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Health status associated with SARS-CoV-2 risk perceptions in Sierra Leone and Zimbabwe

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Abstract

Background & Aims. The COVID-19 pandemic had a significant impact on health in countries of every income level. While much is known about risk factors for COVID-19 severity, less is known about the relationship between COVID related risk perceptions and behaviors, particularly in low-income settings. The purpose of this study is to investigate the relationship between existing health status and COVID-19 risk perceptions and behaviors in Sierra Leone and Zimbabwe.

Methods. Data for this study came from a cross-sectional survey conducted simultaneously among 1158 adults in Sierra Leone and 1154 in Zimbabwe during July and August of 2022. Respondents were recruited from among communities served by the Christian Health Association of Sierra Leone (CHASL) and Zimbabwe Association of Church-Related Hospitals (ZACH), both members of the Africa Christian Health Associations Network (ACHAP).

Results. The relationship between health status and COVID-19 risk perceptions and behaviors varied significantly by health condition. Cardiovascular disease was significantly associated with heightened perceptions of COVID-19 risk, heightened perceived safety of COVID vaccines, and subsequent greater vaccine acceptance while cancer was likewise statistically significant in each of lower perceived susceptibility, perceived safety, and vaccination uptake. Similarly, obesity was associated with both lower perceived susceptibility of COVID-19 and decreased perceived safety of COVID vaccines.

Conclusion. Results suggest that the association between health conditions and COVID perceptions and behaviors is neither clear nor consistent across a variety of NCDs. Hence, findings from this study may inform public health interventions aimed at reducing

COVID-19 morbidity and mortality, including increasing vaccine acceptance and uptake in Sierra Leone and Zimbabwe. Further, findings potentially have broader implications for understanding how health status is associated with COVID-19 risk perceptions in other LMICs.

Key Words: COVID-19, Zimbabwe, Sierra Leone, Health status, Risk factors

Introduction

The COVID-19 pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has had a devastating impact on global health. As of April 2023, there have been over 676 million confirmed cases and 6.8 million reported deaths worldwide.[1] Despite lower COVID-19 case and death totals on the African continent when compared to the Americas, Asia, and Europe, the pandemic has nonetheless been destructive in Africa. The World Health Organization (WHO) African Region reported more than 8.9 million cases and 174,243 deaths as of 2023 May 2.[2] Sierra Leone and Zimbabwe are two countries in Sub-Saharan Africa that have been differentially impacted by the pandemic. Sierra Leone, home to 8.42 million people, has experienced 7,760 cases and 126 COVID-19 deaths.[1] With a population of approximately 15.5 million, Zimbabwe has experienced 264,276 cases and 5,671 COVID-19 deaths.[1]

Much is now known about risk factors for COVID-19 severity. Significant demographic risk factors include older age, male sex, and ethnicity.[3] Health status risk factors include the presence of underlying noncommunicable diseases (NCDs), such as cardiovascular diseases (CVD), diabetes, obesity, asthma, and chronic respiratory diseases (CRD).[3] These NCD comorbidities significantly increase the risk of severe COVID-19 morbidity and mortality. This is consistent with increased risk of early death from NCDs at large. NCDs are globally responsible for more deaths than all other causes combined, with CVD, CRD, cancer, and diabetes responsible for 84% of global mortality.[4,5] Although the burden of NCDs is escalating across all regions in the world, research indicates that NCDs have a disproportionately high impact on low-and middle-income countries (LMICs).[5]

