Vaccine acceptance rates were highest amongst the Indo-Fijians (84.1%), followed by the Rotumans (69.4%) and lowest amongst the iTaukei (52%). Religion was also a significant determinant of vaccine acceptance. Those who followed Islam (88.6%) and Hinduism (83.4%) were more likely to get vaccinated compared to Christians, who were most vaccine-hesitant (14.8%) and had lowest levels of acceptance (59.2%). According to Kant et al., there is prevalence of belief in Fiji that faith played a vital role in sustaining health and wellbeing and therefore, there would be no need for vaccines. The study stated that Christian influencers including religious leaders shared vaccine related conspiracy theories through social media platforms (Facebook, TikTok, Instagram, and YouTube) associating COVID-19 vaccines to demonic potions and "mark of beast", a plausible exposition of low acceptance rates amongst those who follow Christianity.

Public confidence in the effectiveness of COVID vaccines to prevent infection may be affected by perceived risks associated with vaccination. Of the 1047 respondents, only 53.9% reported the vaccine was "very safe", while 19.4% reported vaccines to be "little safe" to "not safe at all". This was also reflected in the hesitant group, where 50% reported a fear of vaccine side effects as a reason for their refusal. Other causes include vaccines that aren't safe (36%), vaccines that have metal chips and are connected to 5G or are magnetic (17%), religious reasons (10%). These findings are like studies conducted in Fiji and other countries that identified concerns over vaccine safety, side effects (Harapan et al., 2020) and conspiracy theories as primary reasons for vaccine hesitancy (Kant, 2021). Vaccine hesitancy is usually due to a lack of trust in the health care systems, governments, and the public health agencies that provide professional, expert advice on vaccines and COVID-19. This study found that only 52.2% of respondents had high levels of trust in the public health agencies while 24.6% stated they had a moderate level of trust, and 23.1% indicated they had little to no trust in the agencies that provide COVID-19 vaccine-related information. The World Health Organization was the most trusted source for COVID-19 vaccine-related information, followed by the Fijian Government (50%), mass media (41.6%), online health websites (31.2%), health care professionals (29.6%) and social media (24.1%).

When discussing vaccine hesitancy, one cannot ignore the significance of conspiracy theories. Conspiracy theories have thrived in the face of uncertainty and vulnerability posed by the COVID-19 pandemic. Anti-vaccine conspiracy theories appear to reduce vaccination intentions by inducing undue concerns about the dangers of vaccines and increasing feelings of powerlessness, disillusionment, and mistrust in authorities (Jolley & Douglas, 2014). Online misinformation and vaccine hesitancy has been an uphill battle for the Fijian health authorities from the beginning of the pandemic. 5.64% of the concerns were popular debunked conspiracy theories regarding COVID19 vaccines (Vaccines contain a metal chip and is connected to 5G networks (2.8%), Vaccines causing magnetism (2.5%), and other theories like population control and "New World Order" (0.4%)). Amongst the vaccine-hesitant group, males (53.3%), iTaukei (71.1%), Christians (80%) and those living in the Central Division were most likely to believe in one or more theories mentioned above. Strikingly, 100% of the respondents who believed in conspiracy theories reported using Facebook, which is littered with similar vaccine-related conspiracy theories (Kant, Jorari and Cain, 2021), as the primary source for COVID-19 vaccine-related information. Although the number of those against the vaccine, in general, has been relatively small, their opposing views on vaccines must be acknowledged because they may influence others, especially those undecided but aware of the risks of the vaccine (Burki, 2020).

The Fijian public is provided with public updates regarding this disease, including information about the vaccines by the World Health Organization (WHO) Pacific and Fiji's Ministry of Health and Medical Services (MoHMS) and people have been encouraged to access news from these official sources regularly (Fijian Government, 2021).

Information about the outbreak and vaccines is also regularly aired across radio, television, newspapers, and through social media; however, in this study, the respondents' source of information about COVID-19 was mainly from social media (71.2%), doctors and health professionals (60%), television (40.2%), newspaper and friends & family 25.1% and 22.1% respectively. A large proportion of the respondents indicated they knew where to access timely and accurate information (81.9%); however, it is disconcerting that 68% of the respondents stated they had been exposed to COVID-19 vaccine-related information that they could not verify was true or false. Of all social media platforms, Facebook (90.2%) was most widely used for COVID-19 and COVID-19 vaccine-related information, apparently because the Ministry of Health and Medical Services provides daily COVID-19 updates mainly by publishing a statement on Facebook in the absence of press briefings. Similarly, a study done by the Asia Foundation reported 68% of Fijian Facebook users and about 58% of messaging application users indicated “frequently” seeing COVID-19 misinformation (Kant, Jorari and Cain, 2021). Misinformation spread through these channels can have a considerable effect on the acceptance of the COVID-19 vaccine therefore, government, public health officials and advocacy groups must address hesitancy and build vaccine literacy to increase vaccine acceptance and achieve the greater goal of herd immunity.

