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What drives the willingness to get vaccinated against COVID-19 in South Africa?

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Abstract

The willingness to get vaccinated in South Africa is among the highest in the world, measuring at 76%. This study investigated the impact of individual risk beliefs, self-reported health status, and familiarity with someone with coronavirus disease 2019 (COVID-19) on the willingness to get vaccinated in South Africa. Data were obtained from the Wave 5 of the South African National Income Dynamics Study – Coronavirus Rapid Mobile Survey. Data were analyzed using descriptive statistics and binary logistic regression. More than 53% of the population believed that they were not at risk of COVID-19; 71.8% believed that they were in good health; and 31.6% knew someone with COVID-19. Beliefs (odds ratio [OR]: 1.287), health status (OR: 1.064), and COVID-19 case familiarity (OR: 1.034) were associated with willingness to get vaccinated. Other associations remained positive in the adjusted model. The relationship between case familiarity and willingness to get vaccinated shows that knowing someone who died of COVID-19 or suffered from the discomfort induced by the disease may drive other individuals to get vaccinated.

Keywords: COVID-19; Risk beliefs; Health status; Case familiarity; Vaccine willingness; South Africa

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1. Introduction

More than 2 years after its emergence as a public health issue, the coronavirus disease 2019 (COVID-19) pandemic still gripped the world. As of February 4, 2022, more than 386.5 million cases and 5.7 million deaths have been recorded in over 200 countries (World Health Organization [WHO], 2022a). Initial efforts to contain its spread were targeted mainly at the restriction of movement and social interactions as well as the use of facemasks. To complement these efforts and in the absence of WHO-approved antiviral drugs for the treatment of the disease, research laboratories and pharmaceutical companies developed vaccines against COVID-19. Vaccines stimulate the body's natural defenses to fight against infections (WHO, 2022b; Center for Disease Control, 2022). With the WHO approval for some of these vaccines, over 10 billion vaccine doses had been administered globally as of February 1, 2022 (WHO, 2022c). These ranged from not <100 doses per 100 population in North America and Europe to between 0.52

and 50.26 doses in most of sub-Saharan African region according to the WHO. While China, the United States, the United Kingdom, and France have administered 3 billion, 523 million, 138 million, and 140 million vaccine doses, respectively (WHO, 2022c), South Africa recorded the highest number of doses administered in sub-Saharan African region, standing at 29.8 million doses (Department of Health, South Africa, 2022). The doses were administered to 19.9 million people in South Africa, which has an estimated population of 59 million people. The geographical variation in vaccination coverage could be attributed to the geography of vaccine manufacturing technology, production capacity and availability, vaccine nationalism prevailing in wealthy nations (Ghebreyesus, 2021), and vaccine hesitancy. While the first three apparently put sub-Saharan African countries at a disadvantage, vaccine hesitancy is a global phenomenon as studies have shown that COVID-19 vaccine hesitancy rate was around 40 – 45% in Sweden, Germany, Italy, the US, Russia, Poland, and France (Lindholt *et al.*, 2021; Sallam, 2021) and as high as 63% in Jordan (El-Elimat *et al.*, 2021) and 76% in Kuwait (Sallam. 2021). Factors underlying the hesitancy include perceived risks and benefits, cultural and religious beliefs, sociodemographic characteristics, and trust (Lindholt *et al.*, 2021; Sallam, 2021; El-Elimat *et al.*, 2021).

In South Africa, however, the willingness to get vaccinated stood at around 76% in July 2021, despite vaccine insufficiency (National Income Dynamics Study – Coronavirus Rapid Mobile Survey [NIDS-CRAM], 2021). With its index case reported on March 5, 2020, 3.6 million positive cases out of 22.4 million tests, and nearly 96,000 deaths in four COVID-19 waves as of February 4, 2022 (Department of Health, South Africa, 2022), South Africa has the highest prevalence of COVID-19 in Africa and accounts for half of the total number of cases on the continent (WHO, 2022c). The country also ranked 17th of 220 countries in the number of cases, a position higher than the Netherlands, Canada, and Sweden. While a number of studies have focused on exploring the drivers of COVID-19 vaccine hesitancy across the world, this study investigated the factors driving the willingness to get vaccinated. Specifically, this study assessed the impacts of individual's beliefs about their risks of getting infected, their self-reported health status, and their familiarity with someone infected with COVID-19 on their willingness to get vaccinated.

