Policy Research Working Paper 10152

Turning COVID-19 Vaccines into Vaccinations

New Evidence from Sub-Saharan Africa

Philip Wollburg
Yannick Markhof
Shelton Kanyanda
Alberto Zezza

WORLD BANK GROUP
Development Economics
Development Data Group
August 2022

Policy Research Working Paper 10152

Abstract

As COVID-19 vaccines have become more widely available in Sub-Saharan Africa, vaccination campaigns in the region have struggled to pick up pace and trail the rest of the world. This paper presents new evidence on vaccine hesitancy, uptake, last-mile delivery barriers, and potential strategies to reach those who remain unvaccinated. The data come from high-frequency phone surveys in five countries in East and West Africa (Burkina Faso, Kenya, Malawi, Nigeria, and Tanzania). The surveys were conducted by countries' national statistical agencies, have national scope, are cross-country comparable, and draw their samples from nationally representative sampling frames. The findings show that across the study countries, a majority is willing to get vaccinated. Still, vaccine hesitancy is non-negligible among those pending vaccination. Concerns about side effects of the vaccine are the primary reason for hesitancy. At the same time, many who are willing to get vaccinated are deterred by a lack of easy access to vaccines at the local level. Radio broadcasts have widespread reach and medical professionals have good rapport among the unvaccinated population. Furthermore, social ties and perceptions as well as intrahousehold power relations matter for vaccine take-up. Based on the findings, the paper elaborates policy options to boost vaccination campaigns in Sub-Saharan Africa.

This paper is a product of the Development Data Group, Development Economics. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/prwp. The authors may be contacted at pwollburg@worldbank.org.

Turning COVID-19 Vaccines into Vaccinations: New Evidence from Sub-Saharan Africa

Philip Wollburg[1]

Yannick Markhof[1,2]

Shelton Kanyanda[1]

Alberto Zezza[1]

JEL codes: I14, I18, I100, O55

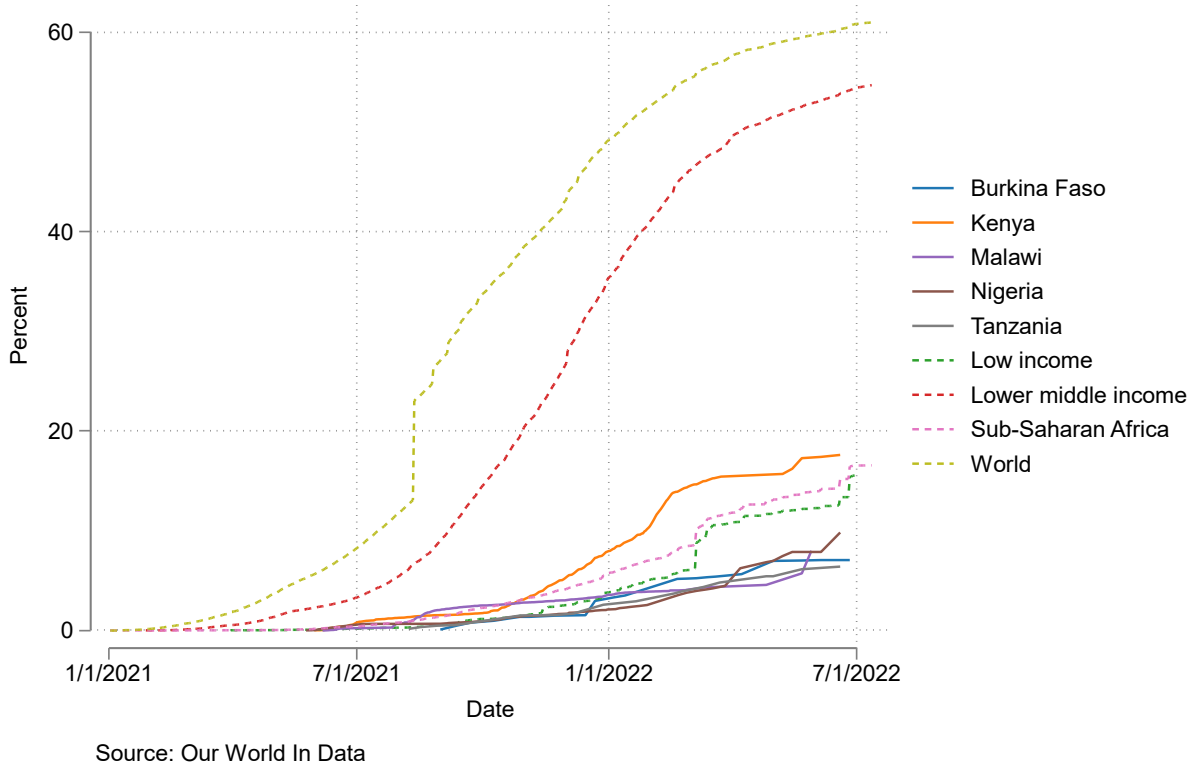
Keywords: COVID-19, vaccination, Africa, vaccine access

[1]Development Data Group, World Bank. [2]UNU-MERIT, United Nations University. The authors are grateful for support in designing the survey instrument and collecting the data by the country teams: Marco Tiberti for Burkina Faso; Wilbert Drazi Vundru for Malawi; Akiko Sagesaka, Amparo Palacios-Lopez, Ivette Contreras Gonzalez, and Gbemisola Oseni for Nigeria; and Akuffo Amankwah for Tanzania; Antonia Delius and Caleb Leseine Gitau for Kenya. We are furthermore grateful for comments and support by Gero Carletto and Kevin McGee and comments and feedback in the development of the survey instruments by the members of the World Bank Development Data Group's HFPS Questionnaire Working Group. This paper received funding support from the World Bank Research Support Budget grant "Understanding and estimating COVID-19 vaccination attitudes, uptake, and barriers in Sub-Saharan Africa" and the Global Financing Facility.

Introduction

Since the availability of the first COVID-19 vaccines in late 2020, the world has witnessed the largest vaccination effort in history.[1] In early June 2022, 60 percent of the world population had been fully vaccinated for COVID-19. However, large regional disparities in COVID-19 vaccine coverage remain (Figure 1). Sub-Saharan Africa (SSA), in particular, is lagging in its vaccination efforts. As of July 1, 2022, less than 17 percent of the population had received at least two doses. Consequently, all but two countries (the small island states of the Seychelles and Mauritius) in SSA remain adrift of the World Health Organization's (WHO) goal to fully vaccinate over 70 percent of the African population by June 2022.[2]

Figure 1: Share of the population fully vaccinated over time.



A variety of reasons have been cited for why vaccination efforts in SSA are trailing their targets.[3–12] Shortages in vaccine supplies, the accessibility of vaccination sites, and vaccine hesitancy are the main hypotheses discussed to explain the low coverage.[3,13] However, there is a conspicuous lack of systematic, cross-country comparable, and up-to-date evidence on these issues. Using data from five national phone surveys, we provide new evidence on vaccine hesitancy, uptake, last-mile delivery barriers, and possible promoters of vaccine demand in SSA. Our contributions are fourfold. First, unlike many existing studies that examine specific population groups or regions within countries, our data is national in scope and was collected by the respective national statistical agency of each country we study (Burkina Faso, Kenya, Malawi, Nigeria, and Tanzania) with samples drawn from large, nationally representative sampling frames. Second, data collection efforts were harmonized to a high degree between countries. Our insights are therefore cross-country comparable and representative of a population of approximately 369 million people,

32% of the population of SSA. Third, the evidence we present is timely and supersedes potentially outdated information on issues such as vaccine hesitancy from before the start of vaccination for the general population in SSA.[14–16] Fourth, our analysis is comprehensive and provides microlevel evidence on all five dimensions of vaccine hesitancy, *confidence, complacency, convenience, communication,* and *context,* last-mile delivery barriers, and potential strategies to reach those who remain unvaccinated.[17] These insights come at a crucial moment for vaccination campaigns which have struggled to pick up pace.

Based on our findings, we elaborate policy options to turn vaccines into vaccinations in Sub-Saharan Africa.

Methods

Data

We use data from High Frequency Phone Surveys (HFPS) in five countries in East and West Africa – Burkina Faso, Kenya, Malawi, Nigeria, and Tanzania. The surveys were conducted by countries' national statistical agencies in collaboration with the World Bank. Since 2020, the HFPS have collected cross-country comparable longitudinal data on a wide range of topics, including the impacts of COVID-19 on households and individuals.

Some rounds of the HFPS include a module on COVID-19 vaccination. The data we use in this study was collected between November 2021 and May 2022: Burkina Faso (April-May 2022), Kenya (November 2021-March 2022), Malawi (February 2022), Nigeria (December 2021 – January 2022), and Tanzania (December 2021).

Sampling and sample representativeness

The HFPS are re-contact surveys with national scope whose samples are drawn from nationally representative samples of households interviewed in recent in-person surveys. In Kenya, an additional sample of households was drawn via random digit dialing. Phone survey samples may not be fully representative of the general population, because of limited mobile phone coverage, non-response, and attrition, especially in lower-income contexts. To mitigate these concerns, sampling weights were recalibrated using propensity score and post-stratification methods, which were shown to mitigate sample selection biases in the HFPS.[18–20] In each household, one main respondent over the age of 15 was interviewed, who was selected to be knowledgeable of the affairs of the household and its members to provide reliable responses, though this selection overrepresents certain population groups.[20]

Table A1 in the supplementary files summarizes the resulting sample sizes for each country included in our study.

Survey instrument and variables

A harmonized survey module on COVID-19 vaccination was implemented in all five study countries. To study vaccine hesitancy and uptake in a systematic and comprehensive manner, we distinguish three groups in the population: (i) those already vaccinated, (ii) those who are willing to get vaccinated but are yet unvaccinated, and (iii) those who are hesitant to get vaccinated. We define hesitancy in our data as those

respondents who are either unwilling to get vaccinated or uncertain about their decision. Analogously, we categorize as willing those who have either already been vaccinated or are willing to do so.

