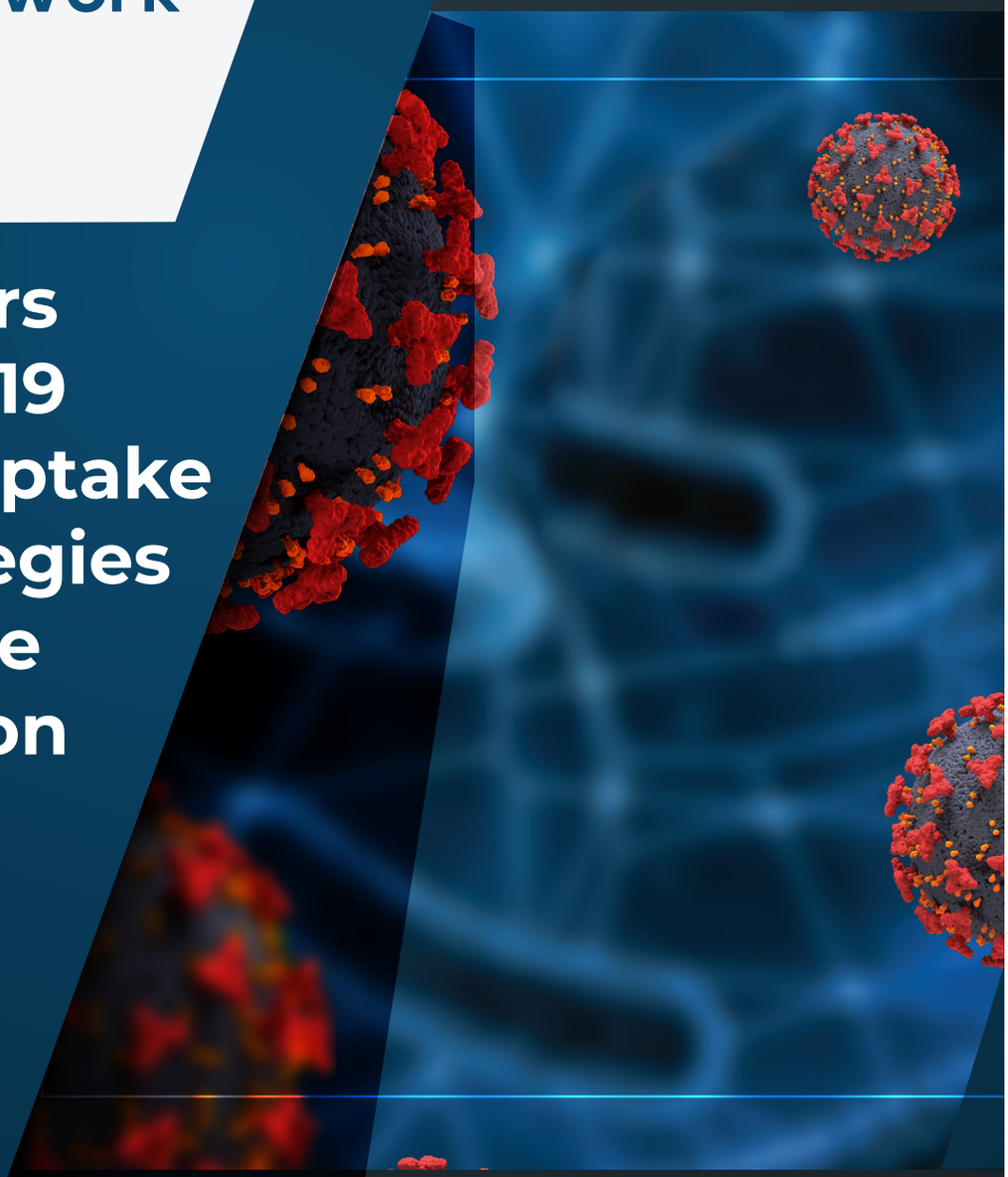
Global Health Security Network

The Drivers of COVID-19 Vaccine Uptake and Strategies to Increase Vaccination Rates



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Executive Summary

The COVID-19 pandemic is an international public health emergency with major social, economic, environmental and health consequences.[1] Vaccination is an important strategy needed to control the effects of the pandemic, and the effectiveness of vaccination programs hinges on the public's uptake of vaccines.

Low vaccination rates are often assumed to be the result of vaccine hesitancy; however hesitancy – a motivational state of being conflicted or opposed to vaccination - is one of a number of social and behavioural drivers of vaccine uptake. The practicalities of going about getting vaccinated also play an important role[2], yet is often overlooked. Governments must understand and address these drivers in vaccine uptake when deciding how to address low vaccination rates.

The behavioural and social drivers of vaccine uptake are often not consistently or well-measured, and there are few countries that routinely include social science expertise in public health response decision-making or vaccine policy. Using robust behavioural and social data to diagnose the underlying cause of low vaccine uptake in a population enables the most appropriate corrective actions to be identified and implemented. There is a growing body of evidence on what can be done to address low vaccine uptake, and a combination of targeted actions can be taken according to what is revealed by behavioural and social insights. Some interventions aim to directly change behaviour such as incentivising or requiring vaccination. Others look to address practical barriers to getting vaccinated, such as removing transport obstacles, reducing out of pocket costs, or minimising stockouts,[3] and there are varying levels of evidence supporting each type of intervention. It should be noted that a single intervention on its own rarely increases uptake. Rather, the largest gains come from a range of interventions operating simultaneously at multiple levels, from raising awareness to reducing out-of-pocket costs.

Good communication practices can be effective when used alongside other interventions to increase vaccine uptake, especially when rolling out a new vaccine. Early, clear, and transparent communication

by authorities at a population level, within communities, and by health practitioners on a personal level in the vaccination clinic are important for vaccination programs to be well-accepted by the public. At a population level, frequent communication with clear and actionable messages makes it easier for people to understand what is happening and what they can do regarding vaccination. As decisions like vaccinating are at their core values-driven, messages that explain how vaccinating aligns with people's values (for example, "protect yourself and your loved-ones") and explaining the values underpinning why authorities have made certain trade-offs in their decision-making will encourage people to take the required action. Because different people rely on different sources of information, using a variety of channels for message delivery will ensure that people know whether they are eligible for a vaccine and how to get one. Working with trusted spokespeople is key, particularly when disseminating recommendations, addressing misinformation and encouraging uptake. Importantly though, which particular spokespeople are most trusted is highly dependent on the audience: In some settings it will be non-partisan science or health experts, in others it will be community and religious leaders. Strong community engagement will help health authorities identify these people.

On an individual level in the clinic where an immunization encounter occurs, good communication accurately informs people and ensures their questions and concerns are addressed. It is important to support health workers by providing training and increasing their knowledge and confidence in having vaccination conversations and making recommendations. Mis- and disinformation continue to present challenges for COVID-19 and other vaccination programs. Rather than trying to address all misinformation or disinformation, it is more efficient and effective to use a discerning and targeted approach. This involves using social listening methods and periodic studies to identify if the information is getting broad reach and potentially affecting vaccine uptake. The specific information of concern should be refuted in a timely way with accurate information from trusted sources and via channels reached by the key audiences.

Recommendations

1. The full scope of behavioural and social drivers of vaccine uptake should be routinely measured and used to correctly “diagnose” the true cause or causes of low vaccination rates, which can then be specifically targeted with appropriate action. Governments should ensure that mechanisms and capacity are in place to enable the collection and use of high-quality behavioural and social data concerning vaccination.

2. Social science expertise should be routinely included at the decision-making table. This can be done by embedding social scientists in routine decision-making bodies, such as regional and national immunisation technical advisory groups, and other health and government decision-making groups. Some countries have successfully established dedicated behavioural and social science research bodies that identify and undertake the required social research to inform policy, with a clear conduit of information from the researchers to the decision-makers.

