2

WAVE 5

National Income Dynamics Study (NIDS) – Coronavirus Rapid Mobile Survey (CRAM)

A shot in the arm for South Africa - increased openness to accepting a COVID-19 vaccine:

Evidence from NIDS-CRAM Waves 4 and 5

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CRAM
CORONAVIRUS RAPID MOBILE SURVEY 2020

A shot in the arm for South Africa - increased openness to accepting a COVID-1789 vaccine: Evidence from NIDS-CRAM Waves 4 and 5[1]

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Abstract

As South Africa started its mass vaccination campaign on 17 May, many experts raised concerns about whether the country's ambitious target of administering 60m shots in less than 10 months would be achievable. This paper examines whether vaccine acceptance is as an impediment to vaccine take-up and roll out based on the most recent wave 5 NIDS-CRAM data. Comparing these results to the wave 4 results, we assess the stability of vaccine beliefs over a period of two months. Almost half (47%) of those who 'disagreed strongly or somewhat or did not know' in February or March 2021 subsequently changed their minds over the following two months and either had been vaccinated or agreed to be vaccinated when asked again in April or May.

We analyse the open-ended questions on why respondents are concerned about the safety of vaccines to better understand what beliefs underpin vaccine attitudes and stated intentions and how strongly individuals hold their beliefs regarding vaccines. One in five South Africans worry that COVID-19 vaccines are unsafe, but only one in 10 are very convinced of this. While there has been a substantial increase in vaccine acceptance, concerns about demand constraints remain due to the relatively modest share of the eligible population who have registered for vaccines two months after registrations opened for this group. A substantial proportion of South Africans still need to be convinced to get vaccinated. In particular, we need to bear in mind that stated willingness represents attitudes and beliefs, and frequently may not translate into behaviour and action.

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Executive Summary

This paper considers the new NIDS-CRAM Wave 5 survey evidence on the willingness to accept a vaccine. Against the backdrop of an increase in distrust, uncertainty and anxiety due to the pandemic, we consider the origins of stated intentions and beliefs about vaccines and the strength of such perceptions and beliefs. Our analysis emphasises potential interventions and policy approaches to counter uncertainty and increase vaccine demand.

Our core findings are as follows:

- **There has been a discernible shift towards vaccine acceptance:** Almost half (47%) of those who 'disagreed strongly or somewhat or did not know' in February or March 2021 subsequently changed their minds over the following two months and either had been vaccinated or agreed to be vaccinated when asked again in April or May. This provides encouragement for interventions aiming to improve vaccine intentions.

- **Vaccine acceptance may be becoming a social norm**: Two-thirds of respondents *strongly* agreed in April/May 2021 with the statement 'If a vaccine for COVID-19 were available, I would get it'. This represents an increase from 55% in February/March 2021. Campaigns to increase vaccine registration and uptake should promote the fact that vaccine acceptance is the norm. Spreading the message that most people say they will accept a vaccine has proven to increase COVID-19 vaccination rates worldwide. Conversely, while it is clearly important to address myths and rumours, frequently discussing vaccine scepticism can perversely give credence to myths by creating the impression that these beliefs are widespread and that there is a valid reason to be concerned about getting vaccinated (Jolley & Douglas, 2014).

- **However, many are not fully convinced yet:** A quarter of participants in April/May 2021 reported that they strongly or somewhat disagreed that they would get a vaccination if one becomes available to them, or did not know. A further 10% only somewhat agreed with the statement, thus indicating uncertainty compared to those who strongly agreed. A substantial proportion of South Africans still need to be convinced to get vaccinated.

- **A small share may not be open to persuasion:** One in 15 adults disagreed strongly in both periods – February/March as well as April/May 2021. They should be a lower priority for targeted communication campaigns.

- **Stated good intentions often do not translate to action:** After more than two months, the proportion of the elderly who have registered for vaccination is much lower than their willingness to be vaccinated asserted in surveys, which provides a signal that we need to consider the time costs and burden associated with registration. Getting people motivated is not enough; we need to make the process as easy as possible for people to translate their intentions into action. Providing hassle-free access, and removing impediments, is likely to be even more important amongst the rest of the population, given that the survey shows that vaccination demand in the <60 year group is significantly lower. This is presumably because age is an important mortality risk factor.

- **A greater-than-proportional share of those who said that they strongly disagreed with being vaccinated two months ago have since been vaccinated:** 20% of those who reported in April/May that they have been vaccinated said in February/March that they strongly disagreed with vaccinations. They were 15% of the overall sample.

- **One in five South Africans worry that COVID-19 vaccines are unsafe, but only one in 10 are very convinced of this:** Among the 34% of individuals who did not strongly agree that they would get a vaccine, 53% believed that COVID vaccines are unsafe or could harm them. But only half of those who said that they had safety concerns felt very convinced of these concerns.

- **The most widespread reason for believing that vaccines are unsafe is that vaccines had not been adequately tested:** A third of individuals who thought vaccines are unsafe said they believed this because vaccine testing was rushed. Messaging is therefore needed to reframe the reporting about the science of vaccine development and testing, increasing awareness of the similarity to SARS-COV-1 virus, where there had already been a considerable investment in vaccine development when the pandemic broke out.

- **Concerns about side-effects are common:** One in five of those who believed vaccines are unsafe or could harm them reported that this is because of side-effects. Given the large absolute number of people who have or will receive a vaccine, many individuals will experience systemic side-effects such as headaches, fever, fatigue, chills and shivers. Additionally, most of those who are vaccinated will experience local side-effects such as pain, swelling, tenderness, redness, itchiness or warmth near the site of the injection. Positive framing of side-effects will therefore be important to reduce concerns regarding safety, with the emphasis on reminding individuals that side-effects are signs of an immune system switching on. Messaging can be designed to reframe beliefs about side-effects to emphasize the fact that reported side-effects are minor in severity and short in duration.

- **Conspiracy theories represent a small share of vaccine safety concerns:** Conspiracy theory-driven safety concerns were cited infrequently compared to concerns about side-effects and vaccine testing time frames. As a share of the overall population, we find that 1% of respondents say that they worry about vaccine safety due to national or global plots and fewer than 1% are concerned about vaccine safety because they fear it may alter their DNA or that it is a fraudulent corporate attempt to extract profits.

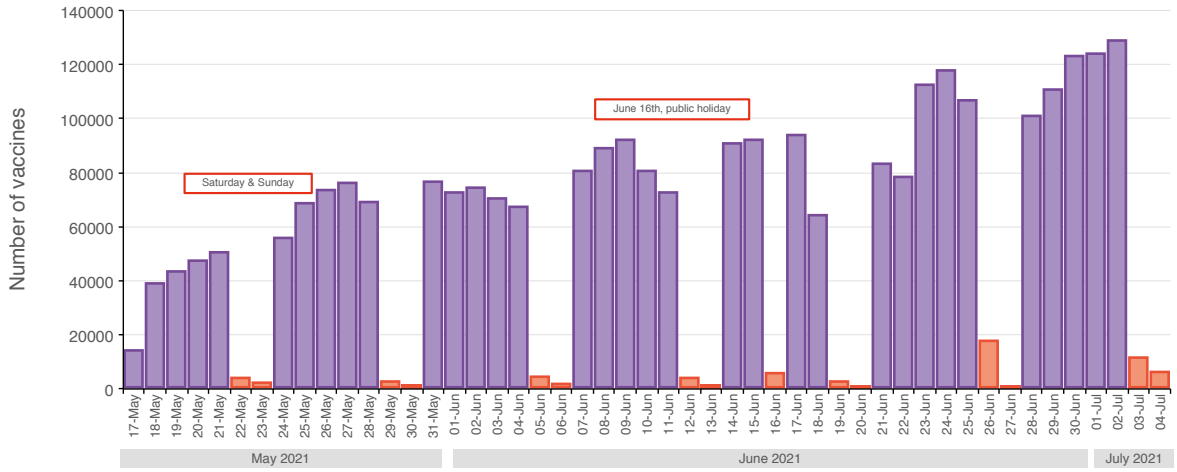
- **Vaccine acceptance varies dramatically across social pockets, which is useful for targeting messages:** Vaccine acceptance is higher amongst respondents living in traditional settlements, amongst isiZulu, isiTsonga and Setswana speakers, and amongst black respondents. Vaccine acceptance is significantly lower amongst respondents living in urban formal residential housing, Afrikaans speakers, and White and Coloured respondents. Users of social media and the youth are more likely to show low vaccine acceptance. The older generations and those with underlying health conditions are more willing to be vaccinated. These patterns are similar to findings from NIDS-CRAM Wave 4 in February and March 2021.