Table 1: Summary of survey questions

Question	Respondent group	Answer options	Availability
(1) Vaccine uptake			
Have you been vaccinated for COVID-19?	all who know of start of vaccination campaigns	Yes, No, Not sure	all countries
Where did you get vaccinated?	all vaccinated	One location per jab received	all countries
What are your main reasons for getting vaccinated for COVID-19 [apart from protecting your health]?	all vaccinated	Up to two reasons (3 in Kenya)	all countries
(2) Vaccine acceptance among the unvaccinated			
Are you planning to be vaccinated for COVID-19?	all who know of start of vaccination campaigns	Yes, No, Not sure	all countries
When a vaccine to protect you from COVID-19 is available to you, are you planning to be vaccinated?	all who do not know of start of vaccination campaigns	Yes, No, Not sure	BFA, MWI, NGA, TZN
If an approved vaccine to prevent coronavirus was available right now at no cost, would you agree to be vaccinated?	all who do not know of start of vaccination campaigns	Yes, No, Not sure	KEN
What are the main reasons why you want to get vaccinated for COVID-19 [apart from protecting your health]?	all willing but unvaccinated	Up to two reasons (3 in Kenya)	all countries
Why are you not sure or not planning to get vaccinated?	all hesitant	List of reasons for hesitancy	all countries
(3) Barriers of access			
Do you know if your country has started COVID-19 vaccination?	all	Yes, No	BFA, MWI, NGA, TZN
Do you know if a vaccine for COVID-19 is available in Kenya?	all	Yes, No	KEN
Why have you not received the COVID-19 vaccine yet?	all willing but unvaccinated who know of start of vaccination campaigns	Up to two reasons	MWI, NGA, TZN
What do you think are the main difficulties that you will/would encounter to get the vaccine?	all willing but unvaccinated	List of barriers	KEN
(4) Information sources and channels			
Who/what (institution/body/entity) are your sources of information regarding COVID-19 vaccines?	all who know of start of vaccination campaigns	List of information sources	BFA, MWI, NGA
Which source of information do you trust the most for reliable information on COVID-19 vaccines?	all who know of start of vaccination campaigns	Select one among mentioned info sources	BFA, MWI, NGA
Through what channels do you receive the information from the source you trust the most?	all who know of start of vaccination campaigns	Select one info channel	BFA, MWI, NGA
(5) Ambassadors of vaccination			
Would you be more likely to receive the COVID-19 vaccine if any of the following individuals/authorities receive or recommend the vaccine?	all hesitant	Select yes or no for list of individuals/authorities	all countries
Whose recommendation to get vaccinated for COVID-19 would you trust the most?	all hesitant that had named at least one individual/authority that could encourage them	Select one among previously selected potential ambassadors	BFA, MWI, NGA, TZN
How likely are you to encourage others to get the COVID-19 vaccine?	all willing to get vaccinated or already vaccinated	Five point Likert scale	BFA, MWI, NGA, TZN
(6) Social factors in vaccine attitude formation and uptake			
Out of 10 people in your community, how many do you think have been vaccinated or are willing to be vaccinated for COVID-19?	all	Number from 0-10	BFA, MWI, NGA, TZN
Who in your household mainly decides whether the adult household members will get vaccinated for COVID-19?	all who know of start of vaccination campaigns	Each for themselves; All adults together; Household head; Name other household member	BFA, MWI, NGA, TZN

Our analysis draws on the questions summarized in Table 1. These questions group into six broad themes. First, we ask about vaccine uptake among respondents and ask those who have already been vaccinated about the vaccination process. The second theme relates to vaccine acceptance among those who have not been vaccinated yet. These questions gauge the extent of vaccine hesitancy among respondents and the main reasons for their vaccine attitudes. The third theme covers the barriers that keep respondents from getting vaccinated with a particular focus on those who have not been vaccinated yet despite being willing to. Fourth, we ask respondents about their main sources and channels of information on COVID-19 vaccines to identify possible communication strategies for national vaccination campaigns. Theme five is devoted to potential ambassadors that could promote vaccination among respondents. Finally, the sixth theme turns to the social context in which vaccine attitudes are formed and looks at the transmission of vaccine attitudes and uptake decisions within communities and households.

In the analysis we present population-weighted means at the country-level for each variable, computed using the recalibrated phone survey weights. The full results are presented in the supplementary files.

Role of the funding source

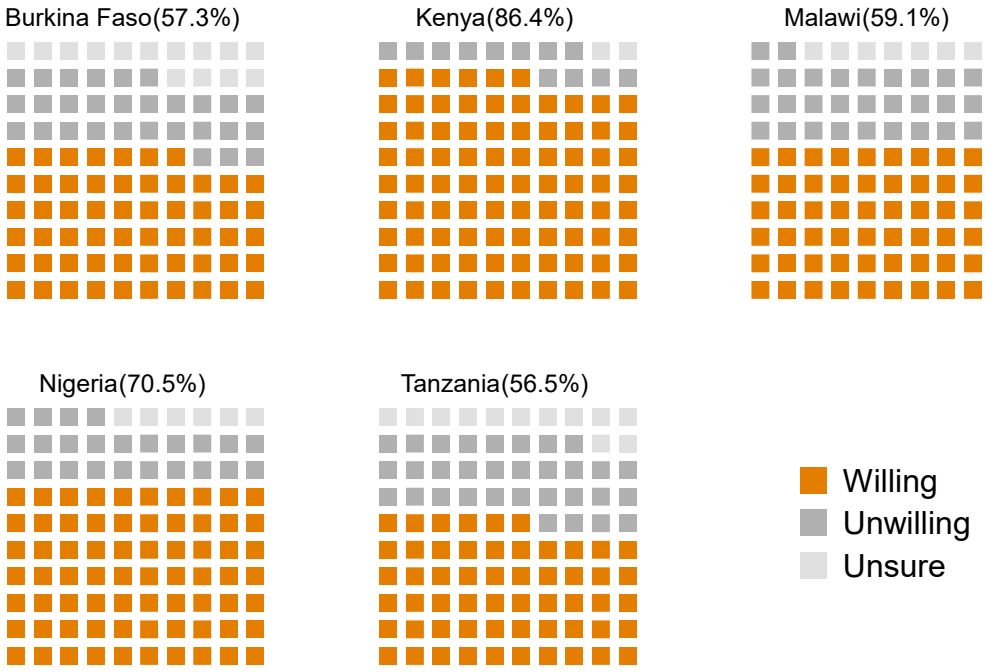
The funding sources for this paper had no involvement in study design; collection, analysis, and interpretation of the vaccination-related data; in the writing of the report; nor in the decision to submit the paper for publication.

Results

A majority is willing to get vaccinated, but COVID-19 vaccine hesitancy should not be dismissed

Overall, we find that estimated acceptance rates for COVID-19 vaccines in SSA have dropped below the initially high levels of acceptance reported in late 2020.[14–16] An exception is Kenya where vaccine acceptance is near universal (95.1%), likely reflecting the issuance of vaccination requirements for public services and places by the Kenyan government in December 2021. Further, we estimate high vaccine acceptance in Nigeria where almost four in five people (78.4%) would accept or have already accepted to be vaccinated for COVID-19. Vaccine acceptance is also above the WHO's envisioned 70% threshold in Malawi (75.1%) and Burkina Faso (74.4%). At the same time, vaccine hesitancy is notably higher in Tanzania where less than two-thirds of the population (63.3%) are willing to get vaccinated. This is consistent with the COVID-19-sceptic stance the Tanzanian government took during much of the pandemic.[21] Our estimates point to higher hesitancy among women and in urban areas (Table A2).

Figure 2: Vaccine acceptance among the unvaccinated.



Among those who are still unvaccinated, the main group for vaccination campaigns to reach out to, vaccine hesitancy is expectedly higher (Figure 2). In Kenya and Nigeria, reported vaccine acceptance still stands at

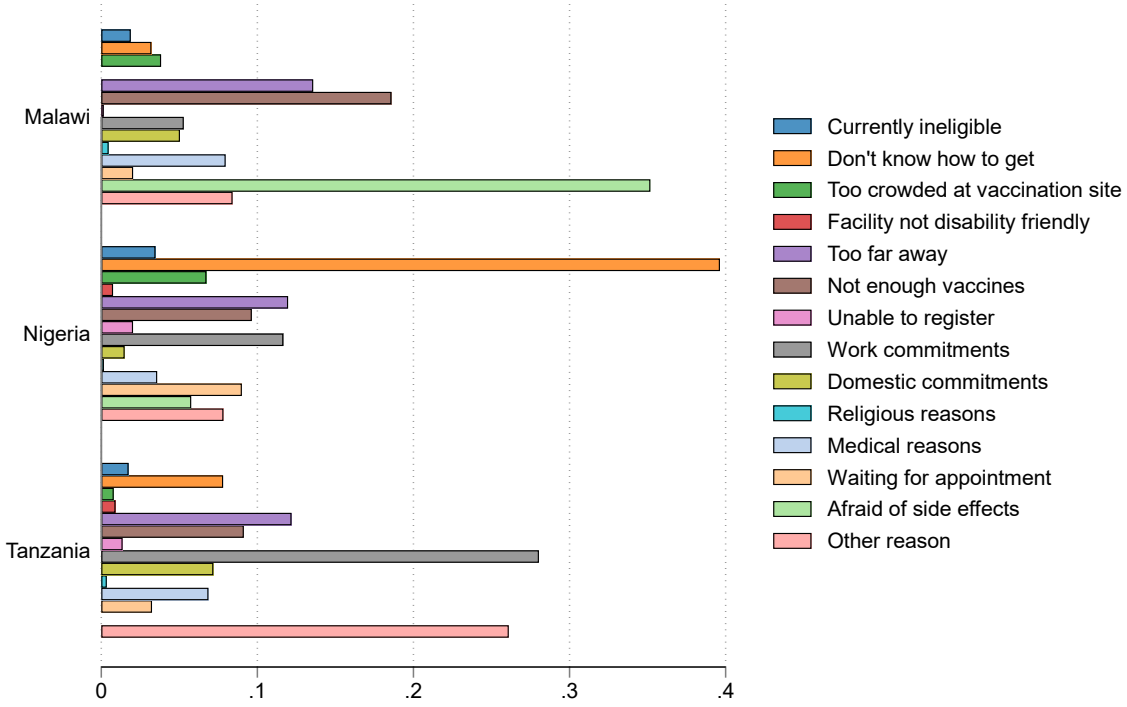
86.4% and 70.5% among the unvaccinated, but this figure is lower in Malawi (59.1%), Burkina Faso (57.3%), and Tanzania (56.5%). Furthermore, in all countries the majority of those we classify as hesitant report being unwilling to be vaccinated rather than uncertain of their decision.

Ease of access to vaccines remains a key barrier

Our data confirms that self-reported knowledge about the start of vaccination campaigns is very high and does not seem to prevent vaccine uptake. Among those currently unvaccinated, knowledge about the start of vaccination campaigns in their country is almost universal in Kenya (99.9%), Malawi (99.3%) and Tanzania (96.3%), very high in Burkina Faso (92.5%), and slightly lower in Nigeria (82.2%).