3. Actions to address low vaccine uptake should be guided by behavioural and social data, and will usually involve a range of programmatic interventions, as no single intervention will universally increase vaccine uptake. The issues underlying low vaccine uptake are often vaccine- and population-specific, and high-quality data gathered using established methods such as surveys, focus groups and interviews with the community of interest is key to identifying and implementing effective actions.

4. Communication should form part of any range of actions taken to address low vaccination rates. Good communication is done frequently via channels and people trusted by the community. Well-crafted messages are empathetic, explicit in the values and processes underpinning decisions, and clearly explain what people need to do. Disproportionately affected communities require targeted and tailored messages informed by strong community engagement. Rather than attempting to target all misinformation, social listening and behavioural and social data should be used to identify mis- and dis-information that is gaining traction and potentially affecting vaccine acceptance.

Introduction

COVID-19 has caused hundreds of millions of cases and millions of deaths world-wide.[4] Governments around the world implemented a wide range of containment measures including social distancing, travel restrictions, and lockdowns. These measures, while intended to save lives and reduce human morbidity, also involved tradeoffs at the health, environmental and economic levels that have also had far-reaching impacts. The urgent need for a vaccines to curb the spread and severity of COVID-19 and allow the lifting of other restrictive containment measures has seen unprecedented efficiency in global vaccine development, licensing, and rollout.

Over half of the world’s population has received at least 1 dose of a COVID-19 vaccine, however vaccination rates vary dramatically by country, with only a fraction of people living in low income countries having received a vaccine in the same timeframe as those living in high income countries.[5] These differences can be attributed to combinations of factors occurring at different levels. These include high-level factors such as a lack of supply, procurement processes, and the rollout strategies adopted by different governments, which will have an impact on vaccine availability and therefore uptake.[6] Individual and community-level factors affecting whether people want the vaccine or are able to get it will also affect how widely a vaccine is taken up in a given setting.

The social, cultural, and political setting in which the vaccines are being provided will influence uptake. For example, in Northern Nigeria, a boycott of the oral polio vaccine in 2003 came in the context of post September 11 mistrust of the West, national political tensions, historically low utilization of health services, a lack of the most basic primary care in other areas, and previous population policies that people subsequently connected with vaccine programmes.[7]

These instances, along with the exponential use of social media and rapid dissemination of misinformation have seen a myopic focus on vaccine hesitancy as the cause of low uptake. This attribution was amplified in 2019 when the World Health Organization listed vaccine hesitancy as one of the top 10 threats to global health.[8] The term is problematic, widely used as a catch-all phrase to

describe anything from uncertainty to refusal, and sometimes taken to be synonymous with vaccine refusal as a behaviour.

The focus on hesitancy alone has seen low vaccine uptake explained as simply a function of an individual's incorrect knowledge and understanding, often assumed to arise directly from misinformation. The logic from this hypodermic model of media effects is that low vaccine uptake can be solved by a counteracting injection of the facts. Decades of research from media studies and psychology fields have shown the problem of low vaccine uptake is far more complex, nuanced and context specific. Someone's decision to have a vaccine (or not to), is a culmination of disease and vaccine risk perception, personal beliefs and values, experience, social norms and interactions, trust in health care providers and government, and how easily they can afford and physically get to the vaccination service. Moreover, governments can create the conditions under which these factors wither or flourish.[9]

Vaccine acceptance can also be highly vaccine-specific. For example, in Australia, parents feel and act very differently toward measles-mumps-rubella (MMR) and SARS-CoV-2 (COVID-19) vaccines for their children: 94.8% of five year old children had received a full course of MMR vaccine in 2020,[10] consistent with figures from preceding years.[11] However, in 2021, uptake of the first dose of COVID-19 vaccine plateaued at 50% of children aged 5 to 11 years two months into the vaccine rollout.[12]

In much the same way a physician will use patient history and diagnostic tests to identify what ails their patient, governments wanting to increase vaccine uptake must first understand and measure the causes of low uptake. This understanding will enable governments to identify and deploy evidence-based strategies appropriately matched to these causes. Unfortunately, few governments systematically and routinely measure the social and behavioural drivers of vaccine uptake using comparable and validated measures, nor routinely include social science expertise at their health policy decision-making tables. To this end in 2021, the World Health Organization Strategic Advisory Group of Experts on Immunization (WHO SAGE) recommended that countries begin to routinely measure the social and behavioural drivers of vaccination and are providing such tools to support that process, which we helped develop.[13, 14] Further, they recommended countries strengthen capacity for social science, and include such expertise on decision-making bodies such as national and regional immunisation technical advisory committees.[14]

Scope.

This report gives an overview of the social and behavioural drivers that can influence vaccine uptake, how they can be measured, and how this data can be used to implement evidence-based solutions to the issue of sub-optimal vaccination coverage. We begin with a summary of the current thinking on the drivers of vaccination behaviour in general, and then examine the evidence of those drivers in the context of COVID-19 vaccine, and how they can be measured. We then examine the various strategies available to increase vaccination coverage and the evidence base supporting them, including good communication strategies. We conclude with recommendations for governments wishing to increase COVID-19 vaccine acceptance and uptake.

Key Terms and Abbreviations

Given the broad and often inconsistent use of terms like "hesitancy" when referring to the social and behavioural drivers of vaccination, we first provide definitions of central concepts set out by Shapiro et al (Table 1).[15] This report defines vaccine hesitancy as a "motivational state of being conflicted about, or opposed to, getting vaccinated; includes intentions and willingness".[15] Of note, hesitancy is not a behaviour. A person who is hesitant may still receive a vaccine, and conversely, some who don't vaccinate are not at all hesitant, but firm in their resolve. Still others may not be hesitant about receiving a vaccine, but are unable to get one due to supply issues or other practical barriers.

Table 1. Terms relating to vaccine attitudes and behaviour*

Definitions of key terms used in vaccine confidence measures	
Term	**Definition**
Thinking and Feeling	
Disease risk appraisal	Thoughts and feelings about potential health problems caused by infectious agents. Includes perceived risk, worry, fear, and anticipated regret.
Confidence	Attitudes and beliefs that vaccines work, are safe, and are part of a trustworthy medical system. Includes perceived importance and effectiveness of vaccines and concerns about vaccines being unsafe.
Motivation	
Hesitancy	Motivational state of being conflicted about, or opposed to, getting vaccinated; includes intentions and willingness.
Intention	Aim or plan to get vaccinated.
Behaviour	
Acceptance	Willing receipt of vaccination
Coverage	Estimated percentage of individuals who received specific vaccines. Low coverage reflects both individuals who will never be vaccinated and those for whom vaccination is delayed but eventually occurs.
Delay	Receiving a vaccination after the recommended age. Delay can be the result of a deliberate choice, passive inaction, or forces external to the individual, such as a vaccine shortage.
Refusal	Declining to receive a vaccine when offered.
Un-vaccinated	Has not received any of the recommended vaccines for their age.
Under-vaccinated	Has received some, but not all, of the recommended vaccines for their age.
Uptake	Receipt of a vaccine.