Beliefs about perceived risks of infection and health status have been shown to influence the uptake of health-care services (Rosenstock, 1966; Becker, 1974). Case familiarity as a determinant of health-care seeking is, however, not prominent. With respect to COVID-19, the knowledge of the severity of symptoms and presentations in individuals who tested positive, and/or the loss of a family member or an acquaintance to the disease may affect an individual's disposition to the virus, and influence their willingness to get vaccinated. Reading or watching the news about the prevalence of COVID-19, encompassing the case and death statistics, on the media may not shed light on the extent of its severity. The overarching hypothesis of this study, therefore, is that individuals who perceived themselves as being at risk of infection, whose current health status was sub-optimal, and who knew someone with COVID-19 would be more willing to get vaccinated.

2. Data and methods

2.1. Data source

Data for this study were sourced from Wave 5 of the National Income Dynamics Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) in South Africa. The NIDS-CRAM is a nationally representative panel survey of South Africans over the age of 18. In the survey, the same cohort of individuals were contacted periodically and asked a range of questions about their income, employment status, household welfare, receipt of grants, and their knowledge concerning and attitude to COVID-19 (NIDS-CRAM, 2021). The NIDS-CRAM is a special follow-up with a subsample of adults from households in the National Income Dynamics Study (NIDS) survey. NIDS is a broadly nationally representative panel study following the lives of the same 28,000 South Africans, and those they live with, every 2 – 3 years since 2008 (NIDS-CRAM, 2021). NIDS-CRAM is funded by the FEM Education Foundation and Michael and Susan Dell Foundation, implemented by the Southern Africa Labour and Development Research Unit, and the data from this survey are made accessible by DataFirst.

2.2. Sampling

The sample for the survey was drawn using a stratified sampling technique to select households in all nine provinces of South Africa. Respondents who were 15 years and older in the 2017 NIDS survey were included in the NIDS-CRAM Wave 5 survey in 2020, as they had turned 18 in 2020. Data for the survey were collected between April 6 and May 11, 2021, through Computer-assisted Telephone Interviewing (CATI) (NIDS-CRAM, 2021). As the sample in the panel consists of individuals who have been followed up since Wave 1, this study excluded respondents whose data were included in Wave 5 but without participating in the current round of data collection. This category of individuals comprised of those who were not contacted, moved out of South Africa,

refused to answer COVID-related questions, were not available, or could not be tracked from the previous waves, and/or did not provide any responses to COVID-related questions. Of the 8,051 respondents in the Wave 5 dataset, we worked with the weighted sub-sample of 5,862 who satisfied the inclusion criteria.

2.3. Variable definitions

The primary outcome variable of this study is the willingness to get vaccinated against COVID-19. In the NIDS-CRAM questionnaire, this variable is captured in question G11 as "To what extent do you agree or disagree with the statement: If a vaccine for COVID-19 were available, would I get it?" The response options include "strongly agree," "somewhat agree," "somewhat disagree," "strongly disagree," "refused," and "do not know." In line with our prime objective to study the willingness of respondents to get vaccinated, responses that indicated any degree of willingness, such as "strongly agree" and "somewhat agree," were coded as willing to get vaccinated (Yes, 1), while other options were coded as unwilling (No, 0).

The primary independent variables include beliefs about the risk of being infected (question G1), case familiarity (question G3), and respondent's current health status (question G16). In the NIDS-CRAM questionnaire, these variables are captured in the following questions: "Do you think you are likely to get the Coronavirus?", "Do you know anyone who has been diagnosed with the Coronavirus?", and "How would you describe your health at present? Would you say it is excellent, very good, good, fair, or poor?", respectively. The three response options for questions G1 and G3 are "do not know," "no," and "yes." The response options for question G16 are "excellent," "very good," "good," "fair," and "poor." These were coded as "fair" (0), "poor," (1) and "good to excellent" (2).