Achieving herd immunity through high vaccine uptake remains crucial to control of COVID-19 outbreak in Fiji. According to the World Health Organization, herd immunity, also known as 'population immunity', is the indirect protection from an infectious disease when a population is immune either through vaccination or immunity developed through a previous infection (WHO,2021). There are two possible approaches to build widespread SARS-CoV-2 immunity: (1) a mass vaccination campaign, which requires developing an effective and safe vaccine, or (2) natural immunization of global populations with the virus over time. However, the consequences of the latter are severe and far-reaching—a significant fraction of the human population would need to become infected with the virus, and millions would succumb to it. Thus, the goal for countries around the globe is to achieve herd immunity through vaccination in turn, confer indirect protection to unvaccinated, ineligible populations. For herd immunity to occur, the population coverage required through vaccination varies across diseases. It is dependent on the primary reproduction number (R_0), vaccine efficacy (Anderson et al., 2020) and duration of immunity (Dodd et al., 2021). While epidemiologists continue to mull over the threshold required for the achievement of herd immunity (Rubin, 2020), an expert in the United States estimated about 80 to 90% per cent of the population to achieve herd immunity with the AstraZeneca vaccine (Gumel et al., 2020), however, these estimates have been thrown off in uncertainty after United States Centre for Disease Control estimates revealed that the R_0 for Delta variant is between 5 and 9.5 people (U.S. Centre for Disease Control, 2021). This is higher than the original virus identified in Wuhan, China, which had an R_0 between 2.3 and 2.7, and the Alpha variant had an R_0 between four and five. If R_0 is more significant than one, the number of infected people will keep growing exponentially until all susceptible people have either died or recovered and herd

immunity is reached. If R_0 is less than one, the outbreak will likely fizzle out on its own. Therefore, a vaccine like AstraZeneca available to Fiji, 67% effective against disease acquisition (GAVI, 2021), and R_0 as high as 9.5, Fiji will have to achieve more than 90% vaccine coverage.

It is important to note that there is no universal agreement amongst experts on the herd immunity threshold for COVID-19 given the emergence of new variants with increased transmissibility. Since the pandemic is a rapidly evolving situation, the prevailing view tends to change with new research and contributions to literature. While the mandatory vaccination may have provided the much-needed push in the percentage coverage, Fiji will also have to vaccinated children below 18 years of age with a safe and highly efficacious COVID-19 vaccine like Pfizer to achieve herd immunity. The high R_0 of the delta variant and its greater vaccine escape capacity has also raised questions of whether herd immunity is possible through the first generation covid vaccines which were developed last year targeting the original Wuhan strain of SARS-CoV-2.

To have a substantial population immunized to achieve herd immunity requires high levels of vaccine acceptance. Although the approval of the COVID-19 vaccine in this study was relatively high, aggressive public health campaigns must continue to address vaccine hesitancy, tackle false claims, and increase a willingness to vaccinate.

6. CONCLUSION

The study assessed the levels of trust in vaccines in the Fijian population and the acceptance of the COVID-19 vaccines authorized to be used in Fiji. The results show that the vaccine acceptance rates are relatively high amongst the Fijian population who participated in the study. A careful balance is required between educating the public about the necessity for universal vaccine coverage and avoiding any suggestion of coercion. Respected community-based groups and non-governmental organizations, such as churches and religious and impartial community leaders, are essential to help address concerns regarding the COVID-19 vaccine in the vaccine-hesitant groups. In addition, practical measures to reduce the negative impact of conspiracy theories must also be implemented. These include having an ethical and responsible mass media with a proactive media regulatory agency providing guidelines on COVID-19 reporting, addressing religious elements surrounding the conspiracy theories, stern measures from the healthcare authorities and increasing awareness on COVID-19 to reduce negative perceptions among the general community, amongst others. Arguably, trust is an intrinsic and potentially modifiable component of the successful uptake of a COVID-19 vaccine. The findings show that trust in government and local health agencies is strongly associated with vaccine acceptance. The Fijian Government and other related agencies must target their campaign to address the concerns reported in this study and build greater trust between the local health agencies and the Fijian people using clear and consistent communication from government officials. In addition, credible and culturally informed health communication is vital in influencing positive health behaviours and building public confidence in vaccine programs.