*Reproduced under creative commons license from Shapiro GK, Kaufman J, Brewer NT, Wiley K, Menning L, Leask J and the BeSD Working Group. A critical review of measures of childhood vaccine confidence. Current Opinion in Immunology. 2021;71:34-45.15

Behavioural and Social Drivers of Vaccination

A large and increasing body of research contributes to the current understanding of why people do and do not receive recommended vaccines. Largely dealing with childhood vaccination but with an increasing focus on adolescent and adult vaccines, several systematic reviews have examined the findings of both qualitative and quantitative studies of the elements of vaccination attitudes and behaviour across a number of global settings,[16-18] and a number of conceptual and theoretical models aim to explain vaccination behaviour.[3, 19-21]

Measuring the behavioural and social drivers of vaccination

Traditionally, surveys have been the most widely used method of gathering vaccine social and behavioural data, as they are relatively easy to deploy and data analysis can be relatively straight forward. A plethora of vaccine knowledge, attitudes and practices surveys have been used to measure the drivers of vaccination, which vary widely in quality. Many surveys are developed in an ad hoc way by an individual or group of researchers, based on what they consider to be important to measure. Good survey development involves a systematic process of carefully developing questions that measure the key constructs (themes) relevant to the behaviour; cognitive interviews with a target sub-sample to ensure the questions' meaning and response options are taken as intended; and psychometric evaluation using statistical methods that examine question overlap, predictive validity and stability. This process can be time consuming, expensive, and requires specialist knowledge and therefore is often not regularly undertaken.

The sampling of the population to be surveyed is also important. When inferring the prevalence of a particular attitude in the population, it is essential to be able to represent them as accurately as possible. Many survey studies involve convenience samples, clinic populations, or online panels that may over-or under-represent certain groups. A well-sampled validated survey of the population can be invaluable to understanding which of the factors set out in the survey are most strongly predictive of uptake.

As a complement to surveys, qualitative methods such as interviews and focus groups help address questions quantitative methods such as surveys cannot. By asking open ended questions and analysing text, these methods facilitate understanding of social phenomenon and context related to vaccine acceptance, providing rich insight often unrecognized using the closed-option responses in a survey. For example, qualitative interviews with people who refuse to vaccinate their children have revealed that previous stressful or traumatic experiences with the health system can be influential, leading to mistrust and future avoidance of vaccination.[22] This has led to an appreciation of the importance of good process around adverse events following immunisation so they are investigated and responded to accordingly.

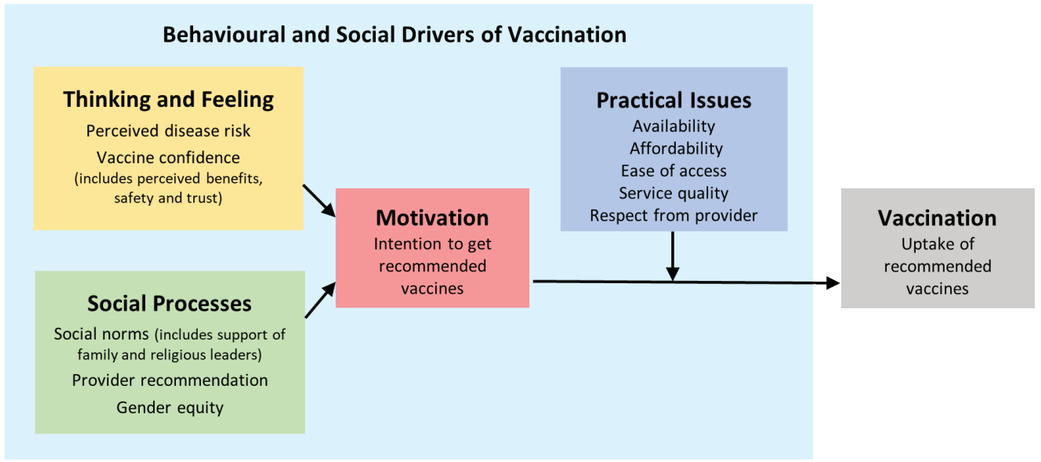
A mixed methods approach of combining qualitative and quantitative data enables a multifaceted understanding of an issue like vaccine acceptance: quantitative surveys estimate the size of the problem and the factors associated with it; qualitative data provides detailed insight into why it's happening and identifies previously unknown issues not identifiable through surveys alone where the scope of questions is pre-determined.

Globally, it is recognized that there is a deficit in social science expertise to support immunisation programmes,[23] and there is a need for focus and funding to increase such capacity.

A conceptual framework for understanding the Behavioural and Social drivers of vaccination

In 2018 the World Health Organization (WHO) convened an expert working group to develop standardised tools for measuring the factors associated with childhood vaccination behaviour.2 This group critically reviewed the existing vaccination behaviour models and measures, and developed a Behavioural and Social Drivers (BeSD) of Vaccination Framework for childhood vaccination[15, 24] which was modified in 2020 for COVID-19 vaccine behaviour in adults (see Figure 1).[25] The framework sets out the influences on vaccine uptake that are measurable in individuals, specific to vaccination and potentially changeable.

Figure 1. The BeSD Framework: direct influences on vaccination uptake



Source: The BeSD expert working group.24 Based on: Brewer NT, Chapman GB, Rothman AJ, Leask J, and Kempe A (2017). Increasing vaccination: Putting psychological science into action. Psychological Science for the Public Interest. 18: 149-2073

The BeSD framework for COVID-19 vaccination behaviour categorises influences on vaccine uptake into four domains: What people think and feel; social processes; motivation; and practical issues.

What people think and feel

This domain includes factors relating to an individual's internal perceptions. In the context of the COVID-19 vaccine, this could include concern about contracting the virus; the perceived safety and importance of the vaccine; belief that vaccinating oneself will allow freedom of social interaction; and trust in the vaccine providers and the authorities. Experience of a vaccine safety scare can

cause low confidence in the safety of vaccines and mistrust in the authorities that provided it.

Case study on the effect of what people think and feel: The dengue fever vaccine controversy in the Philippines[26]

Dengue fever is a mosquito-borne tropical infection that can cause severe and sometimes life-threatening disease, particularly in children. Following endorsement of the vaccine by WHO SAGE in 2016, the Philippines government launched a dengue immunisation drive that aimed to vaccinate over a million children in areas with high disease burden, through a school-based delivery programme. In November 2017 data suggested that the vaccine actually increased the risk of severe disease in people who had not been previously infected, and in December 2017 the dengue vaccination programme was suspended by Philippines authorities. By this time 800,000 children had been vaccinated under the programme. There were several reported deaths of children, there was public outcry and the issue became highly politicised, featuring prominently in mainstream media for a prolonged period of time. The controversy had measurable impacts on vaccine confidence among Filipinos, with the UK-based The Vaccine Confidence Project measuring a drop in vaccine confidence from 93% "strongly agreeing" that vaccines are important in 2015 to 32% in 2018,[27] and a measurable drop in measles vaccine uptake from 88% in 2014 to 55% in 2018, contributing to a 2000% increase in measles cases, from 2400 reported cases in 2017 to 48,871 in 2019.26 Survey data from 2021 about COVID-19 vaccines suggest that around 32% of Filipinos were willing to get a COVID vaccine and around 35% were undecided, this is consistent with vaccine uptake data, which shows that 61% of people had received two doses of COVID-19 vaccine by May 2022.[28] There were calls to use the lessons learned from the dengue vaccine controversy for pandemic preparedness planning prior to the emergence of COVID-19[27,] and more recently, recommended courses of action in response to the COVID-19 pandemic have been put forward.26, [29] Lasco and Yu[29] recommend that actions centre around trust and credibility; transparency; equity; and, participation and Feedback.

TRUST and CREDIBILITY. Public confidence in vaccines is based on trust in a number of factors: trust in the vaccine itself, trust in the vaccinating health workers , and trust in the government and health officials making the decisions.[27, 29] The overt politicisation of the dengue vaccine has been repeated in many places with the COVID-19 vaccine, demonstrating that non-partisan experts and institutions should be allowed to take the lead in vaccine communications without interference from partisan actors, thus maintaining credibility for the public, and not leading people to believe the vaccines are simply a political tool that cannot be trusted.