- **Harness the trust in community-based networks and leaders:** According to the survey, respondents are willing to accept vaccines if local community leaders are vaccinated and stay healthy. Half of those who do not fully accept vaccinations, said they would be convinced if their trusted local leaders lead by example. Even amongst those who say they 'strongly' disagree with the statement about accepting a vaccine, almost 40% are willing to change their mind if a community leader is vaccinated and stays healthy afterwards. This is interesting because we see that 10% of those who are worried about vaccine safety mention a lack of trust when asked to motivate their concerns. This evidence resonates with the inspirational case study of Limpopo's vaccination campaign, which involved church and community leaders. Messaging can be designed to increase awareness of vaccine uptake among leaders, as choices among this group will likely influence what others believe and do.

- **The lack of weekend vaccinations is constraining progress with vaccinations.** Although vaccine supply was initially the major constraint to the roll out of vaccines in South Africa this is no longer the case. At the end of June 2021 South Africa had 7,4-million doses of vaccines but had only administered 3-million doses. Reviewing National Department of Health data on the number of vaccines administered per day shows that there are virtually no vaccinations on weekends. The most recent data shows that 163,000 doses were administered on Tuesday the 6th of July 2021. Yet on Sunday the 4th of July only 6,609 doses were administered. Thus, weekend vaccination rates are 4% of weekday vaccination rates. Given the convenience of weekend vaccinations for many workers, it is plausible that weekend vaccination rates may be higher than weekday vaccination rates. For example, as part of the rollout of the J&J vaccine to teachers, the

DBE reports that on Wednesday the 23rd of June 48,000 teachers and administrative staff were vaccinated across seven provinces. Limpopo chose to administer vaccines on two successive weekends instead, and on the first weekend alone managed to achieve 30,000 vaccines - higher than any of the other provinces. Weekend vaccinations would have gone a long way towards ensuring that the lion's share of the 5,5-million target for the high-risk 60+ category could've been met. This is critical given the high infection and mortality risk that the eldery are facing during the winter months of June and July. Given this demographic group's share of COVID-19 hospital cases, weekend vaccinations could also have had a substantial impact on reducing the burden that hospitals are now facing during wave 3.

Figure: Vaccines administered per day (17 May to 4 July 2021)



Source: Sugan Naidoo using National Department of Health data

Background

Due to the partial effectiveness of the available vaccines against the Beta and Delta variants dominant in our country, a higher proportion of South Africans than was initially thought need to be vaccinated in order for the country to control its COVID-19 epidemic. Therefore, sub-optimal demand for vaccinations presents one of our most pressing immediate public health challenges. The high and rapid COVID-19 death-toll during the third wave of infections in South Africa has given these considerations an additional urgency and priority. Encouragingly, the NIDS-CRAM Wave 5 findings show an increased willingness to be vaccinated and also an openness among sceptics to be convinced of the safety and effectiveness of vaccinations.

The Wave 5 NIDS-CRAM survey took place from 6 April to 11 May 2021, which means the survey period overlaps with the "pause" in vaccinating health workers announced on 13 April 2021 by the Minister of Health Zweli Mkhize. The decision to suspend the use of the Johnson & Johnson COVID-19 vaccine on Phase I vaccinations (Sisonke health worker vaccinations trial) followed health concerns raised by the Food and Drug Administration (FDA) in the US. Cabinet lifted the suspension on 22 April. Phase II of South Africa's vaccine roll out started on 17 May, and thus the survey period preceded the launch of the vaccination of individuals 60 years and older. However, by 16 April, the government opened the Electronic Vaccination Data System (EVDS) for registrations by individuals 60 years and older, so Phase II registrations had already opened for the elderly at the time of the survey.

This paper examines vaccine reluctance as an impediment to vaccine take-up and roll out, against the backdrop of the increased uncertainty, anxiety and distrust that the pandemic brought. We analyse the data from the open-ended questions in NIDS-CRAM on beliefs about vaccine safety, to understand better what underpins the reluctance to accept vaccines, and how strongly individuals hold their beliefs regarding vaccines. Finally, the paper explores the potential of role models in influencing vaccine intentions by analysing data on whether discovering that a community leader had been vaccinated would influence participants' intentions. We compare respondents' beliefs about vaccines in April and May 2021 with their beliefs earlier this year, in February and March. We identify subgroups who were more likely to change their beliefs and also consider the direction of change. This analysis allows us to assess the stability of beliefs, and to provide insights that can guide interventions to counter uncertainty and boost vaccine demand.

NIDS-CRAM & NIDS surveys

The Coronavirus Rapid Mobile Survey (NIDS-CRAM) is a collaboration across three South African universities – Stellenbosch University, University of Cape Town and University of Witwatersrand – to create a rapid longitudinal data set representative of the South African population to help inform evidence-based policy-making during the social and economic turbulence of the COVID-19 pandemic. Additionally, the NIDS-CRAM consortium also draws on experts from universities, NPOs, corporates and government departments.

NIDS-CRAM is a special follow-up survey of a subsample of adults from households that were part of the last wave (2017) of the National Income Dynamics Study (NIDS). NIDS was a large-scale longitudinal survey, run by the Southern Africa Labour and Development Research Unit (SALDRU), that tracked the social and economic well-being of South Africans from 2008 up to 2017.

SALDRU (based at the University of Cape Town) was responsible for the NIDS-CRAM survey data collection, quality assurance and production. The NIDS-CRAM survey instrument includes a wide range of questions on income and employment, sociodemographic characteristics, and household welfare. This paper draws on questions about vaccine acceptance that were included in Waves 4 and 5 of the NIDS-CRAM survey. Wave 4 was conducted from 2 February to 10 March 2021 with a sample of 4,792 individuals, and Wave 5 was conducted from 6 April to 11 May 2021 with a sample of 4,996. Compared to NIDS-CRAM Wave 1 (May and June 2020), Wave 4 had 31% attrition and Wave 5 had 28% attrition.

To contextualise the responses to the vaccine questions, we draw on a wide range of information, including poverty quintiles based on 2017 household living circumstances, obesity and hypertension measurements from the 2017 NIDS survey, and questions on trusted information sources from NIDS-CRAM Wave 1.

Questions about vaccine acceptance and safety concerns

In NIDS-CRAM Wave 5, respondents were first asked whether they had received a vaccination. They could answer yes, no, do not know, or refuse to answer. Those who responded yes, skipped the rest of the vaccine module.

Those who did not report being vaccinated were asked a question on vaccine acceptance. As in the Ipsos-World Economic Forum global survey, respondents were asked to what extent they agreed or disagreed with the statement that "If a vaccine for COVID-19 were available, I would get it". Four options were read aloud: "Strongly agree, somewhat agree, somewhat disagree, and strongly disagree". We defined vaccination acceptance to include both those who 'strongly' or 'somewhat' agree with the statement. Conversely, vaccine reluctance was defined as those who 'strongly' or 'somewhat' disagreed, as well as those who said that they did not know. When defining a binary variable for vaccine acceptance or vaccine reluctance, we include those who have already been vaccinated in the denominator.

Those who answered that they 'strongly agree', skipped the rest of the vaccine module. The rest of the respondents were then asked to imagine a hypothetical scenario in which a trusted leader in their community was vaccinated for COVID-19 and remained healthy, and were asked whether they would then be willing to be vaccinated. Following this, respondents were asked whether they thought the vaccine was unsafe or could harm them. If they answered 'no', 'don't know' or 'refuse to answer', they skipped the rest of the vaccine module.

If they responded 'yes' to whether the vaccine was unsafe or could harm them, they were asked how convinced they were of this, with three options read out: 'a little convinced', 'somewhat convinced' or 'very convinced'. The final question in the module was an open-ended question that asked respondents: "Why do you believe the vaccine is unsafe or harmful?" Interviewers were provided with eight categories (representing findings from exploratory work on vaccine beliefs) in which to place responses, but they were instructed not to read out these categories. Just under half (48%) of the responses were assigned to these existing categories. The rest of the responses were written down as text by the interviewer, and then later categorised by a research psychologist using thematic analysis. Most respondents provided only one response (92%), 8% provided two responses, and two respondents provided three responses.

Correlates of vaccine acceptance

From Wave 5 we also use information regarding location and settlement type, province, district, age, gender and home language. We also include home language and self-reported religious affiliation from the 2017 NIDS survey. We use two questions regarding COVID-19 risk beliefs in our analysis: a question asking whether respondents thought they were likely to get the Coronavirus and whether they thought they could avoid getting the virus.

We included questions regarding trusted sources of information from NIDS-CRAM Wave 1. Respondents were asked "Where do you get information about the Coronavirus that you trust?" with no options being read aloud. In Wave 1, we asked "Do you have any of these chronic conditions (you don't have to tell us which one): HIV, TB, lung condition, heart condition or diabetes?"

We include information on respondents' biometrics from NIDS Wave 5. The survey captured both their BMI – through two repeated measurements of length and weight – and their blood pressure (BP) through two measurements in the left arm after a five-minute rest period using a factory-calibrated

Omron M7 BP multi-size cuff. These biometrics are useful even though they are three years old: it is exceptional for blood pressure and obesity to decline dramatically and our comparison between 2017 and 2014 NIDS biometrics indicates this. Moreover, chronic disease risk such as cardiac problems and diabetes accumulates over a lifetime, therefore recent obesity and hypertension remain relevant even if the patient may recently have lost weight or improved their hypertension control.