7. RECOMMENDATIONS

- Even if 100% vaccination rate according to the current target in Fiji is reached, the vaccination coverage will still be approximately 65% of the entire population. This is if we estimate the current population to be around 909,000 people (based on an annual population growth rate of 0.7% calculated from the 2017 census total population figure of 884,887). Countries like Israel, with higher vaccine coverage rates are still seeing their health care facilities overwhelmed with COVID cases therefore there is no basis for optimism that a 65% vaccination coverage will achieve normality in Fiji, let alone lead to herd immunity.
- Fiji needs to proactively work to procure sufficient doses of the Pfizer vaccine to vaccinate under 18s in Fiji. The Pfizer vaccine already has US FDA approval for use in 12–17-year-olds. By the end of September 2021, Pfizer is also expected to submit data from trials on 5–11 year-old children and this is likely to result in the vaccine getting authorised for use in this age group soon after. This, coupled with the fact that many countries are now opting for third (booster) shots, the global demand for Pfizer is expected to soar. The Moderna vaccine has also received approval from the European Medicines Agency for use in 12–17-year-olds, and therefore remains another option.
- There is a need to directly target unvaccinated and under-vaccinated populations. The Ministry's decision to use the Moderna vaccine in under-vaccinated areas is a good move to speed up the vaccination process given the shorter intervals between doses for the vaccine. However, the priority areas should be those that are at higher risks of severe community outbreaks (hot zones).
- For a society as susceptible to misinformation as Fiji, the need for continued awareness and information dissemination can not be overemphasized. Given that the MOH is overwhelmed, other government ministries should be mobilised to assist in increasing knowledge about vaccines and dispelling misinformation. NGOs, CSOs and others with proven capacities can also become invaluable partners in these campaigns. This will also partly address the problem of vaccine hesitancy due to a lack of trust in government. The government is usually seen as a political actor in most societies and viewed with suspicion and mistrust by segments of society.
- Some Fijians are afraid of going to vaccination venues to get their vaccine shots. From observations of many vaccination sites, this fear is justified. A number of vaccination sites are not safe places as physical distancing in queues are not enforced, vaccination officials sit too closely together forcing the people to do the same during registration/verification processes, and some vaccination staff have been observed not to wear their personal protective equipment properly.

- At the drive-in vaccination sites, officials who direct vehicles or facilitate registration and verification have been observed to get too close to people and even put their heads inside cars of those in queues. The vaccination staff interact with thousands of people daily, and given the community prevalence rate, this would mean that they are inevitably exposed to SARS-Cov-2 carriers everyday and would likely be carriers themselves. They can very easily pass the virus to fully susceptible or partially vaccinated people with dire consequences for the recipients. The MOH needs to train its staff and other people involved (including from the security forces) and develop clear guidelines to ensure that vaccination sites are made safer and do not become super spreader venues.
- There is no publicly available data on the percentage of wasted vaccines in Fiji, how vaccine wastage is minimised and how are immunisation staff trained to classify and deal with spoilt vaccines. The AstraZeneca vaccine comes in multi-dose vials. From international data, the indicative wastage rate for a 10-dose vial vaccine is 15% to 25%. Vaccine wastage happens in two ways. "Closed vial wastages" happen due to issues in storage and transportation. "Open vial wastages" occur due to errors on the part of immunisation workers or the need to throw away unused doses in open vials. The French Directorate for Health, for example, reported that the rate of vaccine wastage in their country was as high as 30%. The Fijian Ministry of Health and Medical Services needs to make data on vaccine wastage rate in Fiji publicly available to provide a greater degree of confidence to people that they have not been given a spoilt vaccine.
- The Ministry of Health needs to engage influential Fijians (religious leaders, politicians from both sides of the political spectrum, traditional leaders, youth and women's leaders, CSO leaders, sports celebrities, etc.) to bust myths relating to the COVID vaccines, counter misinformation and to encourage vaccine uptake.
- As a last resort, the government should consider mandatory vaccinations, to reach vaccination targets. The lower levels of testing which have led to lower numbers of covid cases being announced have given people a false sense of security. Whilst the "No Jab, No Job" policy and the tying of eligibility for unemployment benefits (cash handouts) have been significant inducements in increasing vaccine uptake, they may not have the same impact for the vaccination of under 18-year-olds. Parents will make the decision for their children and given the high prevalence of vaccine hesitancy, this may present a problem. In addition, the imposition of a vaccine passport requirement for any movement outside homes, including for children, may be considered.
- The Fijian government needs to swiftly act to develop proper vaccine passports for various local applications that the current vaccination cards are being used for. The current vaccination cards are not suitable as they do not have photos for verification of holder's identity, nor do they have any security features and can be counterfeited easily.

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