TRANSPARENCY. The manner in which the serious potential side effects of the dengue vaccine was communicated to the public led to accusations of corruption. Clear and early communication about the vaccine, its potential risks and limitations, and how it will be deemed safe and made available to the public is key to engendering trust.

EQUITY. During the dengue vaccine controversy, politicians questioned why, in an election year, certain regions appeared to be prioritized over others. A vaccine rollout plan that is explicit in which groups / regions will be targeted when (and why) should by clearly communicated and implemented.

PARTICIPATION AND FEEDBACK. The dengue vaccine controversy demonstrated that communication is two-way: that communication with the public must include the ability for the public to be heard. Incorporating social science expertise and feedback mechanisms into communications planning is key to ensuring that messaging addresses the key concerns of the population.

Social processes

Social processes refer to how people interact with others around vaccination. They include social norms such as whether other people around them are getting the vaccine, and whether people believe their friends and family community and / or religious leaders would want them to get the vaccine. Receiving a recommendation from a health care provider also falls under the social processes domain.

Case study on the effects of social processes: Community Engagement in Northeast Nigeria to increase polio vaccine acceptance[30]

Polio eradication in Nigeria is an immense multi-faceted challenge, particularly in the Northeastern Yobo state. In 2014 only 27% of the population had received three doses of the oral polio vaccine in that state, which was below the national average. Programme implementers face the challenges of hard-to-reach unimmunized children, unreliable disease surveillance and vaccine coverage data, violent fundamentalist groups targeting polio workers, damaging health facilities and disrupting campaigns, and a history of pervasive vaccine myths and rumor in communities, leading to large-scale polio vaccine rejection in the region.[30] Such a complex and socially specific situation requires a complex and socially specific response. Community engagement uses a sound understanding of the way people interact with each other, their social structures, their history and their culture to inform public health responses. Community engagement is an umbrella term that covers approaches that include involvement and participation of people and groups within a community.[31] The CORE Group Partners Project (CGPP) in Nigeria began work in 2014 to address immunisation challenges in Yobo state using strong community engagement, and initiating a number of approaches, many of which are ongoing and some of which were leveraged as part of the COVID-19 pandemic response.[32] Among these approaches, the CGPP trained and supervised female volunteer community mobilisers who were assigned households in their community for which they were responsible for visiting to speak with caregivers about immunisation and dispel myths. They established personal connections with their assigned families, and are valued members of their communities. They are also trained in breastfeeding support, nutrition and child health. Volunteer community mobilisers attend naming ceremonies of babies that are traditionally held seven days after birth and administer the first dose of oral polio vaccine to newborns. They also guide families with children who are not fully immunised, and report routine immunisation data to health facilities. Recognising the role of men as decision-makers, CGPP also engaged with male heads of households after evening prayers, and male religious leaders were trained to deliver immunisation information. Male heads of households were given the opportunity to ask questions, and fathers were encouraged to commit to bringing their children for vaccination. The following day immunisation services were made available after prayer services. These approaches are just two examples of the many activities of the CGPP in Nigeria, and illustrate how a deep understanding of local issues, social processes and cultural norms can lead to innovative approaches to encouraging vaccine uptake that involve the community.

Motivation

In this context, motivation is how much someone wants to get a vaccine. Following the BeSD framework, what people feel and think and social processes described above affect how much someone is motivated to vaccinate (see Figure 1). Hesitancy is when motivation is reduced and can be affected by things like low trust in vaccine safety, feeling that the vaccine is unnecessary, or believing that others won't have the vaccine and / or don't want you to have it.

Case study on increasing motivation: Canadian parent's intention to vaccinate their children[33]

While the majority of Canadian parents vaccinate their children, surveys showed that some were worried about vaccine safety and were not convinced that vaccines were necessary because they were not convinced of the science supporting herd immunity. In 2015 researchers from The Canadian Immunization Research Network surveyed parents about their children's immunization status at age two, and their intention to vaccinate their child in future. They also measured other factors including their attitudes toward vaccination, and their perceived knowledge about vaccination and their information needs. They found that 85% of the parents surveyed had fully vaccinated their child, and very few reported having difficulty accessing vaccination for their child. Almost 50% reported having no, low or moderate intention to vaccinate their child in future. Parents who reported a strong intention to vaccinate in future were found to have more positive attitudes toward vaccination, had perceived higher social support for vaccination, and considered it easier to have their child vaccinated. They also reported higher trust in doctors and public health authorities, and not having to look for information about vaccines. This data was used to inform a specific type of face-to-face intervention deployed in maternity hospitals that was focused on motivational interviewing, and shown to reduce hesitancy and enhance intention to vaccinate.[34] Motivational interviewing was originally developed in the 1980's to help address substance abuse, and is a patient-centred approach that aims to assist someone with a decision by enhancing their internal motivation to change. It helps someone understand their own ambivalence toward something, and strengthen their motivation for change based on their exploration of their own ambivalence.[35] Researchers developed a specific intervention that used an empathetic communication style, and covered important aspects of vaccination including vaccine preventable diseases, the vaccines, the importance of routine immunisation, and vaccine fears and side effects. The intervention was designed to be delivered by people trained in motivational interviewing techniques to mothers 24-48 hours after giving birth in their maternity hospital room. The intervention was trialed in maternity hospitals in Quebec, and found to increase vaccination intention from 78% pre-intervention to 90% post-implementation.[34, 36]

Practical issues

Practical issues are the influences external to the individual and relate to experience they have when trying to get vaccinated. They include whether the vaccine is available from the service, how easily the service can be afforded and accessed, the quality of the service and how a person is treated in the clinic. For example, migrant populations may not be familiar with the health system in their new country, and may not know where to go to get the vaccine. In some countries the vaccine might be provided free of charge but there may be clinic fees charged on the day that make it difficult to afford. Equally, in some settings the clinic operating hours may mean that a mother may have to take time away from paid work to get her child vaccinated, or may have to travel long distances, creating financial and logistical barriers that may be difficult to overcome. Added to this, there may be a shortage of vaccine, a shortage of health workers, or challenges transporting vaccine under certain storage conditions, all of which could may result in difficulties supplying the vaccine reliably. Likewise, there may not be systems in place to prompt or remind people that a vaccine is due. The pervasive focus on vaccine hesitancy means that these kinds of issues are often not measured, and their importance underappreciated.

Case study on the importance of practical issues: Enabling access to COVID-19 vaccine for migrants to the United Kingdom[37]

Ethnic minority and migrant populations in the United Kingdom (UK) were disproportionately affected by COVID-19, but surveys consistently showed that vaccine uptake among these population to be lower than non-minority residents. There was particular concern that people with precarious immigration status such as undocumented migrants or asylum seekers may not be reached under the COVID-19 vaccine rollout, and there was very little data available on what particular issues this group might experience in obtaining the vaccine. In the UK, the COVID-19 vaccine rollout was planned to be implemented via existing health services, from which migrants are often excluded, either through lack of trust due to data sharing agreements between health services and the Home Office for immigration enforcement purposes, or confusion about entitlements. Researchers undertook a qualitative interview study with recently arrived precarious migrants to explore their views on the COVID-19 vaccine and seek their thoughts on how vaccine uptake might be encouraged. These identified concerns about how they were going to access the COVID vaccine due to problems they had experienced in accessing healthcare before the pandemic, such as language barriers and perceived lack of entitlement. Many reported not trusting the government or health system, with some sharing previous bad experiences. They highlighted difficulty understanding and navigating the health system, and poor treatment by health staff as contributing to the mistrust, and many felt abandoned during the pandemic.[37]