Due to concerns about the reliability and bias in the one-shot household income variable in Wave 5 (26% of respondents did not report any value), we estimate two alternative proxies to capture differences in socioeconomic status for our sample. We formulate a deprivation and poverty index based on the respondent's 2017 household assets and living circumstances. The list of household assets included ownership of a range of marketable assets, access to a savings account, to clean water, to electricity, and to adequate sanitation. Using multiple correspondence analysis, we extract relative weights for each of these dimensions, and then compile quintiles for the analysis.

We adjust the household income variable questions available in Wave 5 to address potential bias in selection into bracket responses, the presence of outliers, and missing values. First, we reweight observations by generating bracket weights to account for selection into bracket responses, as in Köhler and Bhorat (2020) and Hill and Köhler (2020) with the NIDS-CRAM Wave 2 data, as well as the Post-Apartheid Labour Market Series (PALMS). These weights are calculated as the inverse of the probability of an actual monetary (Rand) response in a particular bracket in a particular wave, multiplied by the sampling weight for each individual. In essence, this process weights up individuals whose reported incomes are in brackets where the proportion of actual monetary responses is lower, relative to brackets where such response is high. Second, outlier values are identified and coded as missing by using the "extreme studentised residuals'' approach as advised by Wittenberg (2017). This is done by estimating a Mincerian-style Ordinary Least Squares (OLS) regression of the logarithm of nominal household income on a vector of observable covariates and identifying outliers as those observations with absolute residuals in excess of five. This process resulted in the household incomes of just three observations being coded as missing. Third, there is a wide range of methods available to impute values for observations with missing income data. Here, we simply impute values by estimating and using the within-bracket median response. This process resulted in a significant reduction in the extent of missing values from 26.4% to 6.7% of the sample.

Additionally, we use responses about recent household hunger, and whether the respondent received a social grant, as alternative indicators of socioeconomic status. While we are aware of the shortcomings of each of these measures individually, we believe that collectively they cover an important share of the socioeconomic status variation of our sample of respondents.

Analysis

We conducted cross-sectional analyses on aggregate and between-group variation. Unless specified otherwise, estimates are weighted using the relevant sampling weights after accounting for the complex survey design to adjust for non-random non-response and attrition. We use weights that have been scaled to the NIDS Wave 5 population total. Probit regressions were used to make non-response and attrition adjustments to enhance consistency across different waves. The weighted NIDS-CRAM Wave 5 survey data reflects the outcomes in 2021 for a broadly representative sample of those 15 years and older from NIDS Wave 5 in 2017 who were followed up three years later. For more information on the NIDS-CRAM sampling design, see Kerr, Ardington & Burger (2021), NIDS-CRAM release note (2021) and Ingle et al. (2021).

Our study employs two-way descriptive analyses as well as a multivariate analysis. The multivariate analysis uses a linear probability model (OLS applied to binary variables) to examine the correlations between the reluctance to accept vaccine and a large number of relevant characteristics of the respondent, including demographic, ethnic, social, and economic dimensions, as well as trusted information sources for learning more about COVID-19, and perceptions of infection risk and mortality risk.

We rely on four variables to proxy differences in socioeconomic status across this sample – income quintiles, poverty quintiles, grant receipt, and recent household hunger. Due to multicollinearity and missing values, we prefer not to include all four variables in our main model specification, but in the appendix we have included a series of regressions to examine the robustness of the results to the inclusion and exclusion of these socioeconomic proxies. We find no evidence of a strong, monotonic relationship between vaccine intention and socioeconomic status. Finally, to accommodate the inclusion of the top-up sample we convert the Wave 1 missing values to zeros and add a binary indicator for the top-up sample.

Transition matrices are used to examine changes in vaccine willingness between NIDS-CRAM Wave 4 and Wave 5, with a focus on changes in attitude among high risk groups: including those 60 and older, and respondents who tested hypertensive (in 2017).

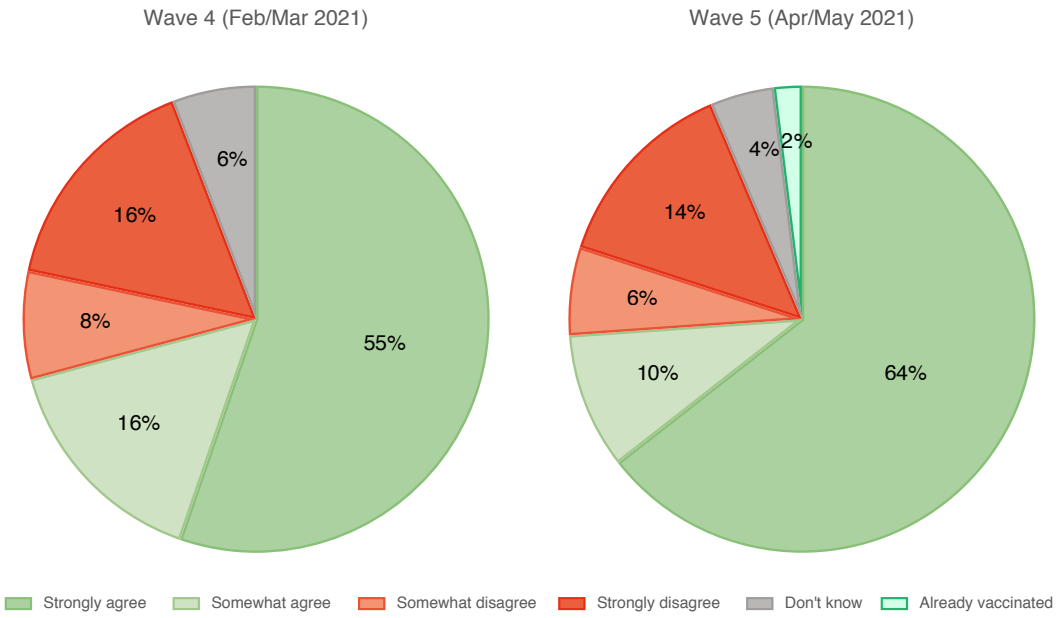
We use Stata 16 for the analysis and employed a 5% significance level benchmark to assess the precision of estimates.

Descriptive statistics

Vaccine acceptance

In April and May 2021 (NIDS-CRAM Wave 5) two-thirds of respondents strongly agreed with the statement 'If a vaccine for COVID-19 were available, I would get it', a substantial increase from 55% who strongly agreed in February and March this year (NIDS-CRAM Wave 4). If we define vaccine acceptance to include both strong agreement and some agreement (as well as reporting having already received the vaccine), then acceptance has increased from 71% in February and March this year to 76% in April and May, as shown by *Figure 1* below. The flip side of this indicates that, in April/May, almost a quarter of respondents disagreed ('somewhat' or 'strongly') or did not know whether they would get vaccinated if available, whereas this category of respondents constituted 29% of the sample in Wave 4. It is also worthwhile to note that the respondent shares in each of these three categories (somewhat disagreed, strongly disagreed, did not know) shrunk between February/March and April/May. For vaccine acceptance, it was notable that most of the growth has been in 'strong' agreement, where the share of respondents in this category rose from 55% to 64%. The share of respondents who responded that they 'somewhat agree' fell from 16% to 10%.

Figure 1: Change in vaccine acceptance, NIDS-CRAM waves 4 & 5



Source: NIDS-CRAM waves 4 and 5. Authors' own calculations.

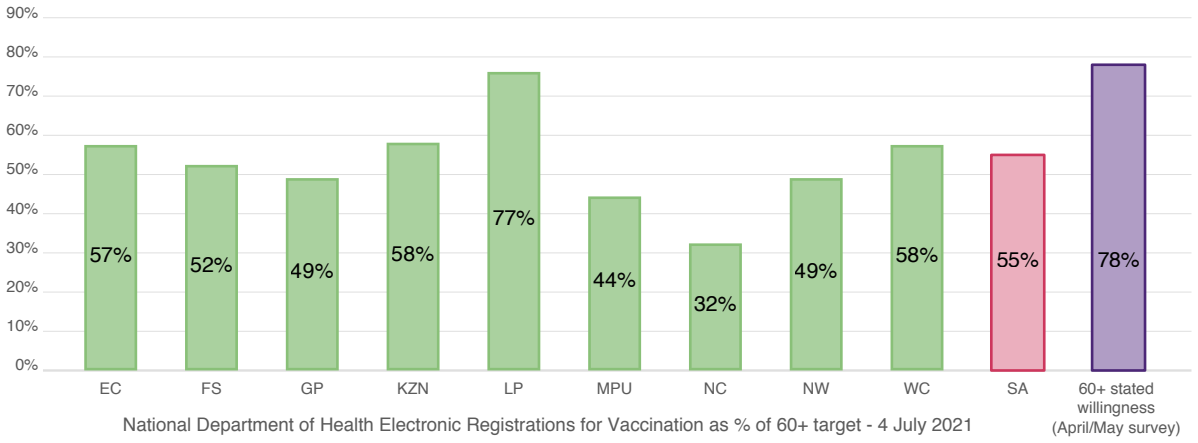
The main concern with the interpretation of an individual's stated vaccine willingness is that intentions and attitudes do not always convert into behaviour and action. Internationally, there has been ample evidence of the gap between vaccine intentions and vaccinations (Jaspers, et al, 2011; Liao, et al, 2011). Psychological theory offers at least three reasons for this: instability of beliefs, anxiety about beliefs and barriers to converting beliefs into action (Auslander, et al, 2019).