The COVID-19 pandemic has highlighted the importance of understanding how people perceive health risks generally and, specifically, those risks associated with SARS-CoV-2. It is essential that public health professionals understand the factors and influences shaping COVID-19 risk perceptions.[6] Moreover, understanding how an individual's COVID-19 risk assessment impacts subsequent behavior is key to public health programming and messaging. Both Sierra Leone and Zimbabwe are LMICs with fragile health systems and a high burden of both communicable and non-communicable diseases with the potential to exacerbate the impact of COVID-19. Little is known, however, about how health status in these nations may be associated with SARS-CoV-2 behaviors and risk perceptions. It is possible that individuals with poorer health status may have a greater perceived susceptibility of contracting the virus and may take more precautions to avoid infection. To date, no study has explored this potential association in either Sierra Leone or Zimbabwe. The purpose of the study is to investigate the relationship between health status and COVID-19 risk perceptions in Sierra Leone and Zimbabwe. Specifically, this study aims to explore whether individuals with poorer health status: 1) have a greater perceived susceptibility of contracting SARS-CoV-2; 2) engage in more preventive behaviors; and 3) have different attitudes towards COVID-19 vaccination. The findings from this study may inform public health interventions aimed at reducing the transmission of COVID-19 in Sierra Leone and Zimbabwe and potentially have broader implications for

understanding how health status is associated with risk perceptions in other LMICs.

Methods

Design. Data for this study came from a cross-sectional survey conducted simultaneously in Sierra Leone and Zimbabwe during July and August of 2022. Data collection was part of the Africa Christian Health Associations Platform (ACHAP) CoV-FaB project ("Promoting COVID-19 Vaccine Equity through Faith-Based Networks in Africa") which aimed to increase the uptake of COVID-19 vaccination in project communities. The survey sought to gain an understanding of COVID-19 attitudes and predictors of vaccine acceptance in both Sierra Leone and Zimbabwe. In both countries, face-to-face interviews were conducted using a survey instrument designed by ACHAP with the agreement of global consortium partners, IMA World Health and Internews, and in-country implementing partners, the Christian Health Association of Sierra Leone (CHASL) and Zimbabwe Association of Church-Related Hospitals (ZACH). The project adapted the Centers for Disease Control and Prevention (CDC) Rapid Community Assessment guide for COVID-19 vaccines for the community survey tool.

Sample. Participants in this study were local faith leaders, healthcare workers, community leaders, journalists, and other community members in areas served by local ACHAP partners. The sample was selected using a nationally stratified sample. Specifically, communities from the areas where ACHAP partners operated were randomly selected for inclusion. Within each selected community, convenience sampling was applied to identify study participants. Efforts were made to survey both men and women and participants in both urban and rural communities, factors which could influence vaccine hesitancy. In Sierra Leone, 1,158 responses were collected while 1,154 responses were gathered in Zimbabwe. The total sample included 2,312 respondents.

Procedure. Participants were recruited from the communities within the project catchment to participate in a face-to-face interview and were asked to acknowledge their interest and willingness by providing their contact information and scheduling a date to meet with the data collection team. Interviewers were recruited by CHASL in Sierra Leone and ZACH in Zimbabwe and completed a 3-day training on data collection tools and methods. Face-to-face interviews were conducted in participants' homes using a preset questionnaire and lasted approximately 20 minutes. Interviews were generally conducted in English with translation to local language being provided when needed. Participation was voluntary and informed consent was obtained. Only those aged 18 and above were eligible. The collected data was coded into a database and checked for errors. Ethical clearance for publication of study's data was approved by the Brigham Young University Institutional Review Board (IRB#: IRB2023-026).

Measurement. Project partners (ACHAP, IMA World Health, Internews, CHASL, and ZACH) collaboratively developed the survey instrument (see Appendix A). Focus groups in both Sierra Leone and Zimbabwe were used to test the questionnaire. Based on focus group feedback the survey was further revised before use in the field. The instrument consisted of 27 items addressing five specific areas: demographics and health, experience with COVID-19, likelihood of getting vaccinated, vaccination confidence, and vaccine information. Health conditions, including cancer, immunocompromised state due to therapy or disease, cardiovascular disease, obesity, diabetes, pulmonary disease, and any other underlying condition were self-reported as participants were asked "Do you have any of the following conditions?" In the analysis of results, a high perceived susceptibility is attributed to those who were "very concerned" they could contract COVID-19 at work or in public and infect friends and family. Perceived safety of the vaccine is considered as high when respondents felt the COVID-19 vaccine was "very safe." A positive vaccination status is defined as those who self-reported receiving any COVID-19 vaccine dose.