What is preventing those who are willing to be vaccinated from doing so? Reasons vary between countries but typically relate to the ease of access to vaccinations (Figure 3). In Nigeria, almost four in ten unvaccinated people (39.6%) do not know how to get vaccinated. In Malawi, Nigeria, and Tanzania, a substantial share reports prohibitively long distances to the nearest vaccination point (Malawi: 13.6%; Tanzania: 12.2%; Nigeria: 12.0%) or a lack of available vaccines (Malawi: 18.6%; Nigeria: 9.6%; Tanzania: 9.1%). In Tanzania and Nigeria, traveling to the vaccination site also commonly clashes with work commitments (Tanzania 28.0%; Nigeria 11.7%). In contrast, fear of potential side effects of the vaccine is only a widespread concern in Malawi (35.2%). Structural issues such as the availability of vaccines and distance to the nearest vaccination point are more frequently reported in rural areas whereas in urban areas, work commitments more commonly stand in the way of getting vaccinated. There is a gender divide, with women citing domestic commitments and medical reasons more commonly while men mention work commitments more frequently (Table A4 and A5).

Figure 3: Reasons for pending vaccination despite being willing to get vaccinated.



In Kenya, a similar question on the anticipated barriers of access was asked. While the largest group cites no barriers of access (37.9%), substantial shares are deterred by crowded vaccination sites (27.8%), a lack of vaccines in sufficient numbers (25.8%), and long distances to the nearest vaccination point (23.5%).

Insufficient ease of access to COVID-19 vaccines is also reflected in the vaccination points used. The majority of respondents was vaccinated at a medical site such as a health center (Burkina Faso: 45.4%; Tanzania: 45.1%; Nigeria: 30.7%; Malawi: 23.4%; Kenya: 18.3%) or hospital (Kenya: 59.9%; Malawi: 43.6%; Tanzania: 31.8%; Nigeria: 29.5%; Burkina Faso: 13.7%). Somewhat fewer people were vaccinated at mass vaccination sites (Burkina Faso: 35.1%; Malawi: 20.0%; Nigeria: 12.6%; Tanzania: 11.9%; Kenya: 8.9%) and smaller, local vaccination sites such as pharmacies, clinics, religious centers, senior homes, or people's work location play only a minor role.

Beliefs about the health benefits and risks of vaccines drive vaccine acceptance and uptake

A large share of the vaccinated population reports that protecting their own health was the primary and only reason to get vaccinated (Malawi: 89.9%; Tanzania: 76.8%; Nigeria: 64.1%; Burkina Faso: 60.8%; Kenya: 22.7%). This makes a strong case for vaccination campaigns to emphasize the health benefits of vaccination when aiming to increase COVID-19 vaccine take-up. Other motivations commonly cited for getting vaccinated are to protect the health of others in Kenya (68.8%) and Burkina Faso (26.7) and government mandates in Nigeria (18.7%) where a law requiring everyone working in a public institution to get vaccinated took effect in December 2021 - shortly before the start of our data collection. In Kenya, substantial numbers also got vaccinated because they considered it "the right thing to do" (29.7%).

Consistent with the importance of health considerations when deciding to take up the vaccine, concerns about the vaccine's side effects are the main reason for vaccine hesitancy in all countries studied (Kenya: 86.0%; Malawi: 45.8%; Tanzania: 41.3%; Burkina Faso: 36.2%; Nigeria: 20.8%). In Kenya, concerns about the safety of vaccines are also common (45.2%). Other reasons for hesitancy reflect a lack of confidence, either in vaccines in general or the COVID-19 vaccines in particular: Among vaccine hesitant individuals, one in three in Burkina Faso (33.2%), 15.1% in Malawi, 10.5% in Tanzania, 9.5% in Kenya, and 4.7% in Nigeria say they do not think the vaccine works. In Tanzania and Malawi, around one in five say that they generally do not trust vaccines. Finally, a non-negligible share of the hesitant also simply do not regard getting vaccinated as a high enough priority (Malawi: 21.6%; Tanzania: 10.9%; Nigeria: 10.7%; Burkina Faso: 8.4%).

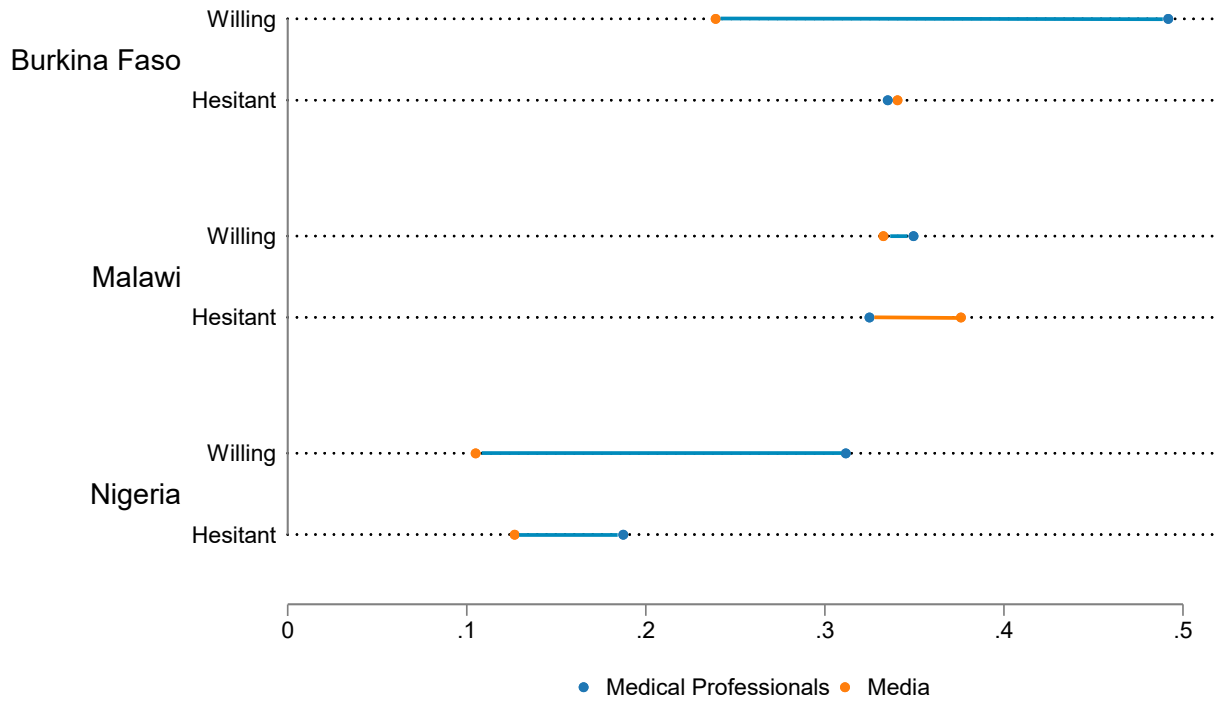
Medical professionals are widely trusted as vaccine ambassadors

The most common information sources on COVID-19 vaccination are medical professionals (doctors, nurses, pharmacists, and other health workers) and the media. Medical professionals are the most trusted information source in Burkina Faso (45.2%) and Nigeria (28.7%) and also highly trusted in Malawi (34.3%). Notably, trust in medical professionals is higher among those willing to be vaccinated than among the vaccine hesitant population. The hesitant are relatively more likely to cite the media over medical professionals as the most trusted source of information on COVID-19 vaccines (Figure 4). This may relate to an association between vaccine hesitancy and misinformation spread through media channels that previous studies found.[4,12,22]

Leveraging trusted figures as ambassadors of COVID-19 vaccination could be a viable strategy to promote vaccine uptake. Across the countries we study, a large but varying share of the hesitant report that they

would be more likely to get vaccinated if it was recommended to them by a "vaccine ambassador" (Tanzania: 77.3%; Nigeria: 58.2%; Kenya: 44.0%; Burkina Faso: 42.1%; Malawi: 36.1%). Most frequently, the hesitant mention medical professionals (Nigeria: 40.1%; Kenya: 34.8%; Burkina Faso: 34.5%; Tanzania: 31.9%; Malawi: 26.6%) and family and other community members (Nigeria: 42.7%; Malawi: 29.9%; Burkina Faso: 28.2%; Kenya: 17.6%; Tanzania: 12.1%) among the people that could encourage them to get vaccinated.

Figure 4: Most trusted information source on COVID-19 vaccines by vaccine acceptance.



Media outlets such as radio and television reach large shares of the population with information on COVID-19 vaccines

Across countries, we estimate that more than half of the population rely on radios to receive their most trusted information on COVID-19 vaccines (Burkina Faso: 67.0%; Nigeria: 58.8%; Malawi: 51.1%). This emphasizes the role of radio broadcasting as an effective medium of information transmission that has wide dissemination across SSA and among different population groups. Other important channels of vaccine information transmission are in-person interactions (Malawi: 61.7%; Burkina Faso: 44.9%; Nigeria: 42.9%) and, to a lesser extent, television (Burkina Faso: 36.1%; Nigeria: 25.3%; Malawi: 4.5%).

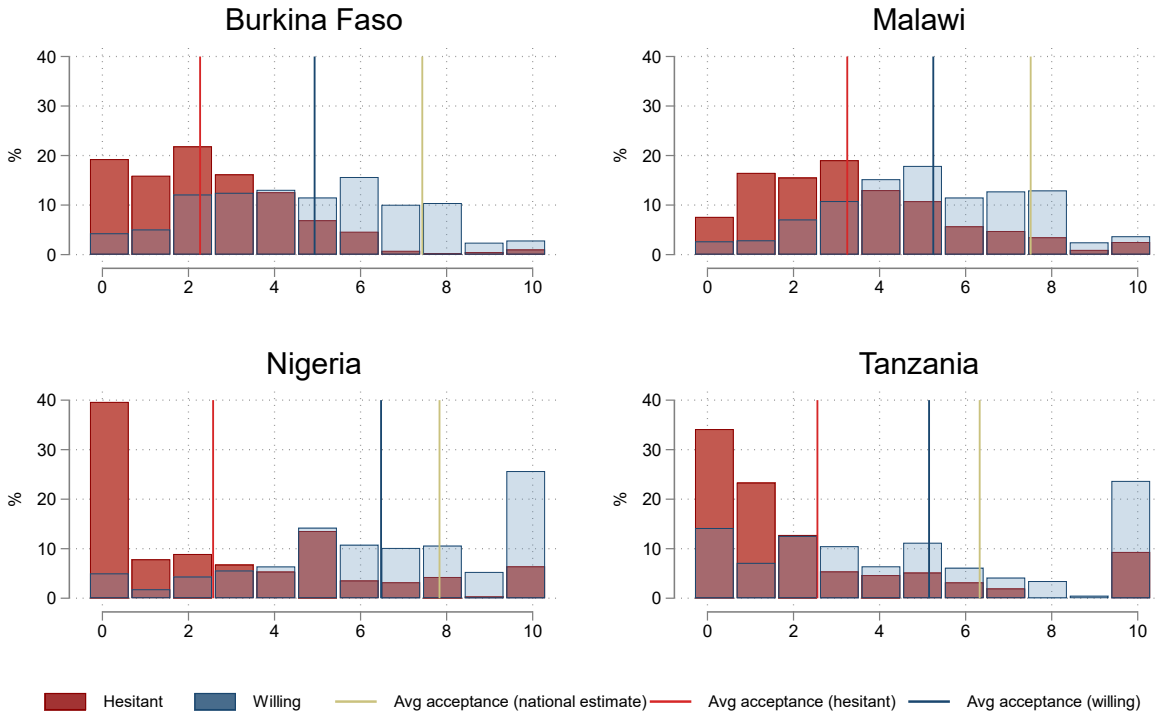
The social context informs vaccine attitudes

Beliefs about the attitudes and norms prevalent in one's social circle have been shown to influence individual attitudes and behavior.[23,24] Notably, people are found to often misperceive the true attitudes of

those around them and correcting these beliefs can change behavior.[23] We explore community beliefs on vaccinations by asking respondents to estimate how many members of their community out of ten would be willing to be vaccinated.