In South Africa we observe similar patterns. We see, for instance, a rising willingness to accept vaccines in NIDS-CRAM data, particularly amongst the 60+ group, yet there has been relatively slow progress with provincial vaccine registrations of South Africans who are 60 and older (16 April until 25 June). While 78% of this elderly group of South Africans said that they were willing to be vaccinated, the national average vaccine registrations after two months has only recently crossed the halfway mark, and new registrations have been slow recently. This discrepancy is concerning, especially given that our survey shows that willingness to be vaccinated is highest amongst this age group. This observed discrepancy is, however, in line with international evidence that shows that stated willingness has not always been reflected in vaccination registrations and vaccine uptake (Dubé et al., 2016; Thomson et al., 2016).

In general, this has been explained by the impediments to registration and vaccination, and the proposed solution has been to decrease such costs by offering vaccinations at more convenient locations and also offering vaccination registrations in different areas close to where people live (MacDonald & Butler, 2018; Thomson et al., 2016).

For South Africa, the case study of Limpopo is instructive. Limpopo is South Africa's poorest province but it has outpaced more well-resourced provinces with its Phase II registrations and vaccinations. Despite being very poor and largely rural, the province had vaccinated 8% of its adult population by 25 June, while the national average was 6%. Similarly, the graph below shows that it had vaccinated more than three-quarters of the 60+ population by 4 July 2021 (77%). According to a recent media article, the province's health MEC attributes this success to planning as well as partnering with community-based organisations such as churches. Additionally, they gave community healthcare workers smartphones and data to allow them to register community members on the spot (Daniel, 2021).

Figure 2: Vaccine registrations as share of provincial 60+ population targets, compared to stated willingness to accept the vaccine by 60+ respondents in NIDS-CRAM



Note: Stated willingness to vaccinate refers to cases where respondents either strongly agreed or somewhat agreed that they would be willing to vaccinate if vaccinations were available - or they said they had already been vaccinated (2% of 60+ group)
Source: NIDS-CRAM wave 5; SA Coronavirus site (https://sacoronavirus.co.za/latest-vaccine-statistics/). Authors' own calculations

Vaccine concerns

Examining the motivations behind vaccine acceptance in more detail, *Table 1* considers respondents' answers to three further probes. These questions were asked to all respondents who did not answer 'strongly agree' to the question about their willingness to vaccinate. Firstly, respondents were presented with a hypothetical scenario and asked whether they would be willing to be vaccinated if a trusted community leader were vaccinated and remained healthy. 54% of this group of respondents said 'yes', 38% said 'no' and 8% said they did not know. This average of 54% varies substantially based on replies to the vaccine acceptance question. Amongst respondents who 'somewhat agreed' that they would be willing to be vaccinated, 79% said that they would be convinced by the vaccination of a trusted community leader. Among those who did not know, 60% said they could be convinced to receive a vaccination based on this hypothetical community leader scenario. Even amongst those who 'somewhat disagreed' and those who 'strongly disagreed', 46% and 38% said they could be convinced to get vaccinated under these conditions.

All those who did not 'strongly agree' with the vaccine acceptance question were also asked whether they thought the vaccine was unsafe or harmful: 53% answered 'yes' and 22% said 'no', while 25% said they did not know. Most of those who answered 'yes' to this question said they were very convinced of this (52%), with 17% being somewhat convinced and 31% admitting that they were only a little convinced.

Table 1: Vaccine concerns and strength of beliefs

Question	Response	Share or respondents	Standard deviation
Would you be willing to be vaccinated if a trusted community leader was vaccinated for COVID-19 and remained healthy?	Yes	53.8	(1.9)
	No	38.2	(1.8)
	Don't know	8	(1.1)
Do you think the vaccine is unsafe or could harm you?	Yes	53.2	(2.1)
	No	21.7	(1.6)
	Don't know	25	(1.8)
How convinced are you of this?	Very	52.2	(2.7)
	Somewhat	17	(1.7)
	A little	30.9	(2.2)

Notes: The responses recorded here are for the subsample who had not been vaccinated yet and did not strongly agree that they would be vaccinated. This represents 34% of the total sample. The last question was asked only to respondents who said that they felt that the vaccine was unsafe or could harm them, which represents 18% of the total sample.
Source: NIDS-CRAM wave 5. Authors' own calculations

Beliefs regarding safety

All respondents who said that they believed that vaccines were unsafe were also asked why they believed this. It is vital to understand the underlying concerns motivating beliefs that vaccinations are unsafe, so that such misinformation and fears can be addressed via coordinated public messaging campaigns. The adverse impact of misinformation and vaccination concerns have been convincingly demonstrated by previous studies such as Loomba et al. (2021) and Wilson and Wiysonge (2020).

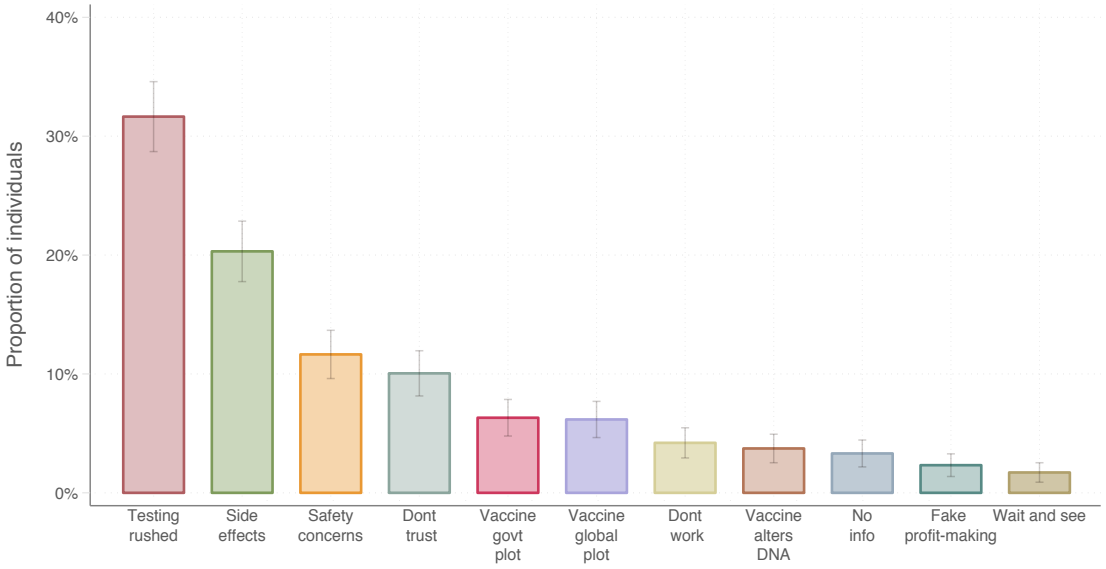
Table 2 and *Figure 3* below show motivations that were given by at least 2% of the population. The most widespread reason for believing that vaccines were unsafe is that vaccines were not adequately tested. A third of individuals who thought vaccines are unsafe said they believe this because vaccine testing was rushed. One fifth cited concerns about side-effects as the motivation. Respondents worried about different side effects: 6% mentioned death, 4% mentioned blood clots, 1% mentioned HIV or cancer, 4% mentioned illness or other side effects and 5% did not specify the side effect.

Of these respondents, 12% referred to general safety concerns. This category included individuals who worried about getting COVID-19 from the vaccine, and others who were concerned about the vaccine's appropriateness to the local context given that it was developed overseas, and also concerns about whether it might be harmful for individuals with certain comorbidities. In most cases however, respondents cited safety concerns without providing more concrete information about the rationale for such fears. One tenth cited specific or general distrust as the reason for their concerns. As the note below *Figure 3* and *Table 2* shows, these response shares are for a subsample representing 18% of the total sample. Therefore even the largest response category – which represented the motivations of 32% of the respondents who answered this question – would only constitute 6% of the total sample. Similarly, motivations given by 6% of this subsample thus represent less than 1% of the overall sample. Reasons that were cited by less than 2% of the population and thus not represented in the table included that vaccines were against their religion, that vaccines had expired, or that they did not need them.