Analysis. Data were analyzed using STATA 17 (College Station, Texas). The study sample and health conditions were described using frequency statistics and Chi-square test statistics to identify differences between Sierra Leone and Zimbabwe. Logistic regression analysis was used to examine the association between health conditions and perceived susceptibility, perceived safety of vaccine, and vaccination status. All models controlled for gender, level of education, country/setting, and role within ACHAP.

Results

Key demographic information including gender, age, education, group, and health condition for participants from both study countries is presented in Table 1. In Sierra Leone, 48.9% were female, while in Zimbabwe, 57.0% of respondents were female. Overall, 52.9% of all respondents were female. The majority of respondents in both countries fell between the ages of 25 and 49, with 52.4% in Sierra Leone and 48.1% in Zimbabwe. The second-largest age group was 20-24 in Sierra Leone with 23.2% and 50+ in Zimbabwe with 28.9%. In terms of education, in Sierra Leone, the majority had primary education as highest achievement with 51.9% and most respondents in Zimbabwe had secondary education with 67.0%. Most respondents identified themselves as (general) community members; 67.5% in Sierra Leone and 68.9% in Zimbabwe. The second-largest group was faith leaders in Sierra Leone with 6.6% and community leaders in Zimbabwe with 5.6%. Finally, the proportion of respondents reporting a health condition in Sierra Leone was 29.0% and Zimbabwe was 26.2%. Overall, 27.6% of all respondents reported a health condition.

Table 1. Demographics

Indicator	**Sierra Leone**	**Zimbabwe**	**Total**
	N=1158	N=1154	N=2312
	% (n)	% (n)	% (n)
Female	48.9 (566)	57.0 (658)	52.9 (1223)
Age (years)			
10-19	9.6 (111)	9.8 (113)	9.7 (224)
20-24	23.2 (269)	13.2 (152)	18.2 (421)
25-49	52.4 (607)	48.1 (555)	50.3 (1163)
50+	14.8 (171)	28.9 (334)	21.8 (504)
Education			
Primary	20.5 (237)	25.2 (291)	22.9 (529)
Secondary	51.9 (601)	67.0 (773)	59.5 (1376)
Tertiary	27.6 (320)	7.8 (90)	17.7 (409)
Group			
Community member	67.5 (782)	68.9 (795)	68.2 (1577)
Faith leader	6.6 (76)	4.2 (48)	5.4 (125)
Healthcare worker	6.6 (76)	1.5 (17)	4.0 (92)
Community leader	11.4 (132)	5.6 (65)	8.5 (197)
Other	7.9 (91)	19.9 (230)	13.9 (321)
Has a health condition	29.0 (336)	26.2 (302)	27.6 (638)

Table 2 presents the prevalence of NCDs in both Sierra Leone and Zimbabwe. NCDs listed include cancer, immunocompromised conditions, cardiovascular disease, other underlying conditions, diabetes, obesity, and pulmonary disease. The prevalence of cancer was highest in Sierra Leone at 1.8% and 0.4% for Sierra Leone (p<.01) and 1.1% overall. Immunocompromised conditions had an overall prevalence of 4%, with 5.4% in Zimbabwe and 2.7% in Sierra Leone (p<.01). There was no significant difference in CVD, which had a prevalence of 7.8% in Zimbabwe and 9.5% in Sierra Leone. Other underlying conditions had a prevalence of 9.2% in Zimbabwe and 5.1% in Sierra Leone (p<.05), and a total prevalence of 7.1% for both countries. The prevalence of diabetes was 3.4% in Zimbabwe and 5.6% in Sierra Leone (p<.05), and 4.5% for both countries combined. Obesity was most prevalent in Sierra Leone (4%) compared to 0.6% in Zimbabwe (p<.01) with an overall prevalence of 2.3% for both countries combined. In Zimbabwe, 4% of respondents said they had a pulmonary disease with 3.1% in Sierra Leone and 3.6% overall. Apart from CVD and pulmonary disease, all the other comparisons between the two countries were statistically significant.