Across our study countries, respondents estimate vaccine acceptance levels to be lower than the national acceptance levels in our data (Figure 5). Furthermore, the margin by which vaccine acceptance is underestimated is large (Burkina Faso: 43.2% vs. 74.4%; Malawi: 47.7% vs. 75.1%; Nigeria: 59.1% vs. 78.4%; Tanzania: 43.6% vs. 63.3%). While both the hesitant and willing on average perceive vaccine acceptance in their community to be below the national average, this difference is much more pronounced among the hesitant. Discrepancies between the hesitant and willing are largest in Nigeria (25.7% vs. 64.8%) but also substantial in Burkina Faso (22.7% vs. 49.3%), Tanzania (25.6% vs. 51.5%), and Malawi (32.5% vs. 52.5%). This suggests a correlation between social perceptions and personal vaccine attitudes.

Figure 5: Perceived vaccine acceptance within their community among the hesitant and willing



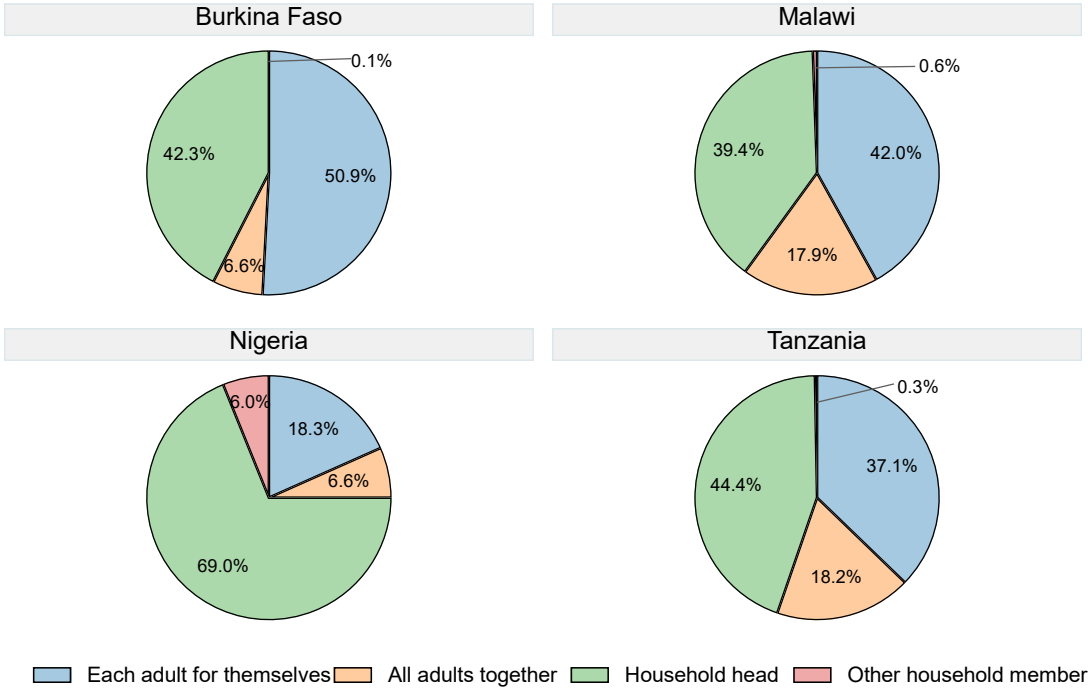
Note: Number of people out of 10 that respondents think would get vaccinated for COVID-19 in their community. The red line is the weighted mean for those hesi and the blue line the weighted mean for those willing to get vaccinated. The yellow line is estimated national level acceptance for COVID-19.

While community dynamics seem to play a role in the formation and transmission of COVID-19 vaccine attitudes, social processes and dynamics within households matter as well (Figure 6). According to the respondents, the household head makes the vaccination decision on behalf of the household members in 69.0% of households in Nigeria, 44.4% in Tanzania, 42.3% in Burkina Faso, and 39.4% in Malawi. In contrast, vaccination decisions are left to individual household members among 50.9% of households in Burkina Faso, 42.0% in Malawi, 37.1% in Tanzania, and 18.3% in Nigeria. Power dynamics within the household can thus mean that vaccination is not an individual decision.

Given the role of social interactions in determining vaccine attitudes and convincing the hesitant, we lastly consider the willingness among those already vaccinated to act as potential ambassadors of COVID-19

vaccination. There is overwhelming willingness among those vaccinated to do so: In Malawi (80.7%), Tanzania (76.4%), and Nigeria (72.1%), more than 7 out of 10 vaccinated individuals would be "very likely" to encourage others to get vaccinated. In Burkina Faso, most are either very likely (22.9%) or somewhat likely (58.4%).

Figure 6: Decisionmaker about vaccine uptake among adult household members.



Discussion

Contribution

Since the start of efforts to vaccinate the world population for COVID-19, vaccine coverage in Sub-Saharan Africa has trailed the rest of the world. In this study, we use data from five national phone surveys conducted by each country's national statistical agency to provide comprehensive, cross-country comparable, and timely insights into the factors that hold back the progress of vaccination campaigns. Our findings on vaccine hesitancy, uptake, last-mile delivery barriers, and possible promoters of vaccine demand come at a critical moment for vaccination campaigns: vaccines are now more widely available in the region but have generally failed to reach beyond a fraction of the population.

Our findings supersede potentially outdated results from previous studies that were conducted before the wider availability of vaccines [14–16,25,26] and add an up-to-date empirical basis to recent discussions of vaccine hesitancy and last-mile delivery barriers in the uptake of vaccines.[3–8,10,12,13,27,28] The analysis spans all five dimensions of vaccine hesitancy that have been hypothesized to underly the low take-up of vaccines in SSA and elsewhere[17]: Trust in the safety and efficacy of vaccines (*confidence*), perceived severity of COVID-19 and risk to fall ill (*complacency*), access to COVID-19 vaccines (*convenience*), the level and sources of information (*communications*), and sociodemographic characteristics (*context*). Furthermore, we provide insights into the last-mile delivery barriers that have kept vaccine-willing people from getting vaccinated

and opportunities to reach out to those who are hesitant. As such, our data can inform strategies that national vaccination campaigns may pursue to turn vaccines into vaccinations in Africa.

Limitations

While our data stands out in its informational richness, national scope, and robust survey methodology, it is still subject to the challenges and limitations of (phone) survey data collection on vaccination. These include sample selection at the household level due to under-coverage, non-response, and attrition, as well as within the household arising from the purposive selection of respondents.[19,20] The implications of these issues for findings on vaccine hesitancy should be the subject of future research as should be the reliability of survey data on vaccination in the context of COVID-19.[29–31] Survey data, regardless of mode, necessarily relies on respondent self-reporting which is susceptible to respondents' incentives, misreporting, and misperceptions.

Main findings and policy recommendations

We find that in our study countries a majority remains willing to get vaccinated but that hesitancy among those unvaccinated is a non-negligible issue. As vaccine coverage in much of SSA is still below 20 percent, vaccination campaigns should focus first on getting those who are willing but yet unvaccinated to take up the vaccine. The main barriers keeping this group away from the vaccination sites are country-specific but commonly relate to the ease with which vaccines can be accessed within communities. Therefore, it is indispensable that vaccination sites become more widespread at the local level.[28] Furthermore, a continuation of communication campaigns about the ongoing risk of COVID-19 and safety of vaccines will be pivotal: We find that the protection vaccines afford to one's own health is the main reason why people take up the vaccine and that hesitancy mostly relates to concerns about the vaccine's side effects.[24] As this was already the main concern among the hesitant in 2020[14–16], national vaccination campaigns should double-down on their efforts to assure the population of the safety of COVID-19 vaccines.

Concerning the means through which the population acquires information on COVID-19 vaccination, we find radio broadcasting to have widespread reach. Radio broadcasts are therefore a promising avenue through which mass communication campaigns could reach their target population. Our results also suggest that medical professionals have good rapport with both the willing and hesitant. Vaccination campaigns could employ endorsements by this group in order to sway the opinions of the hesitant.

Lastly, we find that the social context informs vaccine attitudes, as perceptions about the general acceptance of COVID-19 and within-household power dynamics matter. Changing public perceptions about the true support for vaccines in the country and creating a positive social norm around vaccination could be effective measures. Those already vaccinated could be mobilized as ambassadors that can promote vaccine demand at the community level. Furthermore, convincing key members of the household, mostly the household head, of the need for vaccination may positively affect the take-up of vaccines by the remaining household members. These findings are in line with recent experimental evidence from Zambia.[24]

Concluding remarks

With COVID-19 vaccines becoming more widely available but a large majority of African countries far off the WHO's target to fully vaccinate 70 percent of the population by June 2022, now is the time to push for

increased vaccine take-up in Sub-Saharan Africa. With a renewed focus on creating a positive social norm around COVID-19 vaccination, messaging that leverages trusted and accessible information sources and channels, and more easily accessible vaccination sites at the community level, countries can speed up this process and successfully turn vaccines into vaccinations.

Bibliography

1 Tatar M, Wilson FA. The largest vaccination campaign in history: A golden opportunity for bundling public health interventions. *J Glob Health* 2021; **11**: 03076.

2 WHO Regional Office for Africa. COVID-19 Vaccination in the WHO African Region. Brazzaville: World Health Organization, 2022 https://apps.who.int/iris/bitstream/handle/10665/356373/CV-20220615-eng.pdf (accessed July 7, 2022).