There were a range of views about the COVID-19 vaccine itself, with many indicating levels of hesitancy, and some outright refusal. Underlying the reported hesitancy were worries about side effects, perceived insufficient testing, and some concerns arising from misinformation. Some perceived the vaccine as unnecessary. Further to this, many felt they did not have access to good, understandable information about COVID-19 or the vaccines, leading to reliance on word-of-mouth and social media. Ease of access to vaccines was also a concern, and the importance for familiar settings and minimal travel highlighted. Participants also suggested strategies that health services could implement that they felt would increase vaccine uptake, including making vaccines available via walk-in clinics in trusted places; education campaigns for health staff on the rights of migrants to access health care without documentation; tailored, translated and culturally appropriate information that would be accessible; and engagement with trusted local community champions.[37]

Current data on the drivers of COVID-19 vaccine uptake

Several systematic reviews have summarised published attitudinal and behavioural surveys about COVID-19 vaccines (see Table 2). These reviews included between 30 and 209 studies from a total of 57 countries from across all United Nations (UN) regions, and most reported people's willingness or intentions to vaccinate but did not ascertain vaccination uptake. Overall, intention to receive a COVID-19 vaccine consistently ranged from around 24% to 97% across the included studies, and all reviews reported a wide variation of vaccination intentions between countries and timepoints.

The drivers of COVID-19 vaccine uptake reported in these reviews are summarised in Table 2 below. These reviews synthesise findings from hundreds of studies in many countries and regions, which is helpful in painting a global-level picture of vaccine acceptance, but not so much in helping understand the nuanced differences between settings, cultures, health systems and populations of interest, and therefore what actions could be taken to support vaccine uptake in individual communities.

Table 2. Factors associated with COVID-19 vaccine intentions in select systematic reviews[38-41]

Domain				
What people feel and think	Social processes	Motivation (% willing to vaccinate across all studies in all reviews)	Practical Issues	Demographics
- Perceived COVID-19 disease risk - Exposure to negative information - Conspiracy beliefs - Vaccine safety perception - Vaccine efficacy / effectiveness perception - Concerns about vaccine newness - Trust in nation's health system - Trust in government	- Trust in medical professionals - Health provider recommendation - Workplace norms	24% - 97%	- Previous influenza or MMR vaccination - Cost of vaccination - Convenience	- Age - Gender - Education - Income - Ethnicity - Political leaning - Rurality of residence

Motivation to receive a COVID-19 vaccine

Globally, there was a wide variation in willingness to receive a COVID-19 vaccine between and within regions and countries. This is a function of the varied settings, health systems, timeframes, populations and cultures covered by the included surveys.

What people feel and think

In many countries, perceived susceptibility to COVID-19 disease, and perceived safety of the vaccine were commonly associated with willingness to receive a COVID-19 vaccine, although there was variability in the strength of the association. The more severe people felt the disease was, the more likely they were intending to vaccinate. One review reported this to be particularly reflective in groups considered

vulnerable to severe infection, such as older age groups and those with chronic health conditions,[38] while another review reported that the studies of specific high-risk groups that they identified generally found lower intention to vaccinate.[38, 39] These differences were no doubt a function of the different countries and settings that the surveys were conducted in, and may even be a function of the different ways the questions on those surveys were asked, highlighting the need for more standardized ways of measuring the social and behavioural drivers of vaccine acceptance across different settings.

Those who perceived that the vaccine was developed too quickly and not adequately tested, or who were concerned about its safety and side effects were less willing to have it.[38,40] The unprecedented global media attention given to the development and progress of the COVID-19 vaccine clinical trials, and the closely reported issues with the conduct of the trials,[42] and side effects,[43] likely contributed to this, with studies from France, Germany, the United States, China, and the United Kingdom showing that people who had high exposure to negative COVID-19 information tended to be less willing to have a COVID-19 vaccine. [38]

Increased trust in the government and health care system was reported to be associated with increased vaccine acceptance in many places, including Saudi Arabia, USA, Singapore, South Korea and China.[38, 39] As seen with the Dengue vaccine case study in the Philippines (see case study above), trust in the health system and the government are important factors in encouraging vaccine acceptance in a population, and the level of trust will be very specific to the country and the experiences of the people who live there.

Social processes.

Social processes such as social norms were less often reported in the reviews, but where they were measured, they were often associated with positive intention to receive a COVID-19 vaccine. For example, a multinational study found that 71% of participants said they would take up a COVID-19 vaccine if it were suggested by their workplace.[40] Other studies found that having trust in health professionals was associated with vaccine acceptance.[39]

Receiving a recommendation from a healthcare provider to have a vaccine was also found to increase the likelihood of COVID-19 vaccine acceptance.[38, 40] Historically, someone receiving a recommendation from a trusted nurse, midwife, doctor or other healthcare worker has been consistently shown to increase the likelihood of that person having the recommended vaccine, be it for Human Papilloma Virus in adolescents,[44] or influenza vaccines in pregnant women.[45]

Practical Issues

Most of the surveys reported in these reviews focused on thinking, feeling, and willingness to vaccinate, with practical issues like convenience and cost less often measured and reported. One review noted that the vaccine's convenience was a common reason for vaccine rejection in one country,[39] although this was not elaborated upon. The potential impact of cost was explored in one review, with willingness to pay for the vaccine found to vary greatly among countries and regions. For example, people in Bangladesh were willing to pay a median of USD$7.08, while the median price people were willing to pay in Southern Vietnam was USD$85.92.[39] This variation in willingness to pay was no doubt a function of the local health systems, economies, vaccination programmes (whether or not vaccine is provided free of charge), perceived value of the vaccine, and the incomes of the people participating in the various surveys.

A common finding was that people who reported having had an influenza vaccine in the past were more likely to be willing to have a COVID-19 vaccine than those who had not had an influenza vaccine.[38] This is likely due to a combination of factors, such as the ability to easily obtain vaccines in general and that a person who trusts the safety and efficacy of an influenza vaccine would likely be open to receiving others like the COVID-19 vaccine. It is also likely that previous habits around vaccination make new ones easier to adopt.

Turning data into action: Solutions to address vaccine coverage issues associated with the social and behavioural drivers of vaccination

As shown, the behavioural and social drivers of vaccination are numerous and complex. It is important to be able to reliably identify and measure those drivers so that the underlying reasons for vaccine acceptance or rejection in a given population are well understood, and the appropriate actions can be taken to encourage high vaccine acceptance. However, the integration of behavioural and social data into decision-making is not routine in many countries, and social science expertise is rarely included directly at the decision-making table. There are, however, some excellent examples of how behavioural and social insights were integrated into the COVID-19 crisis response.[46]

Case study: Including Social and behavioural insights into the pandemic response in Ireland[46]

Many countries had social and behavioural science expertise to draw upon for COVID-19 policy decision-making, however in many cases the connection between that expertise and policy makers was external and often informal. Additionally, in many cases the research needed to inform policy was relatively poorly funded. Ireland represents an exemplar of how social science was embedded in decision-making prior to the pandemic, and this was leveraged to create a clear conduit that enabled social and behavioural science to be embedded in the pandemic response.