Table 2. Prevalence of NCDs

Health Condition	Sierra Leone	Zimbabwe	Total
Cancer	1.8	0.4	1.1***
Immunocompromised	2.7	5.4	4.0***
Cardiovascular disease	9.5	7.8	8.7
Other underlying conditions	5.1	9.2	7.1***
Diabetes	5.6	3.4	4.5**
Obesity	4.0	0.6	2.3***
Pulmonary disease	4.0	3.1	3.6

Note. *** p<.01, ** p<.05

Associations for health conditions and perceived susceptibility are presented in Table 3. These estimates adjust for gender, level of education, country/setting, and role within ACHAP. Hence, the sample evaluated includes all participants from both countries combined. Those with cancer (OR= 0.105), obesity (OR= 0.503), and "other conditions" (OR= 0.703) were less likely to report perceived susceptibility of COVID-19 infection while those with cardiovascular diseases perceived greater risk (OR= 1.544). No association was demonstrated for diabetes, immunocompromised, and pulmonary disease.

Table 3. Regression estimates for health conditions and perceived susceptibility

perceived susceptibility	Odds Ratio	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Cancer	.105	.078	-3.01	.003	.024	.455	***
Immunocompromised	.825	.194	-0.82	.414	.521	1.308	
Cardiovascular	1.544	.249	2.70	.007	1.126	2.117	***
Obesity	.503	.169	-2.05	.041	.261	.971	**
Diabetes	.94	.206	-0.28	.776	.612	1.443	
Pulmonary disease	.808	.202	-0.85	.393	.495	1.319	
Other conditions	.703	.125	-1.98	.048	.495	.997	**

Note. *** p<.01, ** p<.05, * p<.1; Each row represents a unique model that examines the relationship between perceived susceptibility to COVID and health condition, and controls for sex, country, education, and community status.

Associations for health conditions and perceived safety of COVID-19 vaccine are presented in Table 4. Based on the logistic regression results, those who perceived the COVID vaccine to be very safe was significantly lower for those with cancer (OR= 0.233) and obesity (OR= 0.513), while the perceived safety of the COVID vaccine was significantly higher for cardiovascular disease (OR= 1.472). The coefficients for immunocompromised, diabetes, pulmonary disease, and "other conditions" are not statistically significant ($p > .1$), indicating that these health conditions are not significantly associated with perceived vaccine safety after controlling for sex, country, education, and community status.

Table 4. Regression estimates for health conditions and perceived safety of COVID-19 vaccines

Perceived Safety	Odds Ratio	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Cancer	.233	.13	-2.61	.009	.078	.696	***
Immunocompromised	.975	.213	-0.12	.907	.635	1.496	
Cardiovascular	1.472	.229	2.49	.013	1.085	1.995	**
Obesity	.513	.169	-2.03	.043	.269	.978	**
Diabetes	.956	.201	-0.21	.831	.633	1.444	
Pulmonary disease	.701	.169	-1.47	.141	.437	1.124	
Other conditions	1.013	.168	0.08	.939	.731	1.403	

Note. *** p<.01, ** p<.05, * p<.1; Each row represents a unique model that examines the relationship between perceived safety of COVID vaccine and health condition and controls for sex, country, education, and community status.

Results of logistic regression modeling exploring the association between COVID vaccine status and each health condition are presented in Table 5. Each row in the table represents a unique statistical model that is controlled for sex, country, education, and community status. The study found that those with cancer (OR= 0.229) were significantly less likely to be vaccinated, while those with cardiovascular disease (OR= 1.52) were more likely to be vaccinated. While not significant, those with obesity and those with "other conditions" were generally less likely to be vaccinated. The coefficients for immunocompromised, diabetes, and pulmonary disease are not statistically significant, indicating that these health conditions are not significantly associated with vaccine status after controlling for sex, country, education, and community status.

