

# COVID-19 Vaccine Acceptability: A Cross-Sectional Mixed Methods Study in Sierra Leone

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## Research Article

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## Abstract

**Background:** Global immunization is critical to combat the COVID-19 pandemic and the public's willingness to be vaccinated will determine the success of elimination efforts. We measured the acceptability of COVID-19 vaccine and views in Sierra Leone.

**Method:** We used a multi-method study including an online cross-sectional survey and semi-structured interviews to assess the acceptance of and perceptions about COVID-19 vaccination among 2146 Sierra Leoneans aged 18 years and above.

**Results:** Most survey respondents (80.1%, n = 1719) would accept COVID-19 vaccination for themselves and close family, but 19.9% (n = 427) would reject vaccination. If vaccination was mandatory the acceptance rate would increase to 85.0% (n = 1,823), while 15.0% (n = 318) of responders would still reject. COVID-19 vaccine awareness was high among respondents (yes: 75.2% n = 1613, no: 24.8%, n = 533). Safety, immunity, and trust in vaccines were the main reasons for vaccine acceptance. Distrust, uncertainties about vaccine safety and effectiveness and lack of belief in the COVID-19 pandemic triggered through media reports were the main reasons for rejecting the COVID-19 vaccination. With respect to vaccine, a small majority would prefer a less reactogenic vaccine even at the cost of a lower efficacy over a more effective but more reactogenic vaccine (55.7%, n = 1195 vs 41.5%, n = 890) while 2.8% (n = 61) of respondents said they would reject any vaccine. Country of origin had an important role in vaccine acceptance: 32.4% (n = 1121) would accept a vaccine from any country if licensed locally, but 15.1% (n = 511) would reject vaccines even if licensed from China, 12.6% (n = 437), India 11.4% (n = 393), USA 8.0% (n = 276), Germany 7.8% (n = 271), Russia 7.7% (n = 267), UK and 5.0% (n = 173) from Belgium.

**Conclusion:** Sensitizing the public about the COVID-19 infection risk, vaccine development processes and ensuring vaccine safety through continuous communication and community engagement, with community leaders leading by example as well as the independent role of regulatory authorities in safety and efficacy evaluation, would improve COVID-19 vaccine acceptance.

## Background

The world is struggling to deal with the unparalleled strain of morbidity and mortality incurred by the COVID-19 pandemic as populations and economies are severely disrupted. As of May 18th, 2021, nearly 164.7 million confirmed cases of SARS-CoV-2 infection (COVID-19) have been reported globally, with more than 3.4 million reported deaths. Of these, Sierra Leone has recorded around 4,107 cases (6.4% of which are among health workers) and 79 deaths, giving a case fatality rate (CFR) of 2.0%, which is higher than most countries severely affected [1–4].

Various public health interventions, including banning travel, imposition of social distancing and curfews, have been proposed to stop the transmission of the disease. However, the most promising control strategy is through large-scale, equitable access and distribution of safe and effective COVID-19 vaccines. There are thirteen vaccines already approved or with emergency use authorization, all of which meet the WHO criteria for efficacy of 50%-point estimate and minimum 30% lower IC<sub>95</sub> bound. The majority of those have a reported efficacy of > 65% [5–14]. Through the COVAX initiative various vaccine development partners (WHO, CEPI, BMGF, GAVI, the Wellcome Trust, and other government and non-governmental agencies), have outlined a mechanism for ensuring the availability of such COVID-19 vaccines.

In Sierra Leone, the government and other organizations are coordinating programs to ensure that COVID-19 vaccines are accessible to the public. The success of any COVID-19 vaccine program will depend on the public's desire and readiness to accept these and other vaccines. Meanwhile, vaccine hesitancy attributable to multiple causes appears to be a threat that could theoretically affect attempts to control the pandemic through vaccination and immunization [15–19]. In March 2021 A professional polling unit (SierraPoll) at the Institute for Governance Reform reported that a 3-day poll showed COVID-19 vaccine acceptance in the capital city of Sierra Leone, Freetown, was as low as 43.0% [20].

Several other countries have surveyed the level of COVID-19 vaccine acceptability, with mixed levels of acceptance reported. These have been largely linked to the level of perceived risk from SARS-CoV-2, the degree of trust in COVID-19 vaccine research, and the efficacy and duration of protection conferred by the vaccine [17, 19]. Studies conducted in South Africa, Indonesia, Uganda, and the Côte d'Ivoire reported COVID-19 acceptance rates between 51.0% and 69.0%, while others in Kenya, Nigeria, and Mozambique all reported 68% acceptance [16, 21–25]. In Brazil, South Korea, Mexico, USA, India, UK, Italy, and France reported acceptance rates range from a high of 85% in Brazil to a low of 59% in France [19, 26–29].