Other explanatory variables employed from the dataset include age (A8), sex (Ba1), race (Ba2), educational status (Ba4), marital status (Ba5), province of residence (Bb1), place of residence (rural or urban) (Bb2), number of persons in residence (Bc1), number of people aged 60 and above in a residence (Bc5), and mental health status of the respondents (G20). Question G20 is phrased as "Over the last 2 weeks, have you been feeling down, depressed or hopeless?". The responses for this question were "not at all," "several days," "more than half the days," "nearly every day," and "do not know." Individuals who responded "not at all" were categorized as "not depressed/hopeless/down."

2.4. Data analysis

The sociodemographic characteristics of the respondents were expressed in simple frequency, while the sociodemographic dimensions of willingness to get vaccinated of the study population were analyzed using Chi-squared test. Binary logistic regression analysis was employed to examine the relationship between the sociodemographic variables and the respondents' willingness to get vaccinated. Four regression models were run. In the first three models, the three main independent variables were tested individually, while in the fourth model, we controlled for the sociodemographic variables. The fourth model was run as a full model to incorporate all three main independent variables, rather than one at a time, to enable a complete picture of the relationship between these independent variables and the outcome variable after other confounders, including the other main predictors, was controlled for. Running the model while isolating the other main predictors would have presented results under the presumption that the other main predictors were of no influence on the relationship. Results were considered statistically significant at $p < 0.05$.

2.5. Ethical consideration

The implementer of the NIDS-CRAM survey has obtained ethics approval from the University of Cape Town Commerce Ethics Committee to conduct the survey (REC 2020/04/017).

3. Results

One-third of the respondents were aged 35 – 49 (Table 1). The sample was also made up of more females (61.7%), Blacks (86.5%), respondents without tertiary education (62.1%), single individuals (56.3%), respondents from the KwaZulu Natal province (28.7%), and rural dwellers (54.9%). A high proportion of female respondents in the sample suggests that there were more females in the initial sample of the 2017 NIDS survey, and more females constituted the majority among those available and willing to participate in the follow-up NIDS-CRAM survey in 2020. Households with between 1 and 4 residents (47.5%) and without any occupant over the age of 60 (66.3%) were also in the majority. More than 53% of the population believed that they were not at risk of contracting COVID-19, 35% had experienced depression, 71.8% believed that their health was in good to excellent state, and 31.6% knew someone suffering from COVID-19. Only 2.1% of the population had been vaccinated but 76.3% were willing to be vaccinated if the vaccines were available.

The willingness to get vaccinated was high among all the sociodemographic categories (63.5 – 83.4%), as shown in the third column of Table 1. The lowest end of the range, however, was among the Whites (63.5%), those aged 18 – 24 (66.5%), those who had received no formal education (69.2%), and residents of the Northern Cape province

Table 1. Sociodemographic characteristics of study population, and dimensions and predictors of willingness to get vaccinated