In 2015 the Irish federal Department of Health (DOH) established the Research Services and Policy Unit (RSPU) to support evidence-based policy making, which included the use of social and behavioural insights. Additionally, Ireland's Economic and Social Research Institute (ESRI) had a long history of supporting policy with high quality research, and housed the Behavioural Research Unit (BRU), which specifically applied behavioural science to policy. These institutions pre-dated the pandemic, and therefore had well-established working relationships between social and behavioural scientists and various Irish government organisations, including the DOH. With the emergence of COVID-19, a specific COVID-19 behaviour change sub-group was created to provide advice and analysis to the National Public Health Emergency Team, and to communications personnel. In this way a clear and direct path was established between social and behavioural science experts and policy decision-makers, resulting in a number of rapid studies that helped inform Ireland's pandemic response, including designing a behaviourally informed handwashing poster that was shown to improve handwashing, and using end-user research to refine a COVID-19 tracker app.[46]

Turning social and behavioural understanding to action is important as illustrated through the case studies above, and the World Health Organization is currently leading a programme of work to develop tools to help immunisation programme managers and other health officials gather high quality data and use it to identify the most appropriate course of action.[14, 47] The measurement tools currently cover routine childhood vaccines and COVID-19 vaccines for adults and health workers. They include validated surveys and field-tested qualitative interview guides, tested in 10 countries that included a focus on low- and middle-income settings, and translated into the five official UN languages. There is also detailed guidance on how to translate and test the tools in local dialects and settings, gather and analyse the data, and use it to identify a course of action to increase vaccine coverage.[47] These tools form part of a suite of resources and guidance aimed at increasing vaccine coverage,[48] including Human-centred design for tailoring immunization programmes[49] (a community-centred approached originally developed by the WHO Regional Office for Europe),[50] a quality immunization services planning guide,[51] and health worker training modules for communicating with vaccine-hesitant caregivers.[48]

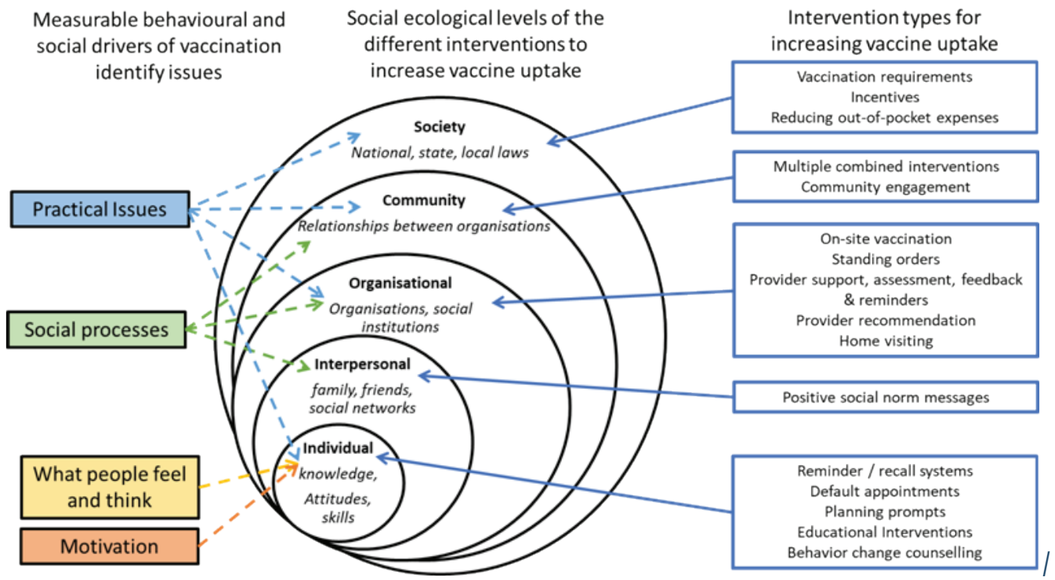
There are many ways that vaccine coverage can be increased. Given that the drivers of vaccine uptake are both internal for an individual (things like personal beliefs and motivations), and external (things like social norms and how easily available a vaccine is), a useful framework for organising and viewing the different solutions is the Social Ecological Model.[52] The Model acknowledges that health behaviour is influenced by factors that occur on multiple levels, that are internal to the individual, such as beliefs and experience, as well as external to the individual, such as through interpersonal, community and societal interactions - the individual's social ecology. The Social Ecological Model has been widely used for many years to help identify factors at different levels that contribute to poor health, and to develop preventive health and health promotion measures that operate at those same levels (see Figure 2). The social ecology of vaccination includes:

- Interpersonal elements such as the vaccination opinions of friends, family and social networks, and the recommendations of health care providers that the individual interacts with;
- Organisational-level elements that the individual and others in their inter-personal network interact with, such as vaccine requirements of schools, workplaces and other such organisations and institutions;
- Community-level interactions between the organisations and institutions, for example, nurses from the local public health unit delivering vaccines in local schools; and
- Public policy elements such as laws that affect vaccination uptake.

Importantly, no single intervention used in isolation will universally increase vaccine acceptance and uptake. Rather, a range of interventions operating simultaneously across the various social ecological levels will work synergistically to increase uptake, and it's important to make sure the interventions are chosen based on sound social and behavioural evidence.

Figure 2 illustrates a range of evidence-based solutions to general vaccine coverage issues, based on the underlying social ecology strata. Interventions can be aimed at direct behaviour change, but may also seek to address practical barriers to obtaining vaccines, such as out of pocket costs, lack of transport, inadequate leave or childcare and lack of vaccine availability.[3]

Figure 2. Solutions to Vaccine Coverage Issues, and Their Relationship With The Social Ecological Model of Health Behaviour[52]



Individual level Interventions

If data suggests that what people feel and think affects their willingness to have a vaccine, such as a low perception of the risk posed by a disease or being unaware that they are eligible for the vaccine, then educational interventions designed to increase knowledge or awareness about immunisation could be designed and implemented. Examples include information sessions, interactive online materials, information sheets and brochures. A systematic review reported low to moderate evidence that face to face information or education may improve children's vaccination status.[53] Other reviews report that education alone or in combination with other strategies has variable impact on vaccine uptake[54, 55] If, on the other hand, data suggests that people are hesitant to have a vaccine, then interventions such as decision aids that focus on underlying values can reduce decisional conflict and encourage vaccine uptake.[56] Similarly, a systematic review and meta-analysis concluded that behaviour change counselling can improve vaccination rates, and may also improve patient knowledge and satisfaction.[57] If data suggests that people are supportive of vaccination but remain unvaccinated for other reasons, such as low prioritization or forgetting, then reminder or recall systems can be implemented to prompt people into action. Systematic reviews of studies from low, middle and high-income countries have consistently shown that patient reminder / recall is effective in increasing vaccine uptake.[54, 55, 58]

Interpersonal level interventions

Data on social processes may reveal that people value what their religious or community leaders think about vaccination, or that people don't recall whether their trusted health care provider recommended a vaccine to them. Interpersonal level interventions leverage interactions between people. For example, trusted local religious or community leaders could be engaged in helping advocate for vaccination, or health workers in a local clinic could be provided with education to strengthen their confidence in recommending vaccination to their patients. This kind of approach was clearly demonstrated in the polio vaccine case study from Nigeria described above. Much research has identified that social norms are associated with vaccine uptake, however there have been few interventional studies that have examined whether social norms-based messaging increases uptake. In other fields such messages are known to be effective.[3]

Supporting health care providers in being confident to recommend vaccinations is another interpersonal-level intervention. There is strong evidence across many different populations and vaccines that a recommendation from a professional health provider is associated with greater vaccine uptake.[3] Evidence from low, middle and high-income settings shows that promotion and administration of vaccines by lay health workers was associated with up-to-date immunisation.[59] In some settings there is strong evidence for provider education / support strategies in increasing vaccine uptake, particularly among those working with at-risk populations.[54] International evidence suggests provider education alone may not improve vaccination rates, but is effective when used in combination with other strategies.[54, 55]

Organisational level interventions

If data suggests that people find it difficult to take time off work to go to the vaccine clinic, the clinic hours are inconvenient, or people must travel a long way to get there, then providing a walk-in clinic at a convenient place or providing vaccination services through home-based visits may be appropriate. The example of walk-in clinics in trusted community places in the case of hesitant migrants in the United Kingdom is such an example. Similarly, removing the need to visit a clinic altogether through home visits may be effective in increasing immunisation rates in specific settings, such as poorly reached or at-risk populations in low, middle and high income settings.[54, 55] Within health organizations, standing orders authorising qualified pharmacists, nurses and midwives to assess for and administer vaccines to patients without a medical order have been shown to increase vaccination rates by a median of 24%.[3, 60]

Community-level interventions.