Survey data from multiple sources suggest an overall 60–70% willingness to be vaccinated with a novel COVID-19 vaccine with significantly lower rates decline among Black or Hispanic communities, people with lower educational level, and those living in rural areas [16, 19].

As of May 18<sup>th</sup>, 2021, there have been 1.51 billion doses of vaccine administered in 176 countries [30]. In Sierra Leone of the 296,000 doses of AstraZeneca COVID-19 vaccine received through the COVAX initiative) only 64,966 doses (0.73% of people vaccinated) have been administered together with 96,000 doses of 200,000 doses available from SinoPharm COVID-19 vaccine from China. The COVID-19 pandemic has also impacted Sierra Leone vaccination rates in general, with a 19% decline in infant vaccination coverage less than five months into the COVID-19 era [29].

Recognizing that most of the population may be eligible for the COVID-19 vaccine, we performed a multi-method study to assess the views and perceptions of Sierra Leoneans regarding the acceptability of the COVID-19 vaccine, both for themselves and for their children or relatives. This cross-sectional mixed-methods study attempts to quantify COVID-19 vaccine acceptability and views across the country. It is hoped that the findings from this study will be used to guide the COVID-19 vaccine deployment process in Sierra Leone.

## Methods

We used a cross-sectional web questionnaire to assess Sierra Leoneans in four regions for their views and beliefs on vaccinations. We used a qualitative and quantitative approach to gain a detailed understanding of the acceptability.

The survey was established by the researchers in consultation with the immunization officials from the Sierra Leone Expanded Programme on Immunization (EPI). In refining the survey questions and structure, we received input from Sierra Leoneans aged 18 years and above on the comprehensibility, accessibility and time taken to complete the survey from the point of view of the target audience.

Between February 22, 2021 and March 25, 2021, we recruited resident Sierra Leoneans aged 18 years and over from the 16 districts (Urban: 548; Rural: 1,598) to take part in the survey. We recruited and trained twelve college students to work as research assistants, whose main responsibilities were to coordinate and administer the survey questionnaires to prospective participants to meet the districts' recruitment targets. The hyperlink to the survey information and the questionnaire was sent to these research assistants for participant recruitment. Using both social media (WhatsApp) and face-to-face approaches to recruitment, the research assistant in each district randomly identified qualified participants through WhatsApp groups or direct contact and shared the full study detail with them, including study purpose, informed consent, and their ability to withdraw from the survey, as well as concerns related to confidentiality and data security. The research assistant then sent the link to the survey questionnaire to those who had expressed an interest in participating and as well administering the questionnaire to those who did not have an Android phone. The importance of written informed consent was stressed in all research materials, and it was made clear that only the data collected by participants who completed the whole survey would be analyzed.

The questionnaire (*see Appendix*) covers demographics and COVID-19 vaccine-related questions. The opening part of the questionnaire consists of questions related to participants' demographic information, including region, gender, age, employment status, household income, and level of education. The research part of the questions explored COVID-19 vaccine awareness, acceptability to be vaccinated, and the participant's views relating to COVID-19 vaccine. A 4-point Likert scale was used to ensure that participants made choices. Multiple checkboxes were used for participants to illustrate their answers to the two questions about the acceptability of the vaccine for themselves and their children/relatives. Two open-ended questions were administered to a randomly selected 2.5% participants of the total respondents to further explore reasons for COVID-19 vaccine acceptability or rejection.

STATA v15 was used to clean and analyze the quantitative data and the aggregate results were presented in frequencies, percentages, means and standard deviations and summarized in tables and graphs. The qualitative data was analyzed thematically in Microsoft Excel.

A paired samples t-test with  $\alpha = 0.05$  was used to assess COVID-19 vaccine acceptance for self and children/relatives. The demographic variables correlated with COVID-19 vaccine acceptance for both self and children/relatives were then assessed using two logistic regression analyses. In logistic regression models, the variables region, age, daily household income, employment, education, and healthcare worker were used as predictors.

The open-text responses were thematically analyzed in Microsoft Excel, and the coding schemes were developed based on the open-text comments.