Table 5. Regression estimates for health conditions and vaccination status

Vaccinated	Odds Ratio	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Cancer	.229	.12	-2.80	.005	.082	.642	***
Immunocompromised	1.016	.226	0.07	.943	.657	1.572	
Cardiovascular	1.52	.245	2.60	.009	1.108	2.083	***
Obesity	.534	.182	-1.84	.066	.273	1.041	*
Diabetes	1.087	.234	0.39	.697	.714	1.657	
Pulmonary disease	.794	.195	-0.94	.348	.491	1.285	
Other conditions	.713	.124	-1.95	.052	.508	1.002	*

Note. *** p<.01, ** p<.05, * p<.1; Each row represents a unique model that examines the relationship between vaccine status and health condition and controls for sex, country, education, and community status

Discussion

The purpose of the study was to investigate the relationship between health status and COVID-19 risk perceptions in Sierra Leone and Zimbabwe. Specifically, this study sought to explore whether individuals with poorer health status have a greater perceived susceptibility of SARS-CoV-2, have different attitudes towards COVID-19 vaccination, and engage in more preventive behaviors. Findings varied significantly depending upon health conditions. CVD was significantly associated with heightened perceptions of COVID-19 risk, heightened perceived safety of COVID vaccines, and subsequent greater vaccine acceptance while cancer was likewise statistically significant in each of these variables, yet in the opposite direction. Cancer findings in the current study have some support from the extant literature, though reports from other studies are mixed. Similar to cancer, obesity was associated with both lower perceived susceptibility of COVID-19 and decreased perceived safety of COVID vaccines. Such stark variation for obesity is odd given the well-established correlation between obesity and COVID-19 morbidity and mortality.[7-9]

Participants with CVD in the current study accurately perceived their significantly elevated risk of COVID-19 morbidity and mortality. CVDs, including hypertension, are significant risk factors for severe COVID-19 disease and death.[7] A meta-analysis inclusive of more than 43,000 study participants, identified hypertension as a significant risk factor for mortality among patients hospitalized with COVID-19.[9] In their study of 191 Chinese patients hospitalized with a SARS-CoV-2 infection, approximately half (48%) had a comorbidity, with hypertension (30%) being the most common ailment, followed by diabetes (18%), and coronary heart disease (8%). Finally, a meta-analysis including only studies from Sub-Saharan Africa concluded that hypertension significantly increases the risk of COVID-19 mortality.[10] Based upon these studies, participants in the current study accurately perceived their heightened susceptibility for COVID-19 morbidity and mortality.

Given previous research findings demonstrating a strong link between obesity and COVID related morbidity and mortality,[11] it is somewhat surprising that obese participants in this study reported less perceived susceptibility to COVID-19 than non-obese participants. Still, this finding is consistent with findings in Canada demonstrating more ambivalence towards COVID-19 among obese people.[12] However, this is the opposite of other research in Kuwait reporting higher rates of positive

COVID-19 related behaviors among obese study participants.[13] Such conflicting results may be due to levels of COVID-19 education and understanding. For example, recent research found a lack of understanding of the higher risk of COVID for those who are overweight or obese.[14]

Participants in the current study did not perceive an elevated susceptibility of COVID-19 due to cancer. While those with certain cancers, including leukemia, have been especially susceptible to SARS-CoV-2, the link between cancer and severe COVID-19 illness and mortality is considerably weaker than that of diabetes, obesity, CVD, and COPD.[15,16] Just weeks into the COVID-19 pandemic, Liang et al. noted that immunosuppressive treatments would place cancer patients at significantly higher COVID-19 risk.[17] However, accounting for age, sex, and other comorbidities, together with the frequent and often prolonged delays in cancer treatment and care due to the prioritizing of COVID-19 by health systems, accurately determining the risk of SARS-CoV-2 on cancer patients has been challenging. In reporting on a large prospective cohort study, Lee et al. concluded that associations between cancer and COVID-19 mortality are largely due to advancing age and other non-cancer comorbidities, not necessarily cancer or cancer treatments.[18] It appears based on the literature available that while participants in the current study inaccurately perceived the risk between obesity and COVID-19 morbidity and mortality, they may have been astute in their perception of cancer and COVID-19.