Community-level interventions often involve a coordinated program of activities to increase demand for vaccination, based on the unique social structures and culture of the target community. Such coordinated efforts often involve cooperation between several organisations, and inclusion of the community in design, decision-making, and implementation, such as the volunteer community mobilisers in the Nigeria case study. There is strong evidence that supporting such coordinated community-based interventions increases vaccine uptake.[60]

Policy-level interventions.

Society-level interventions are generally policy-driven and implemented by governments or authorities. Reducing out-of-pocket expenses is an example of a policy-level intervention, whereby cost barriers to vaccination are removed. The cost of travel to the vaccine clinic and other indirect costs associated with obtaining a vaccine could be re-imbursed to remove financial barriers. The evidence for reducing out of pocket expenses in encouraging vaccine uptake is well-established in some settings.[3, 54] Other examples include vaccination requirements that involve individual consequences for non-compliance such as requirements for school entry,[61] or monetary incentives in exchange for vaccination such as conditional cash transfers or lottery tickets for a prize for vaccine recipients.[55, 62, 63] The evidence for these interventions is at best mixed. Requirements that are more coercive can have negative spill-over effects.[3] For example, people who feel their freedoms are being encroached may reject the requirement and become more resistant to voluntary vaccinations,[3, 40] and there is emerging evidence in jurisdictions with mandated vaccines to support this.[64, 65]

Communicating about COVID-19 vaccination and addressing misinformation

Effectively addressing low vaccine acceptance involves a thorough understanding of the social and behavioural drivers of vaccine uptake and using an evidence-based choice of a combination of interventions that operate at a number of levels of an individual's social ecology. Here we focus on communication about COVID-19 vaccination. Given the prominent role of misinformation in the pandemic-related discourse, we pay particular attention to addressing misinformation regarding COVID-19 vaccines.

Good communication

There has traditionally been a strong programmatic focus on interventions to communicate or educate, such as information campaigns or leaflets. However systematic reviews often show weak or null effects on vaccine uptake from such interventions when they are used in isolation.[53, 66] We note, however, that many such studies and reviews focus on high income countries, with a limited evidence base from low and middle income countries (LMICs) where such interventions may have more impact. Furthermore, a finding of a weak and limited effect does not mean communication should be abandoned. Indeed, communication and education serve a number of important functions in immunisation programs. It is the central method for making people aware they are eligible for a vaccine, alongside provider recommendations and this is particularly important for new or updated vaccine programs. At a programmatic level, good communication ensures people have the knowledge about where, when and how to get to a vaccination service. At the clinic level, good communication in the immunisation encounter informs people and ensures their questions and concerns are addressed – central to valid consent. Tools that help people understand their vaccination options and weigh them according to their values may be a useful way to help people who are hesitant move towards vaccination.[56] More advanced forms of communication which can include person-centred behaviour change counseling, such as motivational interviewing, has also been shown to assist people who are hesitant.[35, 67] Finally, a well informed population is more likely to be resilient against vaccine scares when they arise.

At a population level, good risk communication has been essential for the COVID-19 vaccine program rollouts, particularly in light of the widespread hesitancy that greeted this new vaccine in many countries.[68] Effective risk communication at a population level involves a number of strategies, including transparent and frequent communication, clear and actionable messages that make values explicit, and using a variety of channels for message delivery (see box 1).[69]

Good population-level risk communication is particularly important in new vaccine program rollouts or when new vaccine safety signals arise, such as the emergence of a causal link between the AstraZeneca COVID-19 vaccine and the rare clotting syndrome, Thrombosis with Thrombocytopenia Syndrome (TTS). Here, WHO describes the goals of COVID-19 vaccine safety as to (1) empower people to make evidence-informed choices, (2) encourage trust in health authorities and those delivering the vaccine, (3) facilitate access to timely, accurate and credible information about COVID-19 vaccination safety via trusted channels, and (4) provide people with a means of asking questions and having their concerns addressed.[70] Data should be used to identify disproportionately affected communities, and tailor communication activities developed

through community engagement. Communication itself needs to prioritise understanding and building trust: to communicate with openness and transparency, to communicate with clarity, to be responsive and timely, to accept and acknowledge uncertainty, and to act and speak with empathy.

Case study: New Zealand Prime Minister Jacinda Adern and COVID-19 communication[46, 71]

New Zealand Prime Minister Jacinda Adern's handling of the COVID-19 crisis provides a good example of effective communication: her approach to communicating about compulsory national lockdowns was clear and empathetic, frequent, and transparent. In announcing lockdown measures on March 23rd 2020, Prime Minister Adern used the New Zealand Government's COVID-19 alert-level system to explain why the decisions had been taken, and the plan for decision-making in the coming days. The four-level alert system had been communicated early and transparently, allowing people to understand the decisions that had been made and why. At the end of the press conference, she allowed ample time for the media to ask questions, and in the hours afterwards, she livestreamed on social media from her home to "check in" with New Zealanders, demonstrating a level of empathy that resonated with many people. In this livestream she explained simply and clearly the lag between when cases are acquired and reported, effectively priming people to expect the case numbers to continue to rise at first in spite of the lockdown, and telling them, "don't be disheartened" by this. She finished by telling citizens to "remember to stay at home, break the chain, and save lives", and in doing so gave a simple and actionable message which was well-received by the public. She then followed up with daily televised briefings and regular Facebook live sessions, in which she often related her own experiences as a mother of a toddler in lockdown. This strategy appeared to be effective, with a national poll undertaken shortly after the initial press conference revealing that 91% of people planned to comply with lockdown measures.[72]

- Communicate frequently about the process and outcomes of the vaccine approval process by the local regulatory authority
- Make values explicit when communicating the acceptable level of risk that is assumed
- Use clear, accurate and actionable messages
- Promote vaccination, but don't over-reassure
- Diversify communication channels and platforms
- Identify and address misinformation
- Prioritise key or at-risk groups for communication
- Use credible spokespeople
- Sustain trust through transparency

Box 1. Key elements of a successful public communication strategy*

* Adapted from Leask, J., Carlson, S., Attwell, K., Clark, K., Kaufman, J., Hughes, C., . . . Danchin, M. Communicating with patients and the public about COVID-19 vaccine safety: recommendations from the Collaboration on Social Science and Immunisation. Medical Journal of Australia 2021; 215:9-12. [69]

Addressing misinformation

Misinformation has been a constant challenge throughout the history of vaccination, and throughout the COVID-19 pandemic in particular (see GHSN Policy Report 1, The COVID-19 pandemic vs Post-Truth).[73] It is important to appreciate though, that not all misinformation or disinformation warrants a response. The sheer volume alone makes it impractical to address every piece of misinformation. Furthermore, drawing attention to an idea that has little attention can give it further unnecessary attention. Rather, a more strategic approach would be to use social listening methods to determine whether the misinformation is gaining traction through multiple shares, and behavioural and social data from interviews or surveys to assess if it is having a discernable impact on vaccine uptake.