All questionnaires were assigned a serial number, which was captured as each participant's ID.

## Results

We approached 2570 individuals aged 18 years and recruited a total of 2201 (85.6%) to participate in the survey of whom 2146 respondents (Urban: 548; Rural: 1,598) were included in the final analyses as 55 respondents had to be excluded due to missing data. Of the 2146 analyzed (**Table 1**), 1286 (59.9%) were male, most were educated up to high school level ( $n = 1208$ ; 52.3%) and 344 (16.0%) were classified as employed. Ages ranged from 18 to 65+ years (Median = 25–54 years). The median daily household income reported was < \$2. Of the total participants, we randomly identified 5% ( $n = 110$ ) for a follow up interview, of whom 63 (57.3%) accepted to be interviewed (male = 38, female = 25) and 47 (42.7%) did not respond to calls by the study team or declined to be interviewed. Demographics of this subset were similar to the overall study cohort.

Among the study participants 75.2% ( $n = 1613$ ) were aware that a COVID-19 vaccine was available, while 24.8% ( $n = 533$ ) were not aware.

Overall, 80.1% ( $n = 1719$ ) of respondents would accept a vaccine for themselves and close family, whereas 19.9% ( $n = 427$ ) reported rejecting a COVID-19 vaccine for themselves and their children/relatives. If vaccination was mandatory the acceptance rate increased slightly (85.0%,  $n = 1823$ ) but 15.0% ( $n = 318$ ) of responders would still reject to be vaccinated (Table 2). There was no significant difference in COVID-19 vaccine acceptance for self and for relatives.

**Table 1: Profile of survey respondents**

Characteristics	Frequency (%)
Region	
East	546 (25.4%)
North	569 (26.5%)
South	483 (22.5%)
West	548 (25.5%)
<b>Total</b>	<b>2,146 (100.0%)</b>
Gender	
Female	860 (40.1%)
Male	1,286 (59.9%)
Age	
18-24 years	338 (15.8%)
25-54 years	1,068 (49.8%)
55-64 years	498 (23.2%)
65+ years	242 (11.3%)
Healthcare or COVID-19 frontline worker?	
No	1,837 (85.6%)
Yes	309 (14.4%)
Level of Education	
Master's or Ph.D.	65 (3.0%)
BSc/Undergraduate	329 (15.3%)
High school or some college (e.g., Diploma)	814 (37.9%)
No school or less than high school	938 (43.7%)
Employment status	
Employed_ full time	344 (16.0%)
Self-employed	895 (41.7%)
Student	495 (23.1%)
Unemployed	412 (19.2%)
Household Income Per Day?	
< \$2	1,367 (63.7%)
\$2-\$4	453 (21.1%)
\$4.1-\$8	228 (10.6%)
\$8.1+	98 (4.6%)

<b>Table 2: Details of COVID-19 Vaccine Acceptance</b>	
<b>COVID-19 Vaccine Acceptance Questions</b>	<b>Frequency (%)</b>
<b>COVID-19 vaccine opinions for self and for relatives</b>	
Full acceptance	1,648 (76.8%)
Partial Acceptance	71 (3.3%)
Full Rejection	427 (19.9%)
<b>Total</b>	<b>2,146 (100.0%)</b>
<b>Will you Accept the COVID-19 vaccine for yourself?</b>	
Yes, definitely	1,489 (69.4%)
Unsure but leaning towards yes	215 (10.0%)
No, definitely not	393 (18.3%)
Unsure but leaning towards no	49 (2.3%)
<b>Will you accept the COVID-19 vaccine for your close relatives, including your children?</b>	
Yes, definitely	1,431 (66.7%)
Unsure but leaning towards yes	232 (10.8%)
No, definitely not	385 (17.9%)
Unsure but leaning towards no	98 (4.6%)
<b>Will you accept the COVID-19 vaccine if recommended by law or employer?</b>	
Yes, definitely	1,823 (84%)
No, definitely not	318 (14.8%)
No response	5 (0.2%)
<b>What vaccine profile would you prefer?</b>	
A vaccine with higher efficacy but also higher adverse events	890 (41.5%)
A vaccine with lower efficacy but also less adverse events	1,195 (55.7%)
None	61 (2.8%)
<b>Are you aware of the availability of the COVID-19 vaccine?</b>	
Yes	1613 (75.2%)
No	531 (24.7%)
No response	2 (0.1%)

Of the 1,719 (80.1%) respondents that would accept a COVID-19 vaccine for themselves or their relatives, 1,641 (95.5%) gave reasons for their motivation to accept the COVID-19 vaccination. In order of frequency, the survey participants reported the following reasons for accepting COVID-19 vaccination for themselves and their relatives (Fig. 1).