Variable	Percentage (%) N = 5,862	Willingness to get vaccinated (%)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Age				
18 – 24	12.6	66.5*	-	RC
25 – 34	25.7	74.7*	-	1.459 (1.182 – 1.802)*
35 – 49	33.2	79.9*	-	2.081 (1.160 – 2.609)*
50+	28.3	78.2*	-	2.372 (1.758 – 3.200)*
Sex				
Male	38.3	76.8	-	RC
Female	61.7	76.1	-	0.926 (0.879 – 1.254)
Race				
White	4.3	63.5*	-	RC
African/Black	86.5	78.0*	-	2.301 (1.881 – 2.796)*
Asian/Indian	0.8	74.4*	-	2.110 (1.705 – 2.318)
Colored	8.4	66.2*	-	1.199 (0.952 – 1.321)
Education				
Tertiary	33.6	75.9	-	RC
Below tertiary	62.1	75.6	-	0.962 (0.816 – 1.124)
None	4.3	69.2	-	0.465 (0.392 – 0.616)*
Marital status				
Married/Has a Partner	43.7	77.9*	-	RC
Single	56.3	75.1*	-	0.996 (0.738 – 1.212)
Province				
Northern Cape	5.9	69.9*	-	RC
Eastern Cape	10.0	77.1*	-	1.143 (0.855 – 1.342)
Free State	6.0	72.5*	-	0.846 (0.662 – 0.906)
Gauteng	15.1	71.0*	-	1.004 (0.816 – 1.118)
Kwazulu-Natal	28.7	80.1*	-	1.468 (1.318 – 1.659)*
Limpopo	10.5	83.4*	-	1.692 (1.442 – 1.941)*
Mpumalanga	9.4	74.7*	-	1.048 (0.808 – 1.176)
North West	6.0	75.6*	-	0.928 (0.619 – 1.008)
Western Cape	7.4	71.2*	-	1.461 (1.218 – 1.665)*
Place of residence				
Rural	54.9	79.1*	-	RC
Urban	45.1	72.8*	-	0.880 (0.638 – 1.046)
Number of persons in residence				
1 – 4	47.5	76.3	-	RC
5 – 8	39.3	75.7	-	0.880 (0.608 – 1.038)
9+	13.2	78.4	-	0.922 (0.812 – 1.334)
Number of people aged 60+ in residence				
0	66.3	76.6	-	RC
1	24.7	76.7	-	0.998 (0.798 – 1.329)
2 – 5	9.0	73.6	-	0.839 (0.707 – 1.128)

(Cont'd...)

Table 1. ***(Continued)***

Variable	Percentage (%) N = 5,862	Willingness to get vaccinated (%)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Belief about risk of being infected				
Do not know	8.2	73.5*	RC	RC
No	53.4	75.5*	1.115 (0.814 – 1.299)	1.312 (0.952 – 1.458)
Yes	38.4	78.1*	1.287 (1.110 – 1.412)*	1.403 (1.300 – 1.617)*
Knowing someone diagnosed with COVID-19				
No	68.4	76.2	RC	RC
Yes	31.6	76.8	1.034 (0.881 – 1.203)	1.029 (0.780 – 1.119)
Current health status				
Fair	19.5	78.7*	RC	RC
Poor	8.7	79.7*	1.064 (0.779 – 1.202)	1.025 (0.830 – 1.091)
Good to excellent	71.8	75.4*	0.828 (0.609 – 0.987)*	0.903 (0.717 – 1.209)
Mental health status				
Not depressed/hopeless/down	65.0	76.9	-	RC
Depressed/hopeless/down	35.0	75.2	-	0.901 (0.708 – 1.118)
COVID-19 vaccination history				
No	97.9	-	-	-
Yes	2.1	-	-	-
Willingness to get vaccinated				
No	23.7	-	-	-
Yes	76.3	-	-	-

Note: *Significant at p <0.05; RC: Reference category.

(69.9%). Nearly 80% of respondents aged 35 – 49, more males (76.8%), Africans/Blacks (78%), those with tertiary education (75.9%), and respondents that were married or in union (77.9%) were more willing to get vaccinated. Respondents in Limpopo province (83.4%), those in rural areas (79.1%), and those who lived in residences with more than nine people (78.4%) also had more proportions of individuals willing to get vaccinated.

Among individuals who believed that they were at risk of being infected with COVID-19, 78.1% were willing to get vaccinated, while 76.8% of the respondents who knew someone with COVID-19 were also willing to get vaccinated. Individuals who considered their health status as poor accounted for the highest proportion (79.7%) of those willing to get vaccinated. The Chi-squared test results demonstrated that all the explanatory variables, except for sex, education, number in residence, older persons in residence, mental health status, and case familiarity, were significantly associated with the dependent variable – willingness to get vaccinated ($p < 0.05$; Table 1).