Participants in the current study with CVD perceived COVID-19 vaccines to be safe. Both cancer and obesity, however, were found to be associated with increased vaccine hesitancy in the current study. According to the Strategic Advisory Group of Experts on Immunization (SAGE), vaccine hesitancy refers to a delay in acceptance or refusal of a vaccine despite its availability.19 Vaccine hesitancy generally stems from factors related to complacency, convenience, and/or confidence.[19] Complacency implies a low perception of the disease risk rendering a subsequent vaccine unnecessary or of insufficient value when calculating a benefit-risk assessment. This is consistent with cancer patients in the current study who perceived COVID-19 as an insignificant health threat and COVID-19 vaccines to be unsafe or of little benefit, thus predicting lower vaccine uptake or complacency.

In light of previous research, the link between vaccine hesitancy and both cancer and obesity found in this study may not be too surprising. Tsai et.al. found vaccine hesitancy remained high in their study sample despite serious comorbidities and concluded that assuming the most vulnerable will automatically accept COVID-19 vaccination is erroneous.[20] Further, Noronha et al. surveyed cancer patients in Mumbai, India and found high rates of vaccine hesitancy due to fear of the vaccine impacting cancer treatments, fear of harsh side-effects, and a general lack of information related to COVID-19 vaccines.[21] Similarly, Mejri et al. found that cancer patients in Tunisia had significant concerns surrounding a COVID-19 vaccine interfering with existing and ongoing cancer treatments and the subsequent outcome of those treatments.[22] Lastly, a recent study found that participants who were obese or overweight were more likely to report vaccine hesitancy.[23] Still other emerging literature suggests the picture is not clear cut one way or the other. For example, Rodriguez et al. found COVID-19 vaccine uptake among cancer patients in Puerto Rico had twice the odds of getting vaccinated than individuals without cancer.[24]

It is important to discuss several nonsignificant findings in the current study. In addition to statistically significant misunderstandings and false perceptions related to perceived susceptibility to COVID-19 due to obesity and other conditions, participants in this study were similarly uninformed of the heightened threat for COVID infection due to diabetes and pulmonary disease, neither of which were found to be significant in any of this study's analyses. Indeed, like CVDs, hypertension, and acute kidney injury, diabetes and COPD are significant risk factors for severe COVID-19 disease and death.7 Diabetic patients are more likely to die from COVID-19 than COVID-19

cases without diabetes.[25] Likewise, patients with COPD and COVID-19 have higher rates of hospitalization and death.[26] Both the significant and non-significant findings from this study may have implications for other disease control and prevention efforts. Efforts to prevent respiratory infections, generally, including Respiratory Syncytial Virus (RSV) and influenza, should focus on addressing misperceptions and misunderstandings while increasing perceived severity among those with comorbidities including obesity, diabetes, and pulmonary disease. Such efforts may help to increase uptake of available vaccines and other prevention efforts among these high-risk populations.

It is notable that COVID-19 and the NCDs included in the current study appear to have a bi-directional relationship. NCDs are risk factors for severe COVID-19 disease and poor health outcomes while infection with COVID-19 has been associated with subsequent development of NCDs such as diabetes and CVD.[27]

Fortunately, the direct morbidity and mortality impact of COVID-19 was comparatively minor in Africa relative to other regions of the world. However, COVID-19 has negatively impacted many weak or stressed health systems in Sub-Saharan Africa and posed a major indirect risk of disrupting ongoing measures for prevention, management, and treatment of both non-communicable and communicable disease. A World Health Organization (WHO) rapid assessment in 163 countries found that NCD prevention and care in LMICs were severely disrupted during the COVID-19 pandemic because pandemic-imposed lockdowns posed barriers to access and because health systems were overwhelmed with COVID-19 cases, leaving few staff or facilities to tend to those with NCDs.[28] An interim report by WHO on a survey of 41 Sub-Saharan countries showed that management of hypertension was affected in 59% of the countries, while management of complications due to type-2 diabetes was affected in 56% of the countries.[28] In Zimbabwe, 60% of interviewees of an online survey indicated that they had challenges accessing treatment for NCDs.[29] Similarly, in Sierra Leone, routine treatment for tuberculosis was severely disrupted due to COVID-19 control strategies including lockdowns.[30]

This study has multiple limitations. While nearly 30% of the respondents reported at least one health condition, the proportion of individuals reporting each health condition was relatively low resulting in small sample sizes. Also, all health conditions were self-reported which may lead to both underreporting and overreporting, which could confound or attenuate the findings.