The last column of *Table 2* examines how the strength of respondents' beliefs about the safety or harm of vaccines differ based on the motivation that they provide for such a belief. Concentrating on the top four reasons given for safety concerns, we find that 65% of those who provide rushed

vaccine testing as a motivation for these concerns are very convinced of their beliefs, while 53% of those who motivated their beliefs by referring to side effects are very convinced. For general safety concerns and distrust, the shares of respondents who are very convinced are 61% and 42% respectively.

Figure 3: Motivation for concerns about vaccine safety



Notes: The responses recorded here are for the subsample who had not been vaccinated yet and did not strongly agree that they would be vaccinated and who then, in answers to a subsequent question, said that they were worried about vaccine safety. This represents 18% of the total sample.
Source: NIDS-CRAM wave 5. Authors' own calculations

Table 2: Motivation and strength of belief about vaccine safety concerns

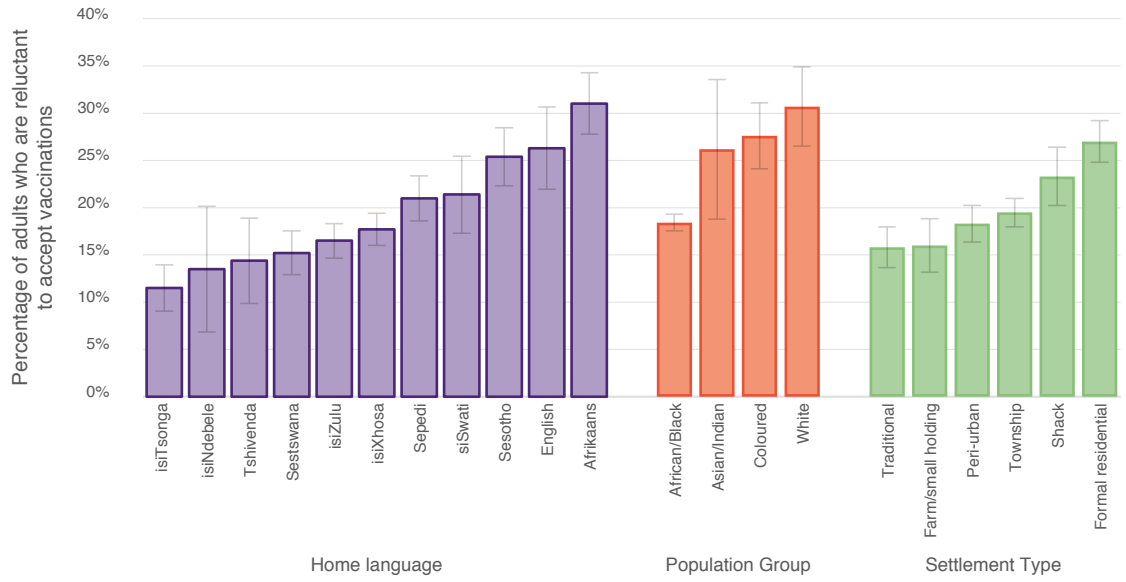
Motivations for concerns about vaccine safety	Why worried about vaccine safety? (subsample) [1]	Why worried about vaccine safety? (full sample) [2]	How convinced?[3]
Vaccine testing rushed	32%	6%	65%
Side effects	20%	4%	53%
General safety concerns	12%	2%	61%
Don't trust	10%	2%	42%
Vaccine government plot	6%	1%	54%
Vaccine global plot	6%	1%	35%
Ineffective	4%	1%	39%
Vaccine will change DNA	4%	1%	52%
Lack of information or knowledge	3%	1%	48%
Vaccine fake for profits	2%	>1%	51%
Other	2%	>1%	47%
Wait and see	2%	>1%	44%

Notes: The responses recorded here are for the subsample who had not been vaccinated yet and did not strongly agree that they would be vaccinated and who then, in answers to a subsequent question, said that they were worried about vaccine safety. This represents 18% of the total sample.
[1] Percentage of subsample reporting reason for thinking vaccines are unsafe or could harm them
[2] Percentage of total survey sample reporting reason for thinking vaccines are unsafe or could harm them.
[3] Percentage of people providing specific motivations for concerns about vaccine safety who were very convinced that the vaccine was unsafe.
Source: NIDS-CRAM wave 5. Authors' own calculations.

Correlates of reluctance to accept vaccines

Despite the large number of changes in beliefs observed and the general move towards strong acceptance of vaccines, we find that our analysis of correlates of vaccine acceptance in Wave 5 is largely confirming the findings of our prior analysis for Wave 4, suggesting that there may be some stable or even structural component to some of the relationships reported here. *Figure 4* below shows that vaccine acceptance is higher amongst respondents living in traditional settlements, amongst isiZulu, isiTsonga and Setswana speakers, and amongst black respondents. Vaccine acceptance is significantly lower amongst respondents living in urban formal residential housing, Afrikaans speakers, and also among White and Coloured respondents. T-tests with a series of binary versions generated for each of the categories from these categorical variables confirm that the relationship with vaccine reluctance is statistically significant for these groups.

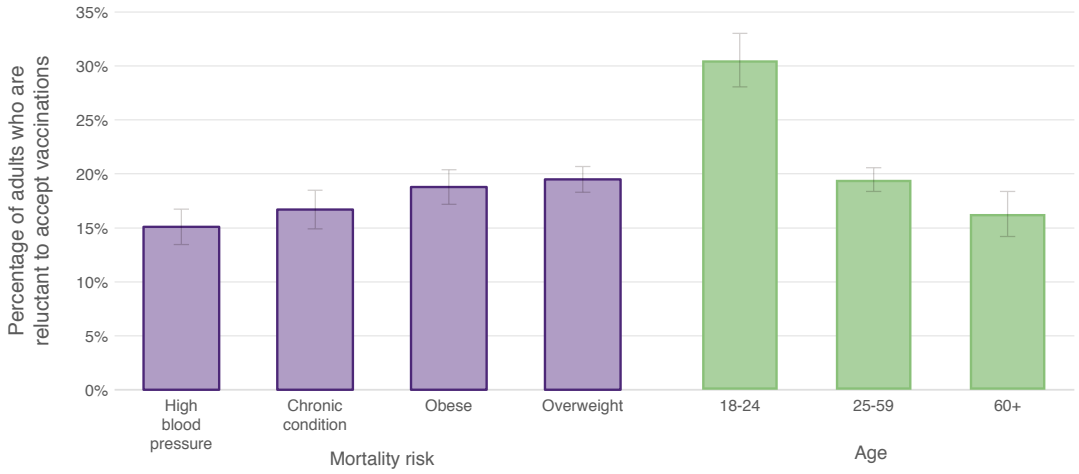
Figure 4: Home language, population group, settlement type & reluctance to accept vaccines



Source: NIDS-CRAM Wave 5 (vaccine acceptance, population group, settlement type).
Authors' own calculations.

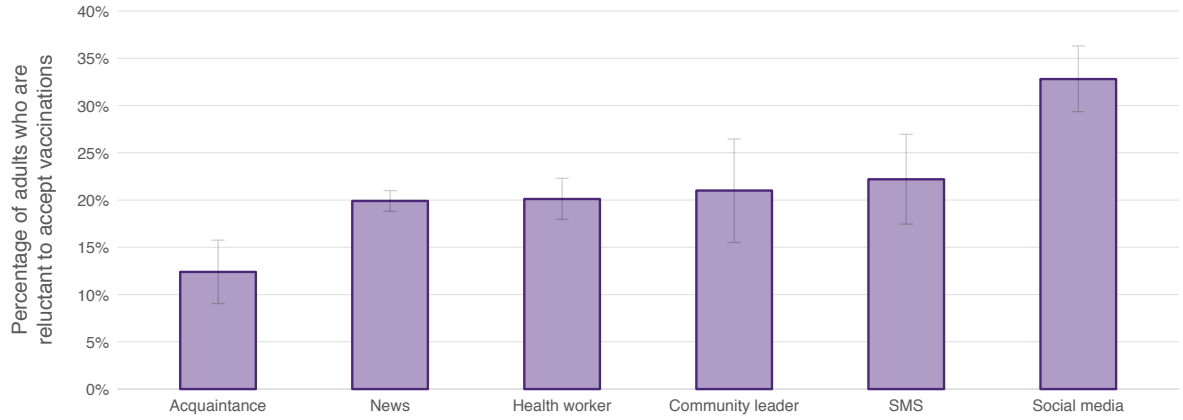
Figures 5 and 6 below show that, similar to what we found with our analysis of the Wave 4 data, users of social media and the youth are more likely to have low vaccine acceptance. Also, the older generations and those with underlying comorbidities and hypertension are more willing to be vaccinated. T-tests with a series of binary versions generated for each of the categories from these categorical variables confirm that the relationship with vaccine reluctance is statistically significant for these groups.

Figure 5: Mortality risk & reluctance to accept vaccines



Source: NIDS-CRAM wave 5 (vaccine acceptance, age); Wave 1 (chronic condition); NIDS 2017 (obesity, overweight, hypertension). Authors' own calculations.