3 Reza HM, Agarwal V, Sultana F, Bari R, Mobarak AM. Why are vaccination rates lower in low and middle income countries, and what can we do about it? *BMJ* 2022; : e069506.

4 Aborode AT, Fajemisin EA, Ekwebelem OC, *et al.* Vaccine hesitancy in Africa: causes and strategies to the rescue. *Ther Adv Vaccines Immunother* 2021; **9**: 25151355211047510.

5 Ajeigbe O, Arage G, Besong M, *et al.* Culturally relevant COVID-19 vaccine acceptance strategies in sub-Saharan Africa. *Lancet Glob Health* 2022; : S2214109X22002510.

6 Mutombo PN, Fallah MP, Munodawafa D, *et al.* COVID-19 vaccine hesitancy in Africa: a call to action. *Lancet Glob Health* 2022; **10**: e320–1.

7 Seytre B. Misunderstanding poor adherence to COVID-19 vaccination in Africa. *Lancet Glob Health* 2022; **10**: e794.

8 Mutombo PN, Fallah MP, Munodawafa D, *et al.* Misunderstanding poor adherence to COVID-19 vaccination in Africa – Authors' reply. *Lancet Glob Health* 2022; **10**: e795.

9 Afolabi AA, Ilesanmi OS. Dealing with vaccine hesitancy in Africa: the prospective COVID-19 vaccine context. *Pan Afr Med J* 2021; **38**. DOI:10.11604/pamj.2021.38.3.27401.

10 Nachega JB, Sam-Agudu NA, Masekela R, *et al.* Addressing challenges to rolling out COVID-19 vaccines in African countries. *Lancet Glob Health* 2021; **9**: e746–8.

11 Machingaidze S, Wiysonge CS. Understanding COVID-19 vaccine hesitancy. *Nat Med* 2021; **27**: 1338–9.

12 Leach M, MacGregor H, Akello G, *et al.* Vaccine anxieties, vaccine preparedness: Perspectives from Africa in a Covid-19 era. *Soc Sci Med* 2022; **298**: 114826.

13 Mobarak AM, Miguel E, Abaluck J, *et al.* End COVID-19 in low- and middle-income countries. *Science* 2022; **375**: 1105–10.

14 Kanyanda S, Markhof Y, Wollburg P, Zezza A. Acceptance of COVID-19 vaccines in sub-Saharan Africa: evidence from six national phone surveys. *BMJ Open* 2021; **11**: e055159.

15 Solís Arce JS, Warren SS, Meriggi NF, *et al.* COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. *Nat Med* 2021; published online July 16. DOI:10.1038/s41591-021-01454-y.

16 Africa CDC. COVID-19 Vaccine Perceptions: A 15 country study. 2021 https://africacdc.org/download/covid-19-vaccine-perceptions-a-15-country-study/ (accessed May 18, 2021).

17 Razai MS, Oakeshott P, Esmail A, Wiysonge CS, Viswanath K, Mills MC. COVID-19 vaccine hesitancy: the five Cs to tackle behavioural and sociodemographic factors. *J R Soc Med* 2021; **114**: 295–8.

18 Himelein K. Weight Calculations for Panel Surveys with Subsampling and Split-off Tracking. *Stat Public Policy* 2014; **1**: 40–5.

19 Ambel A, McGee K, Tsegay A. Reducing Bias in Phone Survey Samples. Effectiveness of Reweighting Techniques Using Face-to-Face Surveys as Frames in Four African Countries. Washington D.C.: World Bank, 2021 https://documents.worldbank.org/en/publication/documents-reports/documentdetail/859261622035611710/reducing-bias-in-phone-survey-samples-effectiveness-of-reweighting-techniques-using-face-to-face-surveys-as-frames-in-four-african-countries.

20 Brubaker J, Kilic T, Wollburg P. Representativeness of individual-level data in COVID-19 phone surveys: Findings from Sub-Saharan Africa. *PLOS ONE* 2021; **16**: e0258877.

21 Buguzi S. Covid-19: Counting the cost of denial in Tanzania. *BMJ* 2021; : n1052.

22 Wilson SL, Wiysonge C. Social media and vaccine hesitancy. *BMJ Glob Health* 2020; **5**: e004206.

23 Bursztyn L, González AL, Yanagizawa-Drott D. Misperceived Social Norms: Women Working Outside the Home in Saudi Arabia. *Am Econ Rev* 2020; **110**: 2997–3029.

24 Hoy CA, Kanagavel R, Cameron CM. Intra-Household Dynamics and Attitudes toward Vaccines : Experimental and Survey Evidence from Zambia. The World Bank, 2022 https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099239408032215339/idu00eb25fa7060d9046af09f400895c23d855f9 (accessed Aug 10, 2022).

25 Sallam M, Al-Sanafi M, Sallam M. A Global Map of COVID-19 Vaccine Acceptance Rates per Country: An Updated Concise Narrative Review. *J Multidiscip Healthc* 2022; **Volume 15**: 21–45.

26 Lazarus JV, Ratzan SC, Palayew A, *et al.* A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med* 2021; **27**: 225–8.

27 Wiysonge CS, Ndwandwe D, Ryan J, *et al.* Vaccine hesitancy in the era of COVID-19: could lessons from the past help in divining the future? *Hum Vaccines Immunother* 2022; **18**: 1–3.

28 Lawal L, Aminu Bello M, Murwira T, *et al.* Low coverage of COVID-19 vaccines in Africa: current evidence and the way forward. *Hum Vaccines Immunother* 2022; **18**: 2034457.

29 Bradley VC, Kuriwaki S, Isakov M, Sejdinovic D, Meng X-L, Flaxman S. Unrepresentative big surveys significantly overestimated US vaccine uptake. *Nature* 2021; **600**: 695–700.

30 Bloland P, MacNeil A. Defining & assessing the quality, usability, and utilization of immunization data. *BMC Public Health* 2019; **19**: 380.

31 Sandefur J, Glassman A. The Political Economy of Bad Data: Evidence from African Survey and Administrative Statistics. *J Dev Stud* 2015; **51**: 116–32.

Supplementary files

Table A1: Sample Size

	Burkina Faso	Kenya (KIHBS)	Kenya (RDD)	Malawi	Nigeria	Tanzania
Pre-COVID F2F Survey / RDD frame	7,010		92,999,970	3,181	4,976	12,812
With phone numbers	6,877	9,007	92,999,970	2,337	4,934	
Attempted to contact	2,199	9,007	5,000	2,337	4,440	5,750
Reached	1,951		4,075	1,729	3,152	2,251
Phone interviews completed	1,847	4,561	1,075	1,447	2,922	2,193

Note: Sampling frame in Kenya consisted of re-contact sample from the Kenya Integrated Household Budget Survey 2015/16 (KIHBS) and a sample obtained from random digit dialing (RDD).

Table A2: Estimated vaccine acceptance

	Burkina Faso	Kenya	Malawi	Nigeria	Tanzania
Overall	74.4	95.1	75.1	78.4	63.3
	(71.5 to 77.2)	(93.4 to 96.9)	(71.1 to 79.1)	(75.8 to 80.9)	(60.2 to 66.3)
Unvaccinated	57.3	86.4	59.1	70.5	56.5
	(53.0 to 61.5)	(81.8 to 91.0)	(53.5 to 64.7)	(67.3 to 73.8)	(53.1 to 59.8)
Men	74.9	95.6	77.6	81.1	65.3
	(71.8 to 78.0)	(93.5 to 97.7)	(73.0 to 82.1)	(78.1 to 84.0)	(61.7 to 68.8)
Women	72.3	94.7	71.8	71.4	59.1
	(65.7 to 78.8)	(92.0 to 97.4)	(65.5 to 78.1)	(67.1 to 75.7)	(53.9 to 64.4)
Urban	58.8	95.6	69.9	75.3	59.8
	(54.6 to 62.9)	(93.5 to 97.7)	(63.0 to 76.8)	(71.5 to 79.1)	(54.7 to 64.9)
Rural	81.8	94.8	76.4	79.7	65.0
	(78.3 to 85.2)	(92.4 to 97.3)	(71.7 to 81.0)	(76.5 to 83.0)	(61.2 to 68.7)
N (overall)	1,847	5,633	1,447	2,934	2,196
N (unvaccinated)	1,157	2,018	863	2,010	1,791
N (male)	1,415	2,605	853	2,053	1,523
N (female)	432	3,019	594	881	670
N (urban)	1,141	3,020	547	1,181	809
N (rural)	706	2,613	900	1,753	1,387

Note: The table compares estimated acceptance rates for COVID-19 vaccines. The breakdown for different demographics includes those already vaccinated. All values in percent. 95% confidence intervals in parentheses.

Table A3: Reasons for pending vaccination

Reasons	Malawi	Nigeria	Tanzania
Currently ineligible	1.9	3.5	1.7
	(-0.0 to 3.8)	(1.9 to 5.1)	(0.5 to 3.0)
Don't know how to get	3.2	39.6	7.8
	(0.4 to 6.0)	(34.8 to 44.5)	(5.1 to 10.5)
Too crowded at vax site	3.8	6.7	0.8
	(1.2 to 6.4)	(4.6 to 8.9)	(0.1 to 1.5)
Facility not disability friendly		0.8	0.9
		(0.2 to 1.3)	(0.2 to 1.7)
Too far away	13.6	12.0	12.2
	(8.8 to 18.4)	(9.2 to 14.7)	(9.3 to 15.1)
Not enough vaccines	18.6	9.6	9.1
	(12.5 to 24.7)	(7.0 to 12.3)	(6.7 to 11.6)
Unable to register	0.2	2.0	1.4
	(-0.1 to 0.4)	(0.8 to 3.3)	(0.4 to 2.4)
Work commitments	5.3	11.7	28.0
	(2.3 to 8.3)	(8.4 to 15.0)	(24.1 to 32.0)
Domestic commitments	5.0	1.5	7.2
	(2.0 to 8.0)	(0.4 to 2.6)	(5.0 to 9.4)
Religious reasons	0.5	0.2	0.4
	(-0.2 to 1.2)	(-0.0 to 0.4)	(0.0 to 0.7)
Medical reasons	8.0	3.6	6.9
	(3.5 to 12.5)	(1.9 to 5.3)	(4.8 to 8.9)
Waiting for appointment	2.0	9.0	3.3
	(0.6 to 3.5)	(6.4 to 11.6)	(1.8 to 4.7)
Afraid of side effects	35.2	5.8	0.0
	(28.0 to 42.4)	(3.6 to 7.9)	
Other reason	8.4	7.8	26.1
	(4.0 to 12.8)	(5.5 to 10.1)	(22.3 to 29.9)
N	493	1,098	992

Note: Reasons for pending vaccination despite being willing to get vaccinated. All values in percent. 95% confidence intervals in parentheses.