The most frequent reason reported for accepting COVID-19 vaccination was that COVID-19 vaccination ensures that the person vaccinated stay safe (25.0%, n = 871). For 16.0%, recommendation by leaders were important, and 5% would switch their attitude from non-acceptance to acceptance if it was mandatory.

Survey participants and interviewees cited less risk to infection for themselves and their relatives when they are vaccinated. 11.0% (n = 393) respondents reported that they and their relatives are at less risk to COVID-19 if they are vaccinated while 9.0% (n = 299) reported that they are in an at-risk group or close to someone that is at high risk to infection. The protection from COVID-19 infection of both the vaccinees and others through immunization was reported as one of the major reasons for accepting COVID-19 vaccination. Respondents cited that COVID-19 vaccination protect those vaccinated and others (8.0%, n = 292).

Of the 427 (19.9%) respondents who rejected receiving COVID-19 vaccine, 318 (15.0%) said they would refuse even if vaccination was mandatory; their reasons to reject are shown in Fig. 2. The main reason for rejection was lack of trust (38.0%, n = 371) with respect to vaccines, the government, and the healthcare system. Many respondents also expressed concerns about vaccine safety and effectiveness (19.0%, n = 181) and vaccine components (11.0%, n = 102). The main concerns were about the COVID-19 vaccine research, the process, and the data generated to support the approval, while others said they did not believe in the benefit of the vaccines because of what they had seen in the media.

These concerns were also propagated in some of the oral interviews by some interviewees who expressed "anti-vaxxer" opinions and doubted scientific expertise. Linked to this the lack of adequate information on COVID-19 and vaccine was stated the fourth main reason for rejecting COVID-19 vaccine (10.0%, n = 95). Another reason, expressed by 9.0% (n = 71) of those who reject vaccination was that they believe that COVID-19 is not real in Sierra Leone or in Africa, but it is "fake news". Some respondents mentioned that they and their relatives are not in an at-risk group (5.0%, n = 48) or are at low risk of getting infected or spreading COVID-19 (5.0%, n = 44) and hence they would refuse vaccination.

We ran a forward stepwise logistic regression analysis with the discrete variable being the self-COVID-19 vaccine acceptance variable. The predictive variables were region, age, gender, education, employment, daily household income, and healthcare worker. All but gender and education were predictive (Table 3) of COVID-19 vaccine rejection for self (Chi-square = 37.15, df = 12, p = 0.001). The goodness-of-fit test (Hosmer-Lemeshow) proves that the model is well-suited to the data (Chi-square = 8.58, df = 12, p = 0.379).

<b>Table 3:</b> Factors associated with COVID-19 vaccine acceptance for self.						
<b>Variable</b>	<b>Univariable Analysis</b>			<b>Multivariable Analysis</b>		
	<b>P-value</b>	<b>OR</b>	<b>95% CL</b>	<b>P-value</b>	<b>OR</b>	<b>95% CL</b>
<b>Region</b>	<b>0.000</b>	-	-	<b>0.043</b>	-	-
East (n = 546)	-	-	-	-	-	-
West (n = 548)	0.000	0.299	0.216-0.414			
North (n = 569)	0.000	0.285	0.206-0.393			
South (n = 483)	0.741	1.069	0.719-1.590			
<b>Age</b>	<b>0.000</b>	-	-	<b>0.000</b>	-	-
18-24 years (n = 338)	-	-	-	-	-	-
25-54 years (n = 1,068)	0.034	1.349	1.022-1.780	0.026	1.371	1.038-1.810
55-64 years (n = 498)	0.000	2.801	1.958-4.005	0.000	3.024	2.096-4.361
65+ years (n = 242)	0.012	1.666	1.118-2.483	0.003	1.880	1.239-2.853
<b>Employment Status</b>	<b>0.000</b>	-	-	<b>0.000</b>	-	-
Unemployed (n = 412)	-	-	-	-	-	-
Student (n = 495)	0.001	1.651	1.227-2.222	0.000	2.135	1.551-2.938
Self-employed (n = 895)	0.000	2.472	1.879-3.252	0.000	2.300	1.718-3.079
Employed full time (n = 344)	0.000	2.207	1.559-3.123	0.000	2.141	1.503-3.050
<b>Daily Household Income</b>	<b>0.000</b>	-	-	<b>0.001</b>	-	-
< \$ 2 (n = 1,367)	-	-	-	-	-	-
\$2-\$4 (n = 453)	0.002	0.673	0.523-0.864	0.000	0.433	0.350-0.612
\$4.1-\$8 (n = 228)	0.542	1.122	0.775-1.625	0.008	0.507	0.356-0.857
\$8.1+ (n = 98)	0.005	0.525	0.334-0.823	0.000	0.206	0.157-0.443
<b>Healthcare/COVID-19 frontline worker</b>	<b>0.000</b>	-	-	<b>0.001</b>	-	-
No (n = 1,837)	-	-	-	-	-	-
Yes (n = 309)	0.000	2.487	1.697-3.644	0.000	3.536	2.328-5.372