Figure 6: Vaccine reluctance and trusted sources of information



Source: NIDS-CRAM wave 5 (vaccine acceptance) & wave 1 (sources of trusted information). Authors' own calculations.

Not all of these relationships remain significant in the multivariate analysis in *Table 3*: none of the home language variables or the population group variables have coefficients that are significant in the linear probability model. Amongst the settlement type variables, only the coefficient of formal residence remains significant. Additionally, younger respondents (18-24) and those who trusted social media remain significantly more likely to be reluctant to accept vaccines, while older respondents (60 and older) and those with chronic conditions were still shown to be significantly more accepting of vaccines.

Table 3: Predictors of reluctance to accept vaccine

		Model 1		Model 2		Model 3		Model 4	
		b	p	b	p	b	p	b	p
Gender	Female	0.027	0.23	0.023	0.3	0.019	0.4	0.0057	0.81
Age	18-24	0.090**	0.01	0.086**	0.02	0.083**	0.02	0.085**	0.03
[cf. 25-59]	60+	-0.051*	0.09	-0.055*	0.07	-0.069**	0.03	-0.056*	0.1
Population group	Coloured	-0.065	0.45	-0.062	0.47	-0.065	0.44	-0.03	0.71
[cf. Black Africa]	Asian/Indian	-0.12	0.46	-0.14	0.4	-0.14	0.4	-0.15	0.39
	White	-0.0026	0.98	-0.0033	0.97	0.0026	0.98	0.019	0.82
Language	IsiNdebele	-0.15	0.1	-0.14	0.12	-0.13	0.12	-0.13	0.13
[cf.Zulu]	IsiXhosa	-0.021	0.67	-0.021	0.66	-0.019	0.68	-0.031	0.52
	Sepedi	0.071	0.19	0.075	0.16	0.076	0.15	0.046	0.43
	Sesotho	0.038	0.48	0.03	0.57	0.026	0.63	0.025	0.64
	Setswana	-0.055	0.34	-0.063	0.27	-0.062	0.28	-0.055	0.33
	SiSwati	0.0025	0.97	0.013	0.88	0.012	0.88	0.026	0.77
	Tshivenda	0.22*	0.07	0.22*	0.06	0.21*	0.08	0.20*	0.09
	IsiTsonga	-0.0096	0.87	-0.0026	0.96	-0.0088	0.88	-0.018	0.72
	Afrikaans	0.13	0.15	0.12	0.18	0.12	0.19	0.09	0.3
	English	0.098	0.26	0.097	0.26	0.099	0.25	0.09	0.27
	Other	0.78***	0	0.82***	0	0.84***	0	0.82***	0
Religion	Not religious	0.073	0.1	0.072	0.1	0.073*	0.09	0.082*	0.07
[cf.Christian]	Jewish	-0.19***	0	-0.18***	0	-0.18***	0	-0.16***	0
	Muslim	0.048	0.74	0.058	0.7	0.063	0.67	0.061	0.7
	Hindu	0.03	0.88	0.032	0.86	0.033	0.86	0.063	0.75
	African traditional	0.04	0.22	0.041	0.21	0.041	0.21	0.045	0.18
	Other	0.065	0.47	0.069	0.44	0.062	0.48	0.07	0.45
Importance of religion	Unimportant	-0.038	0.64	-0.034	0.67	-0.029	0.72	0.032	0.67
[cf. Very unimportant]	Important	-0.014	0.82	-0.012	0.85	-0.013	0.84	0.043	0.47
	Very important	0.01	0.88	0.013	0.84	0.014	0.83	0.075	0.22
Education	Up to Primary	-0.015	0.63	-0.015	0.65	-0.019	0.57	-0.0086	0.8
[cf. Completed Secondary]	Up to Secondary	0.0035	0.89	0.004	0.87	0.0019	0.94	0.014	0.57
	Tertiary	-0.062**	0.04	-0.065**	0.03	-0.063**	0.04	-0.035	0.25
Residential area	Formal residential	0.062**	0.03	0.062**	0.03	0.064**	0.03	0.060**	0.05
[cf. Township]	Shack	0.053	0.12	0.059*	0.09	0.061*	0.08	0.064*	0.07

	Peri-urban	0.0038	0.9	0.0092	0.77	0.011	0.72	0.001	0.98
	Traditional	-0.019	0.58	-0.013	0.71	-0.015	0.67	-0.022	0.55
	Farm/small holding	-0.013	0.75	-0.0078	0.84	-0.012	0.76	-0.018	0.65
Infection risk	Likely to get COVID-19	-0.029	0.13	-0.03	0.12	-0.028	0.14	-0.024	0.22
[cf. Not likely to get COVID-19]	Don't know get COVID-19	-0.024	0.49	-0.021	0.56	-0.023	0.51	-0.035	0.33
Self-efficacy	Can avoid COVID-19	-0.042	0.2	-0.042	0.2	-0.039	0.23	-0.054	0.11
[cf. Don't think can avoid COVID-19]	Don't know if can avoid COVID-19	0.047	0.52	0.041	0.57	0.045	0.54	0.0065	0.93
Mortality risk	Self-reported chronic conditions	-0.041*	0.06	-0.041*	0.06	-0.041*	0.06	-0.039*	0.08
	Overweight	0.0083	0.74	0.0088	0.72	0.0092	0.7	0.021	0.4
	Obese	-0.013	0.59	-0.014	0.55	-0.011	0.63	-0.015	0.53
	Hypertension	-0.032	0.15	-0.033	0.12	-0.035	0.1	-0.032	0.15
Trusted information sources	Social media	0.11**	0.01	0.11**	0.01	0.10**	0.01	0.12***	0.01
	Community leader	-0.13***	0	-0.13***	0	-0.12***	0.01	-0.13***	0
Poverty and exclusion	Q2			0.032	0.41	0.029	0.45	0.03	0.45
[cf. Q1]	Q3			-0.044	0.18	-0.044	0.19	-0.037	0.3
	Q4			-0.028	0.47	-0.029	0.47	-0.018	0.67
	Q5			0.01	0.79	0.011	0.8	0.024	0.58
Grant	Respondent received a grant					0.043**	0.03	0.036*	0.08
Hunger	Recent household hunger					-0.038	0.1	-0.036	0.14
Income	Q2							0.0096	0.71
[cf. Q1]	Q3							0.013	0.61
	Q4							0.016	0.57
	Q5							-0.024	0.51
Constant		**0.35****	**0.01**	**0.36****	**0.01**	**0.35****	**0.01**	**0.27***	**0.06**
Observations		**4390**		**4390**		**4380**		**4117**	
R-squared		**0.08**		**0.08**		**0.09**		**0.09**	

Notes: The regression also includes dummies for districts and a top-up sample, not reported here. Model 1 has no socioeconomic controls. Model 2 adds poverty quintiles as controls for socioeconomic status, Model 3 further expands the controls for socioeconomic status by adding grant receipt and recent household hunger and Model 4 is the most comprehensive, including also the adjusted income quintiles.
Source: NIDS-CRAM wave 5, wave 1 & NIDS 2017. Authors' own calculations.

Changes in willingness (or reluctance) to get vaccinated

Tables 4 & 5 presents changes in willingness or reluctance to get vaccinated using survey data from NIDS-CRAM Wave 4 (February/March 2021) and NIDS-CRAM Wave 5 (April/May 2021). Data are presented for the survey participants who were interviewed in both of these surveys, and therefore represent individual-level changes. The use of appropriate sampling weights, however, account for between-wave attrition and the representativity of the sample. The figures in *Table 4* show the percentage of this longitudinal sample falling within each combination of responses to the question: 'If a vaccine for COVID-19 were available, I would get it.' Results indicate that a large proportion of South Africans have steady intention to get vaccinated, with the majority (~62%) agreeing ('somewhat' or 'strongly') in both the Wave 4 and Wave 5 surveys, and 46% strongly agreeing in both surveys. In terms of reluctance, approximately 7% of the sample strongly disagreed in both February/March and April/May. This suggests that there is only a small proportion of the population with a more entrenched reluctance, who may be especially challenging to convince to get vaccinated.

Table 4. Change (February/March to April/May, 2020) in willingness to get vaccinated - cell % displayed

		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already vaccinated	Total
Wave 4	Strongly agree	45.99	2.18	1.49	2.49	0.78	0.92	53.85
	Somewhat agree	9.05	4.37	1.25	1.68	0.38	0.25	16.97
	Somewhat disagree	2.14	1.20	1.55	2.37	0.57	0.02	7.85
	Strongly disagree	4.61	1.58	1.75	6.63	0.40	0.47	15.45
	Don't know	3.08	0.53	0.17	0.79	1.28	0.02	5.88
	Total	**64.87**	**9.86**	**6.21**	**13.96**	**3.41**	**1.69**	**100.00**

Source: NIDS-CRAM Waves 4 and 5. Authors' own calculations.
Notes: [1] All estimates weighted using relevant sampling weights after accounting for complex survey design. [2] Figures show the percentage of this longitudinal sample falling within each combination of responses to the question: 'If a vaccine for COVID-19 were available, I would get it.' [3] The column 'Already Vaccinated' represents participants who had received a COVID vaccination by the Wave 5 survey (self-reported).