The unadjusted analysis showed that the respondents who believed that they were at risk of being infected with COVID-19 (odds ratio [OR]: 1.287) and those who were familiar with a COVID-19 case (OR: 1.034) were more willing to get vaccinated. Respondents who considered their current health status as good to excellent were found to be less willing to get vaccinated (OR: 0.828). However, the relationship with case familiarity was not statistically significant. When the sociodemographic variables were controlled for, the willingness to get vaccinated was still similar in direction but only the risk of getting infected remained statistically significant (OR: 1.403, $p < 0.05$). Age, race, and being a resident of any province, except Free State and North West, were associated with willingness to get vaccinated. Sex, education, marital status, place of residence, number in dwelling, and number of residents aged >60 years were associated with lower willingness to vaccination.

4. Discussion

More than 76% of the South African population were willing to get vaccinated, despite that the country was facing vaccine insufficiency, and the resultant low vaccine coverage typifies both the inverse care and underclass hypotheses at a global scale (Hart, 1971; Lineberry, 1976; Adewoyin *et al.*, 2018). The prevailing context aptly

describes a situation where vaccines are less available to those who need them and are more receptive to them. The need for vaccination, in this case, is reflected in the disease burden of the country – the burden of COVID-19 in South Africa was among the highest globally, measuring at 10% (WHO, 2022c). Nearly 80% of South Africans were willing to get vaccinated, a statistic higher than that in countries with higher vaccine production capacities such as the United States, Germany, France, and Russia, measuring between 55% and 60% (Lindholt *et al.*, 2021; Sallam, 2021).

Factors predicting the population's willingness to get vaccinated, as shown in this study, were age, racial composition, province of residence, beliefs about the risk of being infected, health status, and familiarity with a COVID-19 case. Sex, marital status, education, place of residence, number of people in households, number of people aged 60 and above in a residence, and mental health status were not found to drive the willingness. Age, race, and place of residence have also been shown to be positively associated with vaccine uptake in studies from other countries (Lindholt *et al.*, 2021; Sallam, 2021; El-Elimat *et al.*, 2021; Arce *et al.*, 2021; Al-Jayyousi *et al.*, 2021; Holzmann-Littig, 2021), which also found a positive association of vaccine uptake with sex, marital status, and education, contrary to findings from the present study. In the same note, conflicting findings from different studies showed that the number of persons per household, number of people aged 60 and above in a residence, and mental health status predispose individuals to COVID-19 and augment their willingness to get vaccinated (Makinde *et al.*, 2021; Najjuka *et al.*, 2021; Vukotic *et al.*, 2021), but such associations were negative in the present study.

Unlike most other sociodemographic attributes that recorded negative odds in their association with the willingness to get vaccinated, marital status of the respondents was not statistically significant in its negative association. This might be related to the country's peculiarity with regard to union formation. More than 56% of the respondents were single in a sample comprising of nearly 90% of individuals aged 25 and above. In tandem, civil marriages had declined in South Africa by 22.5% in 8 years (2011 – 2019) (Statistics South Africa, 2022). South Africa is one of the countries with the highest prevalence of single motherhood globally after countries in Latin America (Adewoyin & Odimegwu, 2022a). Contrary to findings that being in a union or living in households with more male-dominant decision-making powers is positively associated with higher level of utilization of health-care services (Adewoyin & Odimegwu, 2022b; Adewoyin *et al.*, 2022), being or not being in a union did not influence an individual's decision to get vaccinated in the current study.

With respect to the main explanatory variables, the proportion of South Africans willing to get vaccinated against COVID-19 was not lower than 73% of the population, irrespective of risk beliefs, current health status, or familiarity with a COVID-19 case. However, respondents who did not believe that they were at risk of infection, who considered that their health was in good condition, and who did not have someone with COVID-19 were relatively less willing to get vaccinated. When the relationships were analyzed by means of multivariate regression, only the risk of being infected had a statistically significant relationship with the willingness to get vaccinated. Under the unadjusted and adjusted modes, individuals who considered themselves at risk of being infected were more likely to get vaccinated. The odds even increased from 1.287 to 1.403 when the sociodemographic variables were controlled for in the regression model.

The findings of this study indicate that the major factor that drives an individual to seek health-care services is the perception that they might be susceptible to ill health. The role of beliefs in health-care seeking is well established in the literature and as such, the findings here align with what is known. Upon realizing the vulnerability to the risks of infection, many individuals resort to adopt protective behaviors (Rosenstock, 1966; Becker, 1974), such as consulting a doctor, visiting a health facility, or getting vaccinated. During the COVID-19 pandemic period, the same theory held true (Banda *et al.*, 2021; Kim & Kim, 2020), accounting for why South Africans who believed that they were at risk were more willing to get vaccinated.