Table A4: Reasons for pending vaccination by residence

Reasons	Malawi		Nigeria		Tanzania	
	Rural	Urban	Rural	Urban	Rural	Urban
Currently ineligible	1.9	1.7	3.4	3.6	2.0	1.2
	(-0.2 to 4.1)	(-1.7 to 5.0)	(1.8 to 5.1)	(-0.1 to 7.2)	(0.3 to 3.7)	(0.2 to 2.3)
Don't know how to get	3.8	0.3	41.9	34.8	8.6	6.1
	(0.4 to 7.2)	(-0.3 to 1.0)	(35.8 to 48.0)	(26.6 to 43.0)	(5.3 to 11.8)	(1.3 to 10.9)
Too crowded at vax site	3.6	5.1	5.7	9.0	0.8	0.8
	(0.5 to 6.6)	(0.8 to 9.4)	(3.1 to 8.2)	(5.1 to 12.9)	(-0.0 to 1.7)	(-0.3 to 1.8)
Facility not disability friendly			0.7	0.8	1.1	0.6
	(0.5 to 6.6)	(0.8 to 9.4)	(0.0 to 1.4)	(-0.2 to 1.9)	(0.1 to 2.0)	(-0.5 to 1.7)
Too far away	15.1	6.4	13.6	8.4	14.4	7.1
	(9.6 to 20.6)	(-1.8 to 14.6)	(10.0 to 17.2)	(4.9 to 11.9)	(10.6 to 18.2)	(3.2 to 10.9)
Not enough vaccines	20.7	8.4	9.3	10.4	11.6	3.4
	(13.4 to 28.1)	(3.5 to 13.3)	(6.0 to 12.5)	(5.7 to 15.1)	(8.2 to 15.0)	(1.5 to 5.4)
Unable to register	0.2	0.0	2.1	1.8	1.6	0.9
	(-0.1 to 0.5)		(0.4 to 3.9)	(0.4 to 3.2)	(0.2 to 3.0)	(0.0 to 1.8)
Work commitments	3.5	13.5	9.5	16.4	24.0	37.2
	(1.1 to 5.9)	(2.7 to 24.3)	(5.8 to 13.2)	(9.8 to 22.9)	(19.3 to 28.7)	(30.1 to 44.3)
Domestic commitments	4.9	5.9	0.7	3.2	7.1	7.3
	(1.4 to 8.3)	(0.7 to 11.0)	(-0.1 to 1.5)	(0.3 to 6.2)	(4.4 to 9.9)	(3.7 to 10.8)
Religious reasons	0.6	0.0	0.0	0.5	0.3	0.4
	(-0.3 to 1.4)		(-0.0 to 0.1)	(-0.1 to 1.1)	(-0.0 to 0.7)	(-0.3 to 1.2)
Medical reasons	7.4	10.5	2.8	5.3	5.8	9.4
	(2.5 to 12.3)	(-0.7 to 21.6)	(0.8 to 4.7)	(1.9 to 8.8)	(3.4 to 8.1)	(5.2 to 13.6)
Waiting for appointment	2.0	2.0	10.6	5.6	3.2	3.4
	(0.4 to 3.7)	(-1.1 to 5.1)	(7.2 to 13.9)	(2.1 to 9.1)	(1.3 to 5.1)	(1.1 to 5.6)
Afraid of side effects	32.8	46.3	4.4	8.6	0.0	0.0
	(24.9 to 40.8)	(31.2 to 61.4)	(2.1 to 6.8)	(4.3 to 13.0)		
Other reason	8.2	9.6	8.1	7.2	25.5	27.4
	(3.5 to 12.8)	(-2.3 to 21.5)	(5.2 to 11.0)	(3.6 to 10.8)	(20.8 to 30.2)	(21.0 to 33.9)
N	333	160	653	447	660	332

Note: Reasons for pending vaccination despite being willing to get vaccinated, by urban/rural. All values in percent. 95% confidence intervals in parentheses.

Table A5: Reasons for pending vaccination by gender

Reasons	Malawi		Nigeria		Tanzania	
	Female	Male	Female	Male	Female	Male
Currently ineligible	1.6	2.1	3.1	3.6	0.8	2.1
	(-0.5 to 3.6)	(-0.7 to 4.8)	(-1.2 to 7.4)	(1.9 to 5.3)	(-0.2 to 1.7)	(0.5 to 3.8)
Don't know how to get	2.1	3.9	39.5	39.7	10.1	7.0
	(-0.7 to 4.9)	(-0.2 to 8.0)	(30.0 to 49.0)	(34.4 to 45.0)	(4.1 to 16.0)	(4.0 to 9.9)
Too crowded at vax site	1.4	5.3	8.5	6.2	1.5	0.5
	(-0.4 to 3.2)	(1.1 to 9.5)	(3.4 to 13.5)	(3.8 to 8.6)	(-0.6 to 3.6)	(0.0 to 1.0)
Facility not disability friendly			1.2	0.6	0.6	1.0
			(-0.2 to 2.6)	(0.0 to 1.2)	(-0.6 to 1.9)	(0.1 to 1.9)
Too far away	12.4	14.3	8.0	13.2	8.1	13.7
	(4.5 to 20.3)	(8.3 to 20.3)	(2.8 to 13.3)	(10.0 to 16.4)	(3.4 to 12.9)	(10.1 to 17.3)
Not enough vaccines	12.6	22.3	10.6	9.4	6.4	10.1
	(4.9 to 20.2)	(14.7 to 29.9)	(4.6 to 16.5)	(6.3 to 12.4)	(2.3 to 10.6)	(7.2 to 13.1)
Unable to register	0.0	0.3	0.5	2.5	1.2	1.4
		(-0.2 to 0.7)	(-0.1 to 1.2)	(0.9 to 4.1)	(-0.3 to 2.7)	(0.1 to 2.7)
Work commitments	0.7	8.1	8.1	12.8	20.1	31.0
	(0.0 to 1.4)	(3.4 to 12.9)	(2.6 to 13.6)	(9.1 to 16.4)	(13.7 to 26.5)	(26.2 to 35.8)
Domestic commitments	6.4	4.2	2.2	1.3	12.0	5.4
	(2.0 to 10.8)	(0.1 to 8.3)	(-0.1 to 4.4)	(0.0 to 2.6)	(6.2 to 17.8)	(3.3 to 7.5)
Religious reasons	0.0	0.8	0.5	0.1	0.8	0.2
		(-0.4 to 1.9)	(-0.3 to 1.2)	(-0.0 to 0.2)	(-0.2 to 1.7)	(-0.1 to 0.5)
Medical reasons	17.0	2.4	9.4	1.8	13.4	4.4
	(7.4 to 26.5)	(-1.0 to 5.7)	(3.3 to 15.5)	(0.5 to 3.1)	(7.4 to 19.5)	(2.7 to 6.1)
Waiting for appointment	1.7	2.3	3.8	10.6	2.4	3.6
	(-0.1 to 3.4)	(0.1 to 4.5)	(1.5 to 6.1)	(7.4 to 13.9)	(0.6 to 4.2)	(1.6 to 5.5)
Afraid of side effects	42.9	30.4	7.0	5.4	0.0	0.0
	(30.6 to 55.2)	(22.2 to 38.5)	(3.2 to 10.8)	(2.9 to 7.9)		
Other reason	9.5	7.7	10.8	6.9	28.0	25.4
	(0.7 to 18.3)	(3.1 to 12.4)	(4.4 to 17.2)	(4.7 to 9.1)	(20.5 to 35.5)	(20.8 to 30.0)
N	177	316	270	830	277	715

Note: Reasons for pending vaccination despite being willing to get vaccinated, by gender. All values in percent. 95% confidence intervals in parentheses.

Table A6: Barriers of access (Kenya)

Barriers	Overall	Rural	Urban	Female	Male
Currently ineligible	7.4	6.1	10.0	7.4	7.3
	(3.1 to 11.6)	(0.8 to 11.3)	(2.8 to 17.1)	(2.3 to 12.5)	(0.6 to 14.1)
Too far away	23.5	24.8	20.9	22.1	24.8
	(17.7 to 29.2)	(17.1 to 32.5)	(13.1 to 28.7)	(14.8 to 29.5)	(16.0 to 33.6)
Don't know how to get	2.6	2.6	2.7	1.7	3.5
	(0.1 to 5.1)	(-1.0 to 6.1)	(0.4 to 4.9)	(0.2 to 3.2)	(-1.1 to 8.1)
Too crowded at vax site	27.8	28.0	27.3	30.2	25.4
	(21.6 to 33.9)	(19.5 to 36.5)	(20.2 to 34.4)	(21.7 to 38.7)	(16.6 to 34.2)
Facility not disability friendly	0.1	0.1	0.2	0.1	0.1
	(0.0 to 0.2)	(-0.0 to 0.1)	(-0.0 to 0.3)	(-0.0 to 0.1)	(-0.0 to 0.3)
No transport	5.3	4.9	6.0	8.4	2.3
	(2.3 to 8.3)	(1.4 to 8.5)	(0.4 to 11.5)	(2.7 to 14.1)	(0.6 to 3.9)
Not enough vaccines	25.8	26.6	24.4	25.1	26.5
	(20.0 to 31.6)	(18.5 to 34.6)	(17.8 to 31.0)	(18.0 to 32.2)	(17.4 to 35.6)
Unable to register	0.8	0.9	0.5	1.1	0.5
	(-0.0 to 1.6)	(-0.2 to 2.1)	(0.1 to 0.8)	(-0.5 to 2.7)	(0.2 to 0.8)
Too expensive to obtain	0.5	0.3	1.1	0.2	0.8
	(-0.1 to 1.1)	(0.0 to 0.5)	(-0.7 to 2.9)	(-0.0 to 0.4)	(-0.4 to 2.0)
Discouraged in community	0.4	0.4	0.3	0.3	0.5
	(0.1 to 0.7)	(-0.0 to 0.9)	(0.0 to 0.6)	(-0.1 to 0.7)	(-0.0 to 1.0)
No barriers	37.9	38.7	36.4	34.7	41.0
	(31.4 to 44.5)	(29.9 to 47.6)	(27.8 to 45.0)	(26.7 to 42.7)	(30.9 to 51.2)
Other barrier	0.0	0.0	0.0	0.1	0.0
	(-0.0 to 0.1)	(-0.0 to 0.1)	(-0.0 to 0.1)	(-0.0 to 0.1)	(-0.0 to 0.0)
N	1,732	839	893	952	777

Note: Main anticipated difficulties to get vaccinated. All values in percent. 95% confidence intervals in parentheses.