\*\*Reference

Similar vaccine acceptance rates were observed in respondents who were over 24 years of age (65+ Years: OR = 1.88, 95% CI: 1.24–2.85, 25–54 Years: OR = 1.37, 95% CI = 1.04–1.81) with the exception of participants aged 55–64 years (OR = 3.02, 95% CI: 2.10–4.36) who were three times more likely to accept a COVID-19 vaccine. With respect to employment status participants who reported being self-employed or in full-time employment were twice as likely to accept COVID-19 vaccination than those who were unemployed (OR = 2.30, 95% CI: 1.72–3.08).

There was no significant difference in vaccine acceptance across different income levels (\$4.1-\$8: OR = 0.51, 95% CI: 0.36–0.867; \$2-\$4: OR = 0.43, 95% CI: 0.35–0.61, \$8.1+: OR = 0.21, 95% CI = 0.16–0.44) and regions. Participants who self-reported as healthcare/frontline staff were three times more likely (OR: 3.53, 95% CI: 2.33–5.37) than non-healthcare workers to accept COVID-19 vaccine.

We did the same analysis on the factors which would influence a participant to make recommendations for or against COVID-19 vaccination or relatives. There was no material difference between self-acceptance and recommendation for relatives for all the variables.

Vaccine acceptance rates for relatives were similar in respondents above 24 years (55–64 years: OR = 3.31, 95% CI: 2.20–4.98; 65+ years: OR = 1.97, 95% CI: 1.25–3.13, 25–54 Years: OR = 1.30, 95% CI = 0.96–1.76) compared with those aged 24 years or younger.

We had the same observations for participants who reported that they were self-employed or in full-time employment and students. Participants who reported being self-employed or students were twice as likely to accept COVID-19 vaccination than those who were unemployed (self-employed: OR = 2.88, 95% CI: 2.14–3.88; students: OR = 2.39, 95% CI: 1.73–3.29). Healthcare/frontline staff were three times more likely than non-healthcare workers to accept a COVID-19 vaccine for their relatives (OR: 3.45, 95% CI: 2.33–5.13; Table 4).

Table 4  
Factors associated with COVID-19 vaccine acceptance for relatives

Variable	Univariable Analysis			Multivariable Analysis		
	p-value	OR	95% CL	p-value	OR	95% CL
<b>Region</b>	<b>0.000</b>	-	-	<b>0.033</b>	-	-
East (n = 546) **	-	-	-	-	-	-
West (n = 548)	0.000	0.253	0.184–0.348			
North (n = 569)	0.000	0.275	0.200–0.377			
South (n = 483)	0.904	0.977	0.665–1.434			
<b>Age</b>	<b>0.000</b>	-	-	<b>0.000</b>	-	-
18–24 years (n = 338) **	-	-	-	-	-	-
25–54 years (n = 1,068)	0.226	1.184	0.901–1.555	0.186	1.300	0.957–1.764
55–64 years (n = 498)	0.000	2.634	1.856–3.739	0.000	3.309	2.198–4.982
65+ years (n = 242)	0.021	1.585	1.071–2.347	0.005	1.193	1.246–3.125
<b>Employment Status</b>	<b>0.000</b>	-	-	<b>0.000</b>	-	-
Unemployed (n = 412) **	-	-	-	-	-	-
Student (n = 495)	0.001	1.664	1.243–2.226	0.000	2.390	1.733–3.294
Self-employed (n = 895)	0.000	2.375	1.819–3.102	0.000	2.881	2.141–3.876
Employed full time (n = 344)	0.000	1.993	1.429–2.779	0.000	1.728	1.781–4.179
<b>Daily Household Income</b>	<b>0.002</b>	-	-	<b>0.001</b>	-	-
< \$ 2 (n = 1,367) **	-	-	-	-	-	-
\$2–\$4 (n = 453)	0.001	0.669	0.524–0.853	0.000	0.448	0.341–0.591
\$4.1–\$8 (n = 228)	0.915	1.019	0.719–1.445	0.004	0.496	0.324–0.578
\$8.1+ (n = 98)	0.010	0.557	0.357–0.869	0.000	0.240	0.142–0.406
<b>Healthcare/COVID-19 frontline worker</b>	<b>0.000</b>	-	-	<b>0.000</b>	-	-
No (n = 1,837) **	-	-	-	-	-	-
Yes (n = 309)	0.000	2.357	1.645–3.377	0.000	3.454	2.326–5.129
**Reference						