Table 5 presents responses on willingness to get vaccinated in a different format. For each response provided in Wave 4, the figures show the percentage that subsequently provided each response option in Wave 5. Overall, findings show that there has been a discernible shift towards vaccine acceptance. The majority of individuals who initially 'somewhat' agreed that they would get vaccinated, subsequently 'strongly' agreed. Furthermore, approximately 44% who disagreed strongly or somewhat in February or March subsequently changed their minds over the following two months and said that they agreed to be vaccinated (either strongly or somewhat) when asked again in April or May.

The vast majority (85%) of the individuals who strongly agreed in February/March 2021 that they would get vaccinated also strongly agreed in April/May; while only 43% of those strongly disagreeing in February/March also strongly disagreed in April/May. In April/May, nearly half (40%) of those individuals who strongly or somewhat disagreed in February/March strongly or somewhat agreed two months later. Overall, the findings presented in *Table 5* indicate that investments in interventions to persuade individuals to get vaccinated hold promise, even among those who appear highly resistant to vaccination.

Table 5. Change (February/March to April/May, 2020) in willingness or reluctance to get vaccinated, by initial responses in February/March

		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already vaccinated	Total
Wave 4	Strongly agree	85.40	4.05	2.76	4.61	1.46	1.72	100.00
	Somewhat agree	53.30	25.74	7.36	9.88	2.22	1.50	100.00
	Somewhat disagree	27.28	15.28	19.80	30.17	7.22	0.25	100.00
	Strongly disagree	29.85	10.21	11.32	42.95	2.61	3.06	100.00
	Don't know	52.39	9.07	2.89	13.45	21.80	0.40	100.00
	Total	**64.87**	**9.86**	**6.21**	**13.96**	**3.41**	**1.69**	**100.00**

Source: NIDS-CRAM Waves 4 and 5. Authors' own calculations.
Notes: [1] All estimates weighted using relevant sampling weights after accounting for complex survey design. [2] For each response provided in Wave 4 to the question 'If a vaccine for COVID-19 were available, I would get it.', the figures show what percentage that subsequently provided each response option in Wave 5. [3] The column 'Already Vaccinated' represents participants who had received a COVID vaccination by the Wave 5 survey (self-reported).

Additional analyses (presented in Appendix, *Tables A5 - A6*) examined changes in willingness to get vaccinated among groups at increased risk of severe COVID-19-related illness, such as individuals 60 years and older, those with chronic illness, and those aged 50 to 59 years old. At the time of writing, this group of 50-59 year-olds are eligible in the next phase of vaccine rollout, with registration available from 1 July 2021 and vaccinations from 15 July 2021 (BusinessTech, 2021). Findings indicate that there was a discernible shift towards acceptance among the >60 year-old group, and among the 50-59 year-olds, compared to the average. Among the >60 year-old group, 61% who 'somewhat agreed' in February/March subsequently 'strongly agreed' in April/May, with the corresponding figures of 76% for those in the 50-59 age group, compared to 53% for the full sample. Moreover, among both the >60 year-old and the 50-59 year-old groups, ~67% of those who 'somewhat disagreed' in February/March that they would get vaccinated subsequently agreed ('somewhat' or 'strongly') in April/May, with the corresponding figure of only 42% for the full sample. This positive shift in willingness to get vaccinated among the older age groups is encouraging. Of concern, however, is that shifts in willingness to get vaccinated among individuals with chronic conditions were less positive compared to the older age groups. Among those with chronic conditions, 52% of those that 'somewhat agreed' in February/March that they would get vaccinated subsequently 'strongly agreed' in April/May; and 36% of those who 'somewhat disagreed' in February/March subsequently agreed ('somewhat' or 'strongly') in April/May.

Limitations

We note the limitations of our study, especially in terms of reported behaviour and stated intentions. We acknowledge that reporting bias due to social desirability bias may affect our findings. We are aware that our survey questions on vaccine acceptance reflect a stated intention, and the literature has shown substantial gaps between stated intentions and realised decisions. Finally, we are aware that individual judgements and human errors are involved when categorising text answers. Converting this paper to a journal submission, we will ensure that we allow for a second independent categorisation and then a discussion of any discrepancies. This will help enhance the scientific credibility and transparency of this allocation process.

Conclusions

A substantial proportion of South Africans still need to be convinced to get vaccinated. In particular, we need to bear in mind that stated willingness represents attitudes and beliefs, and frequently may not translate into behaviour and action. The section below provides a number of policy recommendations based on a combination of evidence presented here and from earlier studies.

Policy recommendations

- **Vaccine promotion campaigns should promote vaccine acceptance as the norm.** Spreading the message that most people say they will accept a vaccine has proven to increase COVID-19 vaccination rates worldwide. Conversely, while it is clearly important to address myths and rumours, frequently discussing vaccine scepticism can perversely give credence to myths by creating the impression that these beliefs are widespread and that there is a valid reason to be concerned about getting vaccinated (Jolley & Douglas, 2014).

- **Communications should focus on reassurance regarding timeframes of developing the COVID-19 vaccines**. This can be achieved by referring to the similarity between SARS-COV-2 and SARS-COV-1, for which researchers and pharmaceuticals have been working on a vaccine since 2003. In other words, SARS-COV-2 vaccine development did not need to start at square one because it is similar to SARS-COV-1 and could benefit from the vaccine development work on SARS-COV-1 vaccines. If one takes this into account, it helps to explain the rapid progress with the vaccine development. The public should be informed of the typical process for vaccine development as well as the processes and ethics regarding the conduct of clinical trials which are a mainstay for testing vaccine efficacy and safety.

- **Positive framing of side-effects will be important to reduce concerns regarding safety.** Ensure that communications consistently detail the anticipated side-effects, and highlight that this is evidence that the vaccination is working (Leibowitz, et al, 2021). Communication should also focus on the self-limiting nature of side-effects, and the expected proportion of vaccinated individuals who will experience the range of side-effects. The frequency of side-effects should be reported in real-time and in a transparent manner as the vaccines are rolled-out nationally. These should be likened to existing evidence regarding other vaccines, such as the influenza vaccine. Given the large absolute number of people who have or will receive a vaccine, many individuals will experience systemic side-effects such as headaches, fever, fatigue, chills/shivers. Additionally, most of those who are vaccinated will experience local side-effects such as pain, swelling, tenderness, redness, itchiness or warmth near the site of the injection. Messaging can also be designed to reframe beliefs about side-effects, emphasising that reported side-effects are minor in severity and of short duration. Side-effects are a sign of the immune system being stimulated. They are not evidence of a mini dose of COVID – which is what many think is how a flu vaccine works.

- **Reduction in barriers to registration and vaccination should remain a priority**. Costs to the individual should therefore be reduced to ensure easier physical access. Strengthening the health system to ensure high quality vaccination roll-out should remain a priority. Consideration should be given to extending vaccination to be delivered on weekends, and at more accessible sites (taxi ranks, shopping centres, sites in local neighbourhoods) and alternative vaccine registration (use of community health workers to register individuals using smartphones).

- **The lack of weekend vaccinations is constraining progress with vaccinations.** Providing vaccinations over the weekends would help minimize the time and inconvenience associated with vaccinations. Also, it would speed up progress with vaccinations in the 60+ category. If we had done this earlier, it could have made a big difference given the high infection and mortality risk that the elderly face, especially during the winter months and with wave 3. This demographic group represents a substantial share of COVID-19 hospital cases, so the hospital burden may also have been considerably lighter if we had vaccinated a larger share of the elderly by the time wave 3 hit.

- **Harness the power and trust of local networks and community networks.** The inspiring case of Limpopo leading the vaccination registrations demonstrates the importance of leveraging community networks. Furthermore, our survey shows that half of those not yet strongly accepting of vaccines may follow the example set by trusted local leaders. The importance of role models such as church and community leaders should not be underplayed, and the latter should be appropriately educated and supported to communicate accurate information regarding vaccines to the communities.