Table A7: Vaccination location

Location	Burkina Faso	Kenya	Malawi	Nigeria	Tanzania
Hospital	13.7	59.9	43.6	29.5	31.8
	(9.3 to 18.2)	(55.2 to 64.6)	(37.1 to 50.1)	(24.8 to 34.2)	(25.4 to 38.2)
Clinic	0.4	6.1	11.5	14.7	1.6
	(0.0 to 0.7)	(2.8 to 9.5)	(7.7 to 15.4)	(10.9 to 18.5)	(0.0 to 3.6)
Health center	45.4	18.3	23.4	30.7	45.1
	(39.2 to 51.7)	(14.5 to 22.1)	(17.6 to 29.2)	(25.6 to 35.8)	(38.2 to 52.1)
Pharmacy	0.1	0.0	0.0	0.5	0.1
	(0.0 to 0.3)	(-0.0 to 0.1)		(0.0 to 1.3)	(0.0 to 0.2)
Senior home	0.2	0.0	0.0	1.2	0.0
	(0.0 to 0.5)	(-0.0 to 0.0)		(0.0 to 2.7)	(0.0 to 0.1)
Mass vaccination site	35.1	8.9	20.0	12.6	11.9
	(29.2 to 40.9)	(6.7 to 11.1)	(13.8 to 26.3)	(9.3 to 15.9)	(7.5 to 16.3)
At work	1.6		1.7	3.1	1.2
	(0.4 to 2.8)		(0.3 to 3.0)	(1.5 to 4.8)	(0.2 to 2.2)
Religious center	0.8		0.3	1.8	3.5
	(0.0 to 1.6)		(0.0 to 0.6)	(0.0 to 3.7)	(0.6 to 6.5)
Other location	3.1	6.7	0.0	5.5	6.3
	(1.6 to 4.7)	(4.7 to 8.8)		(3.1 to 7.9)	(2.8 to 9.8)
N	690	3586	584	921	403

Note: Vaccination location. All values in percent. 95% confidence intervals in parentheses.

Table A8: Reasons for vaccination

Reason	Burkina Faso	Kenya	Malawi	Nigeria	Tanzania
Protecting own health only	60.8	22.7	89.9	64.1	76.8
	(55.1 to 66.5)	(18.4 to 26.9)	(86.5 to 93.3)	(59.5 to 68.7)	(70.8 to 82.9)
Protecting other's health	26.7	68.6	5.0	9.3	16.0
	(21.4 to 31.9)	(64.1 to 73.1)	(2.7 to 7.2)	(6.4 to 12.2)	(10.8 to 21.2)
Government mandate	6.9		1.1	18.7	4.0
	(4.0 to 9.8)		(0.0 to 2.4)	(14.8 to 22.5)	(1.5 to 6.5)
Attend school	0.3	0.4	0.0	0.2	0.0
	(0.0 to 0.8)	(0.0 to 0.8)	(0.0 to 0.0)	(0.0 to 0.5)	
Employer mandate	0.7	12.1	1.4	1.6	0.9
	(0.0 to 1.4)	(9.5 to 14.6)	(0.4 to 2.3)	(0.2 to 2.9)	(0.0 to 2.0)
Avoid public health measures	4.4		0.9	3.2	0.5
	(2.1 to 6.7)		(0.0 to 2.0)	(0.6 to 5.9)	(0.0 to 1.2)
Take part in social life	2.1	0.2	1.3	3.1	2.6
	(0.6 to 3.6)	(0.1 to 0.3)	(0.0 to 2.7)	(1.3 to 5.0)	(0.3 to 4.9)
Be able to travel	10.7		1.3	10.4	3.1
	(7.6 to 13.8)		(0.0 to 2.6)	(7.6 to 13.2)	(0.4 to 5.8)
People in community did it too	4.4		0.1	2.3	0.1
	(2.0 to 6.8)		(0.0 to 0.2)	(1.2 to 3.3)	(0.0 to 0.2)
Received material incentive	0.0		0.0	0.0	0.0
				(0.0 to 0.1)	
Other reason	1.4	29.7	0.2	1.3	4.1
	(0.0 to 2.9)	(25.8 to 33.7)	(0.0 to 0.4)	(0.1 to 2.5)	(0.7 to 7.5)
N	690	3,586	584	921	403

Note: Reasons for getting vaccinated. 'Other' mainly comprises of people citing ethical reasons as their motivation in Kenya (29.2%). All values in percent. 95% confidence intervals in parentheses.

Table A9: Reasons for hesitancy

Reason	Burkina Faso	Kenya	Malawi	Nigeria	Tanzania
Do not think vax works	33.2	9.5	15.1	4.7	10.5
	(25.8 to 40.6)	(3.3 to 15.8)	(9.6 to 20.6)	(2.6 to 6.8)	(7.5 to 13.5)
Worried about side effects	36.5	86.0	45.8	20.8	41.3
	(29.9 to 43.2)	(77.8 to 94.1)	(38.3 to 53.2)	(15.7 to 26.0)	(36.4 to 46.2)
Already had COVID-19	0.3			0.3	0.1
	(0.0 to 0.8)			(0.0 to 0.6)	(0.0 to 0.3)
Not enough at risk	3.9	6.1	4.8	18.7	2.8
	(1.5 to 6.3)	(1.4 to 10.8)	(1.0 to 8.5)	(14.0 to 23.3)	(1.1 to 4.6)
Don't trust vaccines generally	4.8	5.0	18.4	11.6	19.5
	(1.7 to 7.9)	(1.8 to 8.2)	(11.9 to 24.8)	(7.7 to 15.5)	(15.6 to 23.3)
Against my religion	0.4	1.9	4.9	3.1	1.4
	(0.0 to 1.3)	(-0.2 to 4.1)	(1.6 to 8.3)	(1.4 to 4.7)	(0.5 to 2.3)
Infection risk at facility	0.3	1.7	0.2	1.7	0.1
	(0.0 to 0.6)	(0.2 to 3.1)	(-0.2 to 0.5)	(0.3 to 3.1)	(0.0 to 0.3)
Facility too hard to reach	0.0	7.5	0.8	1.5	2.1
		(-1.8 to 16.8)	(-0.3 to 1.9)	(0.0 to 3.4)	(0.7 to 3.5)
Do not have time	2.2	0.4	2.9	1.9	2.2
	(0.7 to 3.6)	(-0.3 to 1.0)	(-0.7 to 6.4)	(0.0 to 4.0)	(0.8 to 3.7)
Vax available here not effective	10.3		1.7	3.0	0.4
	(6.7 to 14.0)		(-0.6 to 3.9)	(1.3 to 4.6)	(0.0 to 0.9)
Unsure if I get the vax I want	2.6		6.9	1.5	2.2
	(1.0 to 4.2)		(2.5 to 11.3)	(0.5 to 2.5)	(0.8 to 3.6)
Not a priority	8.7		21.6	11.0	10.9
	(5.3 to 12.1)		(15.0 to 28.3)	(6.8 to 15.3)	(7.9 to 13.9)
COVID-19 does not exist	8.9			16.3	2.6
	(5.2 to 12.7)			(9.9 to 22.7)	(1.0 to 4.1)
Medical reasons	0.6		0.2	2.3	2.2
	(0.0 to 1.2)		(-0.1 to 0.5)	(0.8 to 3.7)	(0.8 to 3.5)
Do not trust the government	6.1		1.8	5.0	1.7
	(3.3 to 9.0)		(-0.4 to 4.0)	(2.6 to 7.3)	(0.3 to 3.2)
Other reason	5.5	0.0	1.7	13.7	16.0
	(2.0 to 9.1)	(-0.0 to 0.1)	(0.2 to 3.2)	(9.8 to 17.6)	(12.2 to 19.7)
Do not think it is safe		45.2			
		(27.2 to 63.2)			
N	526	313	366	609	769

Note: Reasons for being hesitant to get vaccinated. All values in percent. 95% confidence intervals in parentheses.

Table A10: Most trusted information sources

Information Source	Burkina Faso	Malawi	Nigeria
Medical professional	45.2	34.3	28.7
	(41.0 to 49.4)	(30.1 to 38.6)	(25.7 to 31.7)
Scientists and epidemiologists	0.1	0.0	0.3
	(0.0 to 0.3)		(0.1 to 0.6)
Celebrities and influencers	0.0	0.9	2.3
	(0.0 to 0.1)	(0.3 to 1.6)	(1.3 to 3.3)
NGO outreach programs	0.4	1.4	1.0
	(0.1 to 0.7)	(0.3 to 2.6)	(0.4 to 1.6)
Other outreach programs	0.3	2.3	1.0
	(0.0 to 0.7)	(0.9 to 3.6)	(0.5 to 1.6)
Local government	5.7	0.5	10.1
	(4.0 to 7.4)	(0.0 to 1.3)	(8.2 to 12.1)
Federal government	0.3	0.0	8.8
	(0.0 to 0.7)		(7.2 to 10.4)
State government	6.2	0.0	6.4
	(4.4 to 8.0)		(5.0 to 7.8)
Family and neighbors	5.6	4.1	12.8
	(3.9 to 7.2)	(2.2 to 6.0)	(10.7 to 14.8)
Religious organizations	0.9	2.3	3.7
	(0.1 to 1.7)	(0.6 to 4.0)	(2.7 to 4.7)
Traditional healer	0.4	0.0	0.0
	(0.0 to 0.9)		
Traditional ruler	1.8	2.0	1.5
	(0.7 to 2.9)	(0.9 to 3.1)	(0.7 to 2.4)
Media	26.5	34.4	10.9
	(22.9 to 30.0)	(30.3 to 38.4)	(9.1 to 12.7)
Other info source	0.4	0.4	2.1
	(0.0 to 0.7)	(0.0 to 0.9)	(1.1 to 3.2)
None	1.7	4.1	5.1
	(1.0 to 2.4)	(2.5 to 5.6)	(3.8 to 6.4)
Trust all equally	4.6	13.3	5.2
	(3.2 to 5.9)	(10.6 to 16.0)	(3.8 to 6.5)
N	1,744	1,443	2,488

Note: Most trusted information sources. All values in percent. 95% confidence intervals in parentheses.