One question was whether the country of origin of a Covid-19 vaccine influenced the decision to accept it or not. Whilst 32.4% (n = 1121) reported that they would accept a vaccine from any country involved in vaccine manufacturing if licensed locally (Fig. 3), there were rejections at different levels depending on the vaccine manufacturing origin despite local licensure: China: 15.1% (n = 511); India: 12.6% (n = 437); USA: 11.4% (n = 393); Germany: 8.0% (n = 276); Russia: 7.8% (n = 271); UK: 7.7% (n = 267); and Belgium: 5.0% (n = 173).

Another question centered around vaccine profile preferences. A vaccine which is less reactogenic at the costs of being also less effective was favored by 56.0% (n = 1195) compared with 41.0% (n = 890) who preferred a vaccine with higher efficacy but also higher reactogenicity, while 3.0% (n = 61) of respondents said they would reject any of the vaccine profiles (Fig. 4).

## Discussion

This is the first prospective population-based study in Sierra Leone and one of the few in Western Africa about the acceptance or rejection of Covid-19 vaccination. A previous small poll in Sierra Leone conducted in 504 respondents in Freetown, the capital city of Sierra Leone, in early March 2021 showed an acceptance of 43.0%. However, this survey was regionally restricted, with a different methodology, and conducted within three (3) days of Sierra Leone COVID-19 vaccine reception period. As high vaccination coverage is critical for herd immunity, information about reasons for hesitancy or rejection are important to address those early on in a program.

In this prospective study a majority of participants (80.1%) reported that they would accept a COVID-19 vaccine for themselves and their relatives. Making COVID-19 vaccination mandatory would increase adherence to vaccination by just another 5%. It is questionable whether a 5% increase in vaccine coverage warrants a debate about mandatory interventions and a potential increase in sentiment against vaccines.

This acceptance rate of 80.1% for COVID-19 vaccine in our study is higher than in other African countries such as Côte d'Ivoire, Uganda, Indonesia, Kenya, Nigeria, Mozambique, and South Africa where the reported acceptance levels range from a high of 69% to a low of 51%. This is also true for some countries in other regions such as the United States, India, United Kingdom, Italy and France that reported acceptance rates between 59–75%.

In our study we found no difference in acceptance levels between Black and Hispanic populations, or due to educational level, or residence in urban or rural areas. Region, age, employment, daily income, and healthcare workers were the major predictors for vaccine acceptance. Self-employed and full-time employed participants were more likely to accept vaccine for themselves and their relatives as were participants aged 25 years and above. Healthcare and frontline workers were more likely to accept COVID-19 vaccine for themselves and their relatives. This could be linked to their level of awareness of current health situation and the risk to exposure due to their involvement in providing care at the different health facilities.

Other than using the proven safety and efficacy of the vaccines another important factor to improve vaccination acceptance is leadership by example. As such, recommendations by governmental and seeing their leaders being vaccinated will influence acceptance. Quote of a participant:

*"If the leaders like the president and the first lady take it and they're not affected negatively, yes, I'll accept it".*

When asked about different vaccine profiles there was no clear preference: a small majority of respondents (56%) would opt for a vaccine with lower reactogenicity at the expense of lower efficacy whereas 41% others preferred a vaccine with higher efficacy even if somewhat more reactogenic. There were, however, preferences of country of origin of vaccines with the lowest rejection of vaccines from countries who traditionally produced WHO prequalified vaccines such as Belgium or the UK, whereas the rejection rates for vaccines from India or China were higher. It is therefore important to educate the population that any COVID-19 vaccine, independent of its origin, which has a WHO EUL has an assured high standard of quality, safety and efficacy.