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Appendix

Table A1: Beliefs about COVID risk across NIDS-CRAM waves

Variable		Wave 1 (May/Jun 2020)	Wave 2 (Jul/Aug 2020)	Wave 3 (Nov/Dec 2020)	Wave 4 (Feb/ Mar 2021)	Wave 5 (Apr/ May 2021)
		% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Believe likely to get COVID-19	Yes	29.3	42.6	37.9	40.5	39.7
		(1.0)	(1.2)	(1.1)	(1.2)	(1.2)
	No	58.4	41.9	51.4	48.7	52.6
		(1.0)	(1.2)	(1.1)	(1.2)	(1.2)
	Don't know	12.2	15.5	10.7	10.8	7.7
		(0.6)	(0.8)	(0.6)	(0.7)	(0.5)
Know anyone diagnosed with COVID-19		.	.	30.3	40.2	35.8
		.	.	(1.2)	(1.3)	(1.2)
Believe can avoid getting COVID-19	Yes	83.1	81.6	84.2	83.7	86.8
		(0.8)	(0.9)	(0.8)	(0.9)	(0.8)
	No	12.1	12	11.8	12.3	10.7
		(0.7)	(0.7)	(0.8)	(0.8)	(0.7)
	Don't know	4.8	6.4	3.9	3.9	2.5
		(0.4)	(0.5)	(0.4)	(0.4)	(0.3)

Source: NIDS-CRAM Waves 1, 2, 3, 4, & 5. Authors' own calculations.

Table A2: Socioeconomic status measures & reluctance to accept vaccine

	Mean	LB	UB
Quintiles of adjusted income			
1	0.164	0.134	0.194
2	0.207	0.173	0.242
3	0.191	0.155	0.226
4	0.222	0.181	0.263
5	0.218	0.163	0.272
Total	**0.2**	**0.181**	**0.219**
Poverty quintiles			
1	0.226	0.183	0.27
2	0.262	0.21	0.315
3	0.179	0.143	0.215
4	0.174	0.144	0.205
5	0.195	0.166	0.224
Total	**0.206**	**0.188**	**0.224**
Personally receives a social grant			
0	0.209	0.185	0.233
1	0.203	0.174	0.231
Total	0.206	0.189	0.224
In last 7 days, anyone in HH gone hungry			
0	0.214	0.193	0.235
1	0.161	0.131	0.191
Total	**0.206**	**0.188**	**0.223**

Source: NIDS-CRAM Wave 5, NIDS 2017. Authors' own calculations.

Table A3: Perceived infection risk & reluctance to accept vaccine

	Mean	UB	LB
Think I'm likely to get COVID			
Yes	0.193	0.162	0.223
No	0.22	0.197	0.244
Don't know	0.173	0.119	0.228
Total	**0.206**	**0.188**	**0.224**
Believe can avoid getting COVID			
Yes	0.2	0.181	0.219
No	0.248	0.191	0.306
Don't know	0.252	0.145	0.358
Total	**0.206**	**0.188**	**0.224**
Know anyone diagnosed with COVID			
No	0.205	0.184	0.226
1	0.207	0.173	0.241
Total	**0.206**	**0.188**	**0.224**

Source: NIDS-CRAM Wave 5. Authors' own calculations.

Table A4: Correlates of likelihood of vaccine sceptics to accept vaccine two months later

		b	p
Gender	Female	0.026	0.17
Age	18-24	0.056**	0.04
[cf. 25-59]	60+	-0.0062	0.83
Population group	Coloured	0.047	0.7
[cf. Black Africa]	Asian/Indian	-0.079	0.52
	White	-0.068	0.52
Language	IsiNdebele	-0.0023	0.96
[cf.Zulu]	IsiXhosa	-0.018	0.51
	Sepedi	-0.048*	0.07
	Sesotho	0.011	0.77
	Setswana	0.00071	0.98
	SiSwati	0.035	0.53
	Tshivenda	-0.084***	0
	IsiTsonga	0.025	0.58
	Afrikaans	0.044	0.68
	English	0.056	0.63
	Other	-0.21***	0
Religion	Not religious	0.090**	0.03
[cf.Christian]	Jewish	0.044	0.62
	Muslim	0.0029	0.98
	Hindu	0.18	0.39
	African traditional	0.026	0.31
	Other	-0.071**	0.02
Importance of religion	Unimportant	-0.081*	0.08
[cf. Very unimportant]	Important	0.031	0.52
	Very important	0.016	0.73
Education	Up to Primary	0.026	0.4
[cf. Completed Secondary]	Up to Secondary	-0.009	0.67
	Tertiary	-0.062***	0
Poverty and exclusion	Q2	-0.041	0.21
[cf. Q1]	Q3	-0.029	0.36
	Q4	-0.053*	0.08

	Q5	-0.028	0.41
	Recent household hunger	0.0059	0.79
Residential area	Formal residential	-0.025	0.39
[cf. Township]	Shack	-0.025	0.39
	Peri-urban	-0.035	0.18
	Traditional	-0.02	0.48
	Farm/small holding	0.013	0.74
Infection risk	Likely to get COVID-19	0.017	0.27
[cf. Not likely to get COVID-19]	Don't know get COVID-19	0.056	0.14
Self-efficacy	Can avoid COVID-19	-0.025	0.42
[cf. Don't think can avoid COVID-19]	Don't know if can avoid COVID-19	-0.042	0.48
Mortality risk	Self-reported chronic conditions	-0.054***	0
	Overweight	-0.00064	0.98
	Obese	0.0047	0.81
	Hypertension	0.007	0.69
Trusted information sources	Social media	-0.048	0.12
Constant		**0.17****	**0.01**
Observations		**3926**	
R-squared		**0.05**	

Notes: Sceptics refer to those who in wave 4 said they disagreed, somewhat disagreed or didn't know whether they would accept vaccines if they were available. The regression also includes dummies for districts and a top-up sample, not reported here.
Source: NIDS-CRAM wave 5, wave 1 & NIDS 2017. Authors' own calculations.

Table A5: Transition matrix of vaccine acceptance among high-risk groups, by status in Wave 4

Respondents 60 years and older								
		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already vaccinated	Total
Wave 4	Strongly agree	90.21	1.26	1.32	4.67	1.31	1.22	100.00
	Somewhat agree	61.45	14.32	0.55	13.25	9.96	0.48	100.00
	Somewhat disagree	30.43	36.83	15.71	14.20	2.83	0.00	100.00
	Strongly disagree	32.43	0.00	8.85	40.83	14.83	3.07	100.00
	Don't know	51.74	1.93	0.00	13.12	33.21	0.00	100.00
	Total	**74.60**	**3.97**	**2.64**	**10.66**	**6.97**	**1.17**	**100.00**
Respondents reporting a chronic condition								
		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already vaccinated	Total
Wave 4	Strongly agree	91.89	2.46	0.50	1.46	1.69	2.00	100.00
	Somewhat agree	51.95	11.05	5.47	19.19	11.05	1.30	100.00
	Somewhat disagree	29.81	6.69	32.17	24.53	4.90	1.90	100.00
	Strongly disagree	23.04	17.23	11.21	43.61	4.18	0.72	100.00
	Don't know	38.22	5.46	3.02	22.73	29.54	1.03	100.00
	Total	**70.47**	**6.18**	**4.58**	**12.52**	**4.59**	**1.66**	**100.00**
Respondents testing as hypertensive								
		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already vaccinated	Total
Wave 4	Strongly agree	86.39	1.86	5.69	2.64	1.48	1.94	100.00
	Somewhat agree	59.85	17.20	2.77	18.85	1.34	0.00	100.00
	Somewhat disagree	35.30	4.37	6.14	51.55	0.00	2.64	100.00
	Strongly disagree	50.64	2.82	6.79	21.84	14.09	3.81	100.00
	Don't know	55.53	20.91	1.86	5.77	15.92	0.00	100.00
	Total	**74.38**	**5.82**	**5.08**	**9.05**	**3.94**	**1.72**	**100.00**

Obese respondents								
		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already vaccinated	Total
Wave 4	Strongly agree	89.61	2.23	1.02	3.74	1.85	1.56	100.00
	Somewhat agree	55.56	17.19	8.76	13.24	1.59	3.64	100.00
	Somewhat disagree	28.78	18.01	29.27	20.58	3.37	0.00	100.00
	Strongly disagree	35.26	3.62	15.26	42.19	1.59	2.08	100.00
	Don't know	64.82	3.15	6.88	12.54	10.97	1.65	100.00
	Total	**71.15**	**5.55**	**6.59**	**12.54**	**2.39**	**1.79**	**100.00**

Source: NIDS-CRAM waves 4 and 5. Authors' own calculations.

Table A6: Transition matrix of vaccine acceptance among 50-59 year olds by status in Wave 4

		Wave 5						
		Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know	Already	Total
Wave 4	Strongly agree	91.1	1.7	2.5	1.4	1.6	1.7	100.0
	Somewhat agree	76.1	5.5	7.5	4.2	2.9	3.8	100.0
	Somewhat disagree	32.1	35.7	11.4	18.4	1.7	0.8	100.0
	Strongly disagree	33.8	7.4	16.6	39.1	2.4	0.8	100.0
	Don't know	46.8	14.3	1.0	11.3	24.8	1.8	100.0
	Total	**74.7**	**5.6**	**5.5**	**8.9**	**3.5**	**1.7**	**100.0**

Source: NIDS-CRAM waves 4 and 5. Authors' own calculations.

For further information please see **cramsurvey.org** and **nids.uct.ac.za**