Table A11: Most trusted information sources by vaccine acceptance

Information Source	Burkina Faso		Malawi		Nigeria	
	Hesitant	Willing	Hesitant	Willing	Hesitant	Willing
Medical professional	33.5	49.2	32.5	35.0	18.7	31.2
	(26.9 to 40.1)	(44.3 to 54.1)	(24.2 to 40.8)	(30.2 to 39.7)	(13.7 to 23.8)	(27.9 to 34.5)
Scientists and epidemiologists	0.5	0.0	0.0	0.0	0.0	0.4
	(0.0 to 1.0)	(0.0 to 0.1)			(0.0 to 0.1)	(0.1 to 0.7)
Celebrities and influencers	0.0	0.0	0.3	1.1	2.9	2.1
		(0.0 to 0.1)	(0.0 to 1.0)	(0.2 to 1.9)	(0.2 to 5.7)	(1.1 to 3.2)
NGO outreach programs	0.2	0.5	0.1	1.9	0.4	1.1
	(0.0 to 0.4)	(0.1 to 0.8)	(0.0 to 0.3)	(0.4 to 3.4)	(0.0 to 0.9)	(0.5 to 1.8)
Other outreach programs	0.1	0.4	1.8	2.4	1.5	0.9
	(0.0 to 0.4)	(0.0 to 0.8)	(0.0 to 4.3)	(0.8 to 4.0)	(0.0 to 3.0)	(0.4 to 1.5)
Local government	3.0	6.6	0.0	0.7	3.2	11.9
	(0.8 to 5.2)	(4.5 to 8.8)	(0.0 to 0.1)	(0.0 to 1.7)	(1.0 to 5.3)	(9.5 to 14.2)
Federal government	1.0	0.0	0.0	0.0	7.1	9.2
	(0.0 to 2.8)	(0.0 to 0.0)			(3.2 to 11.0)	(7.4 to 11.0)
State government	8.1	5.6	0.0	0.0	5.7	6.6
	(4.4 to 11.7)	(3.4 to 7.7)			(2.6 to 8.8)	(5.0 to 8.2)
Family and neighbors	4.5	5.9	3.5	4.3	17.1	11.7
	(1.9 to 7.0)	(3.9 to 7.9)	(1.4 to 5.6)	(2.0 to 6.7)	(12.4 to 21.7)	(9.5 to 13.9)
Religious organizations	0.3	1.1	1.1	2.7	5.4	3.3
	(0.0 to 0.6)	(0.1 to 2.2)	(0.0 to 2.6)	(0.7 to 4.7)	(2.3 to 8.4)	(2.3 to 4.3)
Traditional healer	1.0	0.2	0.0	0.0	0.0	0.0
	(0.0 to 2.9)	(0.0 to 0.4)				
Traditional ruler	0.8	2.1	1.2	2.2	1.4	1.6
	(0.0 to 1.9)	(0.7 to 3.6)	(0.0 to 2.3)	(0.8 to 3.6)	(0.0 to 3.2)	(0.6 to 2.5)
Media	34.1	23.9	37.6	33.3	12.7	10.5
	(27.2 to 40.9)	(20.1 to 27.7)	(29.8 to 45.4)	(28.7 to 37.8)	(8.4 to 17.0)	(8.6 to 12.4)
Other info source	1.4	0.0	0.4	0.4	4.2	1.6
	(0.0 to 2.9)		(0.0 to 1.2)	(0.0 to 1.0)	(1.0 to 7.4)	(0.5 to 2.7)
None	6.5	0.1	11.4	1.6	14.0	2.8
	(3.8 to 9.1)	(0.0 to 0.2)	(6.2 to 16.6)	(0.6 to 2.6)	(9.4 to 18.7)	(1.7 to 4.0)
Trust all equally	5.3	4.3	10.1	14.3	5.6	5.1

	(3.0 to 7.6)	(2.8 to 5.8)	(6.1 to 14.1)	(10.9 to 17.7)	(2.3 to 8.9)	(3.7 to 6.5)
N	483	1,261	366	1,077	477	2,021

Note: Most trusted information sources by vaccine acceptance. All values in percent. 95% confidence intervals in parentheses.

Table A12: Vaccine ambassadors

Ambassador	Burkina Faso	Kenya	Malawi	Nigeria	Tanzania
At least some ambassador	42.1	44.0	36.1	58.2	77.3
	(35.8 to 48.3)	(25.2 to 62.9)	(27.2 to 45.0)	(52.3 to 64.1)	(73.1 to 81.4)
Family	28.3	17.6	29.9	42.7	12.1
	(21.5 to 35.1)	(8.2 to 27.1)	(21.2 to 38.6)	(36.9 to 48.6)	(8.9 to 15.4)
Religious leader	23.4	11.2	25.4	44.0	20.4
	(17.1 to 29.7)	(3.9 to 18.6)	(17.6 to 33.2)	(38.0 to 50.0)	(16.2 to 24.6)
Medical professional	34.5	34.8	26.6	40.1	31.9
	(28.1 to 40.9)	(15.3 to 54.3)	(19.1 to 34.2)	(34.5 to 45.7)	(27.2 to 36.5)
Community leader	22.4	7.3	19.3	35.5	9.5
	(16.1 to 28.7)	(3.2 to 11.4)	(12.4 to 26.2)	(29.9 to 41.1)	(6.4 to 12.6)
Traditional healer	19.2	5.8	11.0	24.4	2.8
	(13.0 to 25.3)	(2.2 to 9.4)	(5.9 to 16.2)	(19.8 to 29.0)	(1.2 to 4.3)
Scientist and epidemiologists	21.8	23.1	16.2	32.3	13.4
	(15.5 to 28.1)	(4.0 to 42.1)	(10.1 to 22.3)	(27.7 to 37.0)	(10.1 to 16.8)
Celebrities and influencers	16.9	5.8	13.5	22.6	4.2
	(10.8 to 23.0)	(2.2 to 9.4)	(8.0 to 19.0)	(18.4 to 26.8)	(2.2 to 6.2)
Other ambassador	2.3	5.9	0.0	1.1	37.2
	(0.5 to 4.2)	(1.9 to 9.8)	(0.0 to 0.1)	(0.1 to 2.2)	(32.3 to 42.2)
N	526	313	366	609	769

Note: People whose recommendation would make the hesitant more likely to get vaccinated. All values in percent. 95% confidence intervals in parentheses.

Table A13: Information channels

Channel	Burkina Faso	Malawi	Nigeria
In person	44.9	61.7	42.8
	(40.9 to 48.9)	(57.3 to 66.0)	(39.9 to 45.7)
Posters, billboards and flyers	9.5	2.4	3.2
	(7.3 to 11.6)	(0.8 to 4.1)	(2.0 to 4.3)
Radio	67.0	51.1	58.8
	(63.1 to 70.9)	(47.0 to 55.3)	(55.7 to 61.9)
TV	36.1	4.5	25.2
	(32.3 to 39.9)	(2.8 to 6.2)	(22.2 to 28.3)
SMS	2.6	3.0	5.7
	(1.2 to 4.1)	(1.6 to 4.4)	(4.4 to 7.0)
Phone	5.0	2.8	11.1
	(3.5 to 6.6)	(1.4 to 4.2)	(9.2 to 12.9)
Newspaper	6.6	0.7	5.6
	(4.8 to 8.5)	(0.3 to 1.0)	(4.3 to 6.9)
Social media	8.5	2.9	10.3
	(6.6 to 10.3)	(1.4 to 4.3)	(8.6 to 12.0)
Other internet channel	0.7	0.0	3.7
	(0.0 to 1.3)	(0.0 to 0.1)	(2.5 to 4.9)
Other information channel	1.3	2.5	3.0
	(0.4 to 2.3)	(1.2 to 3.7)	(1.8 to 4.2)
N	1,738	1,442	2,493

Note: Information channels through which the most trusted information on COVID-19 was obtained. All values in percent. 95% confidence intervals in parentheses.

Table A14: Perceived vaccine acceptance

Estimate	Burkina Faso	Malawi	Nigeria	Tanzania
Estimated national acceptance	74.4	75.1	78.4	63.3
	(71.5 to 77.2)	(71.1 to 79.1)	(75.8 to 80.9)	(60.2 to 66.3)
Average perceived acceptance	43.2	47.7	59.1	43.6
	(40.6 to 45.8)	(45.1 to 50.3)	(56.8 to 61.3)	(40.6 to 46.7)
Perceived acceptance (hesitant)	22.7	32.5	25.7	25.6
	(19.2 to 26.2)	(27.8 to 37.2)	(20.9 to 30.5)	(20.8 to 30.3)
Perceived acceptance (willing)	49.3	52.5	64.8	51.5
	(46.7 to 51.9)	(49.9 to 55.1)	(62.5 to 67.0)	(48.1 to 55.0)
N (national)	1,847	1,447	2,934	2,196
N (perceived)	1,551	1,287	1,995	1,416
N (hesitant)	389	315	280	407
N (willing)	1,162	972	1,714	1,009

Note: Average perceived acceptance of COVID-19 vaccines in one's community. All values in percent. 95% confidence intervals in parentheses.

Table A15: Decisionmaker within the household

Decisionmaker	Burkina Faso	Malawi	Nigeria	Tanzania
Each adult for themselves	50.9	42.0	18.3	37.1
	(46.7 to 55.2)	(37.6 to 46.5)	(15.2 to 21.5)	(34.0 to 40.3)
All adults together	6.6	17.9	6.6	18.2
	(4.9 to 8.3)	(15.3 to 20.5)	(5.2 to 8.0)	(15.8 to 20.5)
Household head	42.3	39.4	69.0	44.4
	(37.9 to 46.8)	(35.4 to 43.4)	(65.5 to 72.6)	(41.1 to 47.7)
Other household member	0.1	0.6	6.0	0.3
	(0.0 to 0.3)	(0.0 to 1.4)	(4.3 to 7.8)	(0.1 to 0.6)
N	1,744	1,343	2,386	2,131

Note: Decisionmaker within the household about vaccine uptake of adult household members. All values in percent. 95% confidence intervals in parentheses.

Table A16: Likelihood to encourage others

Likelihood	Burkina Faso	Malawi	Nigeria	Tanzania
1. Very likely	22.9	80.7	72.1	76.4
	(18.2 to 27.7)	(75.0 to 86.4)	(67.3 to 76.9)	(70.7 to 82.2)
2. Somewhat likely	58.4	13.0	23.6	18.4
	(52.9 to 63.8)	(8.2 to 17.8)	(19.0 to 28.3)	(13.2 to 23.5)
3. Neither likely nor unlikely	12.1	3.8	1.8	2.5
	(8.5 to 15.8)	(1.2 to 6.4)	(0.6 to 3.1)	(0.0 to 5.0)
4. Somewhat unlikely	6.5	0.3	1.4	1.4
	(3.6 to 9.4)	(0.0 to 0.6)	(0.2 to 2.5)	(0.0 to 3.1)
5. Very unlikely	0.1	2.2	1.1	1.3
	(0.0 to 0.2)	(0.3 to 4.0)	(0.3 to 1.8)	(0.0 to 3.4)
N	690	584	921	402

Note: Likelihood to encourage others to get vaccinated among those already vaccinated. All values in percent. 95% confidence intervals in parentheses.