If a piece of misinformation is determined to be affecting vaccine acceptance in a community, strategies can be used to limit its effects. One is mentally priming people to be ready when they hear misinformation. Known as psychological inoculation or "prebunking", this involves warning people that they may be misled, followed by preemptively debunking a piece of misinformation by providing people with small doses of the misinformation so they are ready when they encounter it from a source.[74]

To ensure misinformation doesn't set the foundations for how people think about vaccines, communication scientists recommend early and factual communication to counter misinformation. Using trusted spokespeople can also be highly effective since it levers social influence and such sources are more likely to be trusted.[74] As demonstrated in the dengue vaccine case study (see above), it is generally important to avoid politicisation of an issue, and therefore non-partisan spokespeople are preferable where possible, although this is context-dependent. For example, survey research identified that trust in qualified scientists rose in the German and United Kingdom populations over the course of the COVID-19 pandemic. In these settings a non-partisan scientific expert would be an appropriate spokesperson to engage with. In the United States however, trust in scientists was dependent on political persuasion, with trust in scientists mainly found to increase among democrats,[75] and studies found that being a conservative or alignment with the Republican party was associated with higher vaccine hesitancy.[39] In these situations, carefully chosen partisan spokespeople may be required to counterbalance negative messages that have partisan origins. The polio vaccine case study from Nigeria demonstrated that meaningful community engagement is an effective way to identify trusted spokespeople. In that example, community engagement led to training of male religious leaders to provide positive vaccine messages and leveraging of the local social structure of evening prayer to create an opportunity for male heads of household to ask questions, and for misinformation to be addressed.[30]

There are detailed guides to vaccine communication available, including

- The COVID-19 Vaccine Communication Handbook and Wiki[74], available at https://hackmd.io/@scibehC19vax/home
- The WHO COVID-19 Vaccines Safety and Surveillance Manual[76], available at https://www.who.int/docs/default-source/covid-19-vaccines-safety-surveillance-manual/covid19vaccines_manual_communication.pdf
- The UNICEF Vaccine Messaging Guide[77], available at https://www.unicef.org/documents/vaccine-messaging-guide

Recommendations

The following recommendations offer government bodies actionable approaches to increasing and maintaining vaccine uptake.

1. **The full scope of behavioural and social drivers of vaccine uptake should be routinely measured and used to correctly identify the true cause or causes of low vaccination rates, which can then be specifically targeted with appropriate action. Governments should ensure that mechanisms and capacity are in place to enable the collection and use of high-quality behavioural and social data concerning vaccination.** Efforts should be made to routinely measure and understand all the underlying reasons for low vaccine uptake in a population, which in addition to hesitancy can include difficulties in obtaining vaccination, confusion about eligibility, and whether other people are able to easily access vaccination services. The WHO Behavioural and Socials Drivers of Vaccination tools can be used to assist in this,[13, 24] and opportunities for capacity building in social science expertise in immunisation should be created and funded. Funding and establishment of systems to allow routine data collection or strengthening of existing systems should also be considered. Such systems will need to be able to reliably collect robust data and have a clear conduit for information between data analysts and decision-makers.

2. **Social science expertise should be routinely included at the decision-making table. This can be done by embedding social scientists in routine decision-making bodies, such as regional and national immunisation technical advisory groups, and other health and government decision-making groups. Some countries have successfully established dedicated behavioural and social science research bodies that identify and undertake the required social research to inform policy, with a clear conduit of information from the researchers to the decision-makers.** Embedding social science expertise in routine immunisation programme and public health response decision-making will enable better integration of social and behavioural data with existing epidemiological and programme implementation data, and lead to decisions that are both responsive to the issues specific to the population of interest, and most likely to be acceptable to those populations. This could involve having a social scientist as a standing member of the national or regional immunisation technical advisory group (NITAG or RITAG), and other government or health authority decision-making bodies. Ideally, a structure should be set up to facilitate the flow of social and behavioural data from researchers to the decision-making table, such as that set up in Ireland.

3. **Actions to address low vaccine uptake should be guided by behavioural and social data, and will usually involve a range of programmatic interventions, as no single intervention will universally increase vaccine uptake. The issues underlying low vaccine uptake are often vaccine- and population-specific, and high-quality data gathered using established methods such as surveys, focus groups and interviews with the community of interest is key to identifying and implementing effective actions.** The greatest impacts on vaccination uptake occur when governments implement multiple interventions at once that are evidence-driven, based on robust data (see recommendation 1). Key to developing salient and successful programmes is community engagement through approaches such as Tailoring Immunizations Programmes (TIP), which would involve key individuals and groups within the community in the design, implementation and even the administration of some kinds of interventions.

4. **Communication should form part of any range of actions taken to address low vaccination rates. Good communication is done frequently via channels and people trusted by the community. Well-crafted messages are empathetic, explicit in the values and processes underpinning decisions, and clearly explain what people need to do. Disproportionately affected communities require targeted and tailored messages informed by strong community engagement. Rather than attempting to target all misinformation, social listening and behavioural and social data should be used to identify mis- and dis-information that is gaining traction and potentially affecting vaccine acceptance.** Authorities should:

    a. **Communicate frequently about the process and outcomes of the vaccine approval process by the local regulatory authority** – familiarity with how vaccines are approved will likely encourage trust and contribute to confidence in the vaccine. It will also leave less room for misinformation to gain traction.
    b. **Make values explicit when communicating the acceptable level of risk that is assumed** – values influence how people feel and act. Being explicit about the values that underpin how public policy decisions are made regarding an acceptable level of risk make transparent the dilemmas and trade-offs considered in decisions.
    c. **Use clear, accurate and actionable messages** – A complex and dynamic situation such as a public health emergency increases the likelihood of confusion about what people should do. Clear, accurate and actionable messaging developed with health literacy in mind is important to minimise such confusion and enable people to act to protect their health.
    d. **Promote vaccination using trusted spokespeople, but don't over-reassure** – Highlight the benefits of vaccination without using statements such as "the vaccine is completely safe". For example, a doctor publicly saying that "I vaccinated myself and my children, and I encourage other parents to do so" would likely resonate in many communities more than a politician quoted as saying "the vaccine is completely safe – you should have the vaccine".
    e. **Diversify communication channels and platforms** – Different demographic groups rely on different information channels. Using a variety of channels and platforms will ensure information is easily accessible to a wide range of people. To reduce inequity, focus on channels that are accessed by people who are poorly reached by mainstream ones.
    f. **Identify and address misinformation that is affecting vaccine uptake** – It is important to monitor the characteristics and reach of misinformation, using social listening methods. Before choosing whether to address it proactively, it is best to identify its salience and impact on audiences through behavioural and social data.
    g. **Prioritise key or at-risk groups for communication** – It is important to consider the specific information needs of key groups who are disproportionately affected. Tailor the communication accordingly with consultation and message pre-testing

h. **Use trusted spokespeople** – Identifying and engaging spokespeople who have trust and credibility among different sections of the community is important. In some communities for example, public health, vaccinology or medical professionals are preferred for communicating vaccine safety issues, rather than politicians. In others, community elders will be best. Trusted spokespeople should spend time engaging with the community.

i. **Sustain trust through transparency** – Consistent and transparent communication can help build and maintain trust, even when the message might result in a reduction of trust initially. While people may not trust a vaccine as much when a potential safety issue is transparently flagged, their long-term trust in the authorities is maintained.

Conclusions

Vaccines are one of the most important interventions in the family of strategies to control COVID-19. The reasons for low vaccine uptake are numerous and complex and need to be well-understood so that appropriate measures can be taken to address the problem. Inclusion of social science expertise at the decision-making table, and strong and frequent measurement of the behavioural and social drivers of vaccine uptake are needed to inform the right combination of approaches to address the underlying reasons for low vaccination rates. For increasing uptake, communication-based approaches tend to work best if implemented in combination with other interventions at organisational and policy levels and remains essential for informing and sustaining trust. For this, communicators should use early, clear and transparent communication using appropriate channels and trusted sources. Messages should be based on an understanding of the audiences, attendant to health literacy and pre-tested.

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