The willingness to get vaccinated was also found to be higher among individuals who reported their health as being poor. This may be connected with the established scientific evidence about COVID-19 complications and deaths being higher among individuals who reported underlying comorbidities. Such comorbidities include diseases of heart, kidney, liver and lung, diabetes, obesity, and human immunodeficiency virus infection (Center for Disease Control, 2021). The prevalence rates of obesity and human immunodeficiency virus infection are particularly higher in South Africa (United Nations Programme on HIV/AIDS, 2020; Odimegwu *et al.*, 2020; Sartorius *et al.*, 2015). In this study, higher level of willingness to get vaccinated in this particular cohort may have stemmed from their desire to survive COVID-19 and not to fall ill with the related complications.

Individuals who knew someone with COVID-19 were more willing to get vaccinated than those who were not familiar with any. This finding is similar to those from a

few related studies that investigated this association (Wang *et al.*, 2021; Berihun *et al.*, 2021; Salali & Uysal, 2021). Expectedly, the awareness of the agony and discomfort suffered by a symptomatic COVID-19 patient would likely drive the individuals to get vaccinated for immunity. Such preventive actions related to case familiarity can be validated by the protection motivation theory of fear appeals (Rogers, 1975; Witte & Allen, 2000). Based on this theory, individuals are motivated by external triggers to adopt protective behaviors. In this study, however, the association was not statistically significant in both the unadjusted and adjusted models.

The datasets employed for this study contain self-reported data and captured intentions rather than actual behavior. While actual behavior may eventually differ from initial intentions and may have a different effect on the association considered in this study, but the fact that this study focused on willingness to get vaccinated, and not whether the respondents have been vaccinated or not, overrides this limitation. Furthermore, the use of CATI for data collection may have excluded a section of the population without telephone access. The standardization and other methodological adjustments made by the dataset implementers (NID-CRAM, 2021) are sufficient for this study.

5. Conclusion

While vaccine hesitancy is rife across the world, more than 76% of South Africans are willing to get vaccinated against COVID-19. Our findings showed that the risks of being infected and self-reported health status were significantly associated with higher willingness to get vaccinated. Case familiarity was also positively associated with the willingness to get vaccinated but the association was not statistically significant. For about 24% of the population that were not willing to get vaccinated, their reasons, according to the NIDS-CRAM survey, were largely about trust in the vaccine's efficacy and side effects (NIDS-CRAM, 2021). About 17% of the population considered the vaccines as harmful and unsafe and would only get vaccinated after their community leader is vaccinated first and remains healthy afterward. This implies that in addition to the individuals' perceived risks of being infected with COVID-19 and their reported health status, attitude of the community leaders also plays an important role in influencing the vaccine uptake; therefore, local leaders should engage themselves in the scaling-up of vaccine acceptance across South Africa. Further, media broadcasts showcasing the relatable personal experiences of individuals and community leaders who got vaccinated should be amplified to convince individuals who are unwilling to get vaccinated against COVID-19.

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

Conceptualization: All authors
Data curation: All authors
Formal analysis: All authors
Methodology: All authors
Writing – original draft: All authors
Writing – review & editing: All authors

Ethics approval and consent to participate

The implementer of the NIDS-CRAM Survey obtained an ethics approval from the University of Cape Town Commerce Ethics Committee to conduct the survey (REC 2020/04/017).

Consent for publication

Not applicable.

Availability of data

Data used in this work are available from the National Income Dynamics Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) 2021, Wave 5 [dataset]. Version 1.0.0. Johannesburg and Cape Town: FEM Education Foundation and Michael and Susan Dell Foundation [funding agencies]. Cape Town: Southern Africa Labour and Development Research Unit [implementer], 2021. Cape Town: DataFirst [distributor], 2021. https://doi.org/10.25828/awhe-t852

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