The main reasons for vaccine rejection were safety concerns, distrust about the COVID-19 vaccine research and data, the accelerated development process as well as the varying and confusing information in the media. Some respondents denied the reality of COVID-19 in Sierra Leone and Africa based on social media reports. Two answers exemplify the above:

*"I don't believe that COVID-19 is in Sierra Leone and I do not believe in the COVID-19 vaccine as they intend to use it to poison us. They are using the COVID-19 situation to get money from donors".*

I am rejecting the vaccine for myself and my relatives because I don't trust that it is safe. Maybe it is a means of especially reducing the Africa's population.

The increase in vaccine acceptance from the 43.0% acceptance rate in the poll in Freetown to the 80.1% acceptance in our study - although not directly comparable due to different methodologies - is remarkable. It indicates that there seems to be more trust based on science and dissemination of scientific facts and data.

Monitoring and reporting of safety signs should be at the core of the COVID-19 vaccine rollout activities, and it is critical for the government and health agencies to educate the public in an open and timely manner to avoid the new vaccines having a negative impact on the national immunization program. Importantly, leadership by example could have a big impact on acceptance. False information and fake news is also an issue in Sierra Leone and it is not always possible to overcome this with data. However, it is a minority who believe in this and it is questionable whether making vaccination mandatory would have a major benefit. Rather, the presence of these minorities makes it more important to achieve a high coverage in those who accept vaccination so that herd immunity can be established.

Our research has some limitations. A quantitative survey approach was amended by more qualitative interviews in a random subset to better understand rationales, feelings and emotions. However, because of the restriction during the COVID-19 pandemic this subset was limited in size. Our research took place at the height of the COVID-19 pandemic and during the evolution of the new variants spurring fear and inconsistency in COVID-19 information. Our recruiting approach obtained a high number of responses (n = 2146), but our sample is not reflective in terms of household income or educational level, despite being overwhelmingly representative regionally. There were some inconsistencies in responses which could not be verified, specifically a discrepancy between the answers around formal education and the reported daily income. Thus, our recording of household income is not strictly comparable to the Sierra Leone Demographic and Health Survey data (2019).

## Conclusions

In this prospective survey 80.1% of the population of Sierra Leone had a favorable attitude towards COVID-19 vaccination. The primary reasons for their COVID-19 vaccination acceptance were to ensure personal and family safety and wellbeing. A key role in acceptance is the attitude of leaders. Denial of the COVID-19 reality, distrust in the COVID-19 vaccine research and vaccine safety as well as varying and false information in the media negatively influence vaccination acceptance. Sensitizing the public about the vaccine development process through continuous communication and community engagement, as well as the independent role of regulatory authorities in safety and efficacy evaluation, will be helpful in alleviating these concerns. Efforts should be made to clearly communicate COVID-19 risks, as well as to identify and resolve determinants of COVID-19 acceptance for all population segments

## Declarations

## Ethics approval and consent to participate

Ethical approval to conduct this study was granted by the Sierra Leone Ethics and Scientific Review Committee (Reference: 01 of 01 January 2021). All study procedures were performed in accordance with relevant guidelines and regulations. Informed consent to participate in the study was obtained from all subjects that participated in this study. This study presents no risk or harm to respondents.

## Consent for publication

Not Applicable

## Availability of data and materials

The full dataset is the property of the research team and are available from the corresponding author upon reasonable request and agreement.

## Competing interests

The authors declare that they have no competing financial interests or personal relationships that might have arisen to influence the work published in this article.

## Funding

Not Applicable

## Authors' contributions

MS, RF, SAC, JBK, IK, MJ, and IBS designed and implemented the study. MS, RF, and SAC led the survey's design and developed the first draft of the manuscript. IK and IBS led survey and interview recruitments. MS and JBK performed the statistical analysis. MJ analyzed the qualitative interviews. All authors contributed to the manuscript preparation and approved the final manuscript.