Conclusion

The findings from this study may inform public health interventions aimed at reducing COVID-19 morbidity and mortality, including increasing vaccine acceptance and uptake in Sierra Leone and Zimbabwe. Findings, potentially, have broader implications for understanding how health status is associated with COVID-19 risk perceptions in other LMICs. Results suggest that the association between health conditions and COVID perceptions and behaviors is neither clear nor consistent across a variety of NCDs. Additional research and investigation are needed, particularly qualitative approaches with the ability to gain insight into the perceptions of those with cancer and persons with obesity.

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Appendix A. Questionnaire on COVID-19 vaccine hesitancy and confidence in communities

Country:	District: Ward:
Respondent ID:	Age range of respondent (years): a. 10 – 19 Years b. 20 – 24 Years c. 25 – 49 years d. 50 Years and above
Gender:	Profession:
Respondent category: a. Faith leader b. Health care worker c. Community leader d. Journalist e. Community member f. Other	
Educational level:	

1. Do you have any of the following conditions? [select all that apply]

Cancer	
Immunocompromised state due to therapy or disease	
Cardiovascular disease	
Other underlying condition	
Obesity	
Diabetes (type 1 or 2)	
Pulmonary disease	

2. To your knowledge, have you had COVID-19 before)? Circle:
   - ☐ Yes
   - ☐ No
   - ☐ I don't know

3. IF "Yes in (2) above," describe the status of condition you had, or are receiving:
   - ☐ I had suspected symptoms, but I didn't verify with a doctor and/or specific exams
   - ☐ No
   - ☐ Yes, with no symptoms
   - ☐ Yes, with mild symptoms
   - ☐ Yes, with severe symptoms

4. IF "Yes in (2) above," describe the level of care you received, or are receiving:
   - ☐ Did not seek medical care
   - ☐ Received medical care but was not hospitalized
   - ☐ Was hospitalized

5. If you have refused a vaccine in the past that was recommended to you by a healthcare worker – what was/were the reason(s)? [check all reasons that applied to that situation]

I never refused a vaccine recommended by a healthcare worker	
Did not think it was needed	
Did not have enough information on the vaccine	
Did not think the vaccine was effective	
Did not think the vaccine was safe	
I was concerned about side effects	
I had a bad experience with a previous vaccination	
Did not know where to get vaccination	
Other logistic problems	

6. How concerned are you of:

	Not at all	A little	Somewhat	Very
Contracting COVID-19 at work? (For example: office and other work settings that are not your home)				
Contracting COVID-19 outside of work? (For example: at the grocery store, when you are using transportation, or in other aspects of your daily life)				
Infecting your family or friends with COVID-19?				

7. Do you personally know anyone in your family, group of friends, or community networks who became seriously ill or died because of COVID-19?
   - ☐ Yes
   - ☐ No

8. Have you received a COVID-19 vaccine?
   - ☐ Yes
   - ☐ No

9. What is your perceived risk of the covid-19 vaccine?
   - ☐ Less risky
   - ☐ Somewhat risky
   - ☐ Extremely risky
   - ☐ I don't Know

10. Did you receive a vaccine product that requires only one dose or two doses?
    - ☐ One dose
    - ☐ Two doses
    - ☐ I don’t know

11. During what month/year did you receive the first dose of COVID-19 vaccine? _____

12. During what month/year did you receive the second dose of COVID-19 vaccine*? _____

13. Many COVID-19 vaccines have already been approved. If you were offered to get the vaccine - at no cost for you- how likely are you to take it?

Very likely	
Somewhat likely	
I am not sure	
Somewhat unlikely	
Very unlikely	
I would not take it within the near future, but I might reconsider it in the future with time	

14. How likely are you to recommend getting the COVID-19 vaccine to others?

a. Not at all likely	
b. Somewhat likely	
c. Extremely likely	

15. How easy do you think it will be to get a COVID-19 vaccine for yourself? Would you say…

a. Very easy	
b. Somewhat easy	
c. Somewhat difficult	
d. Very difficult	
e. Not sure	

16. What makes it difficult for you to get a COVID-19 vaccine? (Select all that apply)

a. I can't go on my own	
b. I have a physical limitation.	
c. It's too far away.	
d. I don't know where to goto get vaccinated.	
e. I'm not eligible to get aCOVID-19 vaccine.	
f. I have a medical reason that makes me ineligible to getvaccinated (e.g., I have had a severe allergy to vaccines in the past).	
g. I don't have transportation.	
h. The hours of operation are inconvenient.	
i. The waiting time is too long.	
j. It is difficult to find or make an appointment.	
k. I am too busy to get vaccinated.	
l. It was difficult to arrangefor childcare.	
m. I don't have time off work	
n. Not sure	

17. How safe do you think the COVID-19 vaccine will be for you? Would you say…

a. Not at all safe	
b. A little safe	
c. Moderately safe	
d. Very safe	

18. What would be important for you to know to make you more confident in the COVID-19 vaccine? (select up to three options)

a. The fast production of the vaccine did not compromise its safety	
b. Agencies approving the vaccines are following strict rules	
c. My risk of getting sick with COVID-19 is bigger than the risk of side effects from the vaccine	
d. The vaccine cannot cause any immediate or long-term injury	
e. It is impossible to get COVID-19 or any other disease from the vaccine itself or its components	
f. The vaccine works in protecting me from COVID-19	
g. The vaccine works in stopping the transmission of COVID-19 from one person to another	
h. Health agencies and WHO recommend the vaccine and agree it is safe	
i. I do not need any other information	
j. Other - please specify_____	

19. What would be important for you to know to make you more likely to take the COVID-19 vaccine? (select up to three options)

Once vaccinated I will be able to live my life with no restrictions	
Those with concerns about the vaccine have opportunities to share their opinions with the public	
Pharmaceutical companies will not make large profits from the vaccine	
Everybody will have equal access to the vaccine regardless of income or race	
I will be free to choose if I get the vaccine or not with no consequences	
There are no other reasons why so many people are sick (i.e. 5G technology or other unknown reasons)	

20. What would motivate you to get vaccinated or complete your vaccination schedule? (select all that apply)

a. Protect my health	
b. Protect health of family/friends	
c. Protect health of co-workers	
d. Protect health of community	
e. To get back to work/school	
f. To resume social activities	
g. To resume travel	
h. Because others encouraged me to get vaccinated	
i. Other/Not sure	

21. What is your most trusted source of information about COVID-19 vaccines?

a. Ministry of Health	
b. Employer	
c. Family and friends	
d. Hospital system websites	
e. Local health officials	
f. News sources (e.g., television, internet, and radio)	
g. Health care workers	
h. Professional organization(s)	
i. Religious leader(s)	
j. Online publishers of medical information (such as WebMD or Mayo Clinic)	
k. Social media (such as Facebook, Twitter, Instagram, WhatsApp, LinkedIn, or Tik- Tok)	
l. Union leader(s)	
m. Other	

22. Have you seen or heard any information about COVID-19 vaccines (e.g., on the news, on social media, or from friends and family) that you could not determine were true or false?
    - ☐ Yes
    - ☐ No
    - ☐ Not sure

23. How do you feel about the amount of information on COVID-19 vaccines that you are getting?
    - ☐ I'm not getting enough information
    - ☐ I'm getting enough information
    - ☐ I'm getting too much information

24. Do you know where to get accurate, timely information about COVID-19 vaccines?
    - ☐ Yes
    - ☐ No
    - ☐ Not sure

25. In your views, what can be done to increase COVID-19 vaccine demand and uptake in your community?

26. List down the most outstanding sources of COVID-19 vaccine misinformation and disinformation?

27. What can be done by the following categories to increase vaccine demand and uptake in communities?
    - ☐ Health care workers
    - ☐ Faith leaders
    - ☐ Media personnel
    - ☐ Local community leaders/gate keepers

Thank you for participating

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