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## Figures

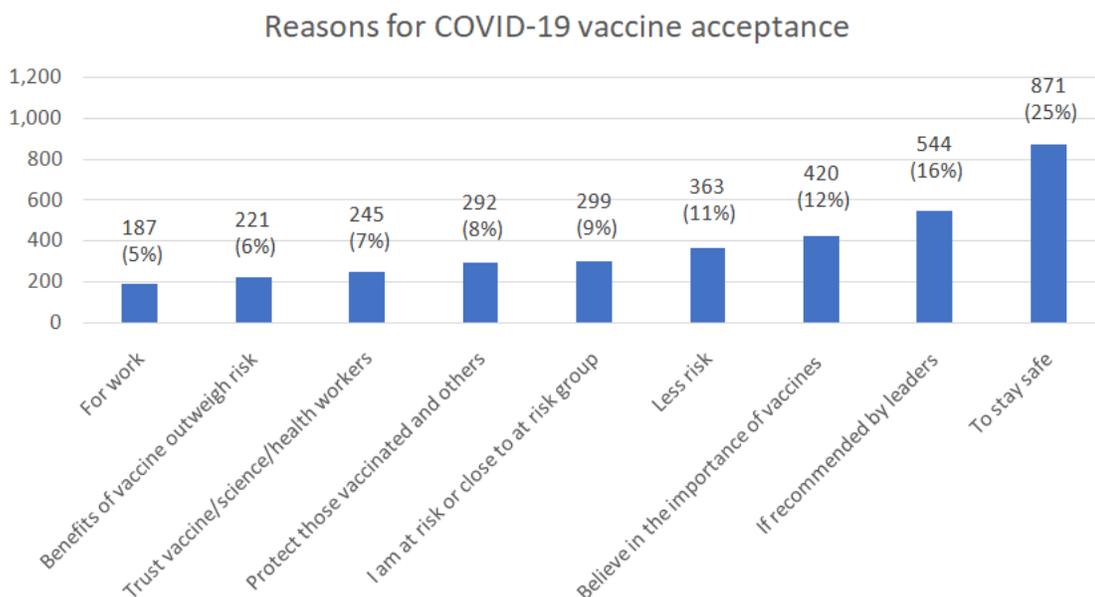


Figure 1

Main reasons for accepting COVID-19 vaccination

## Reasons for rejecting COVID-19 vaccine

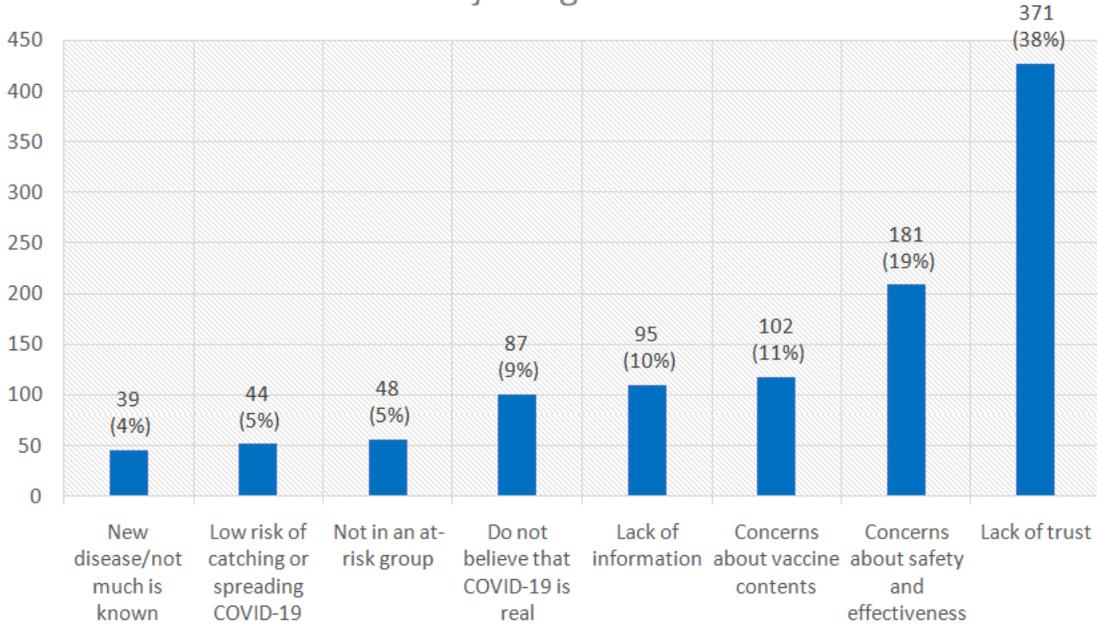


Figure 2

Main reasons for rejecting COVID-19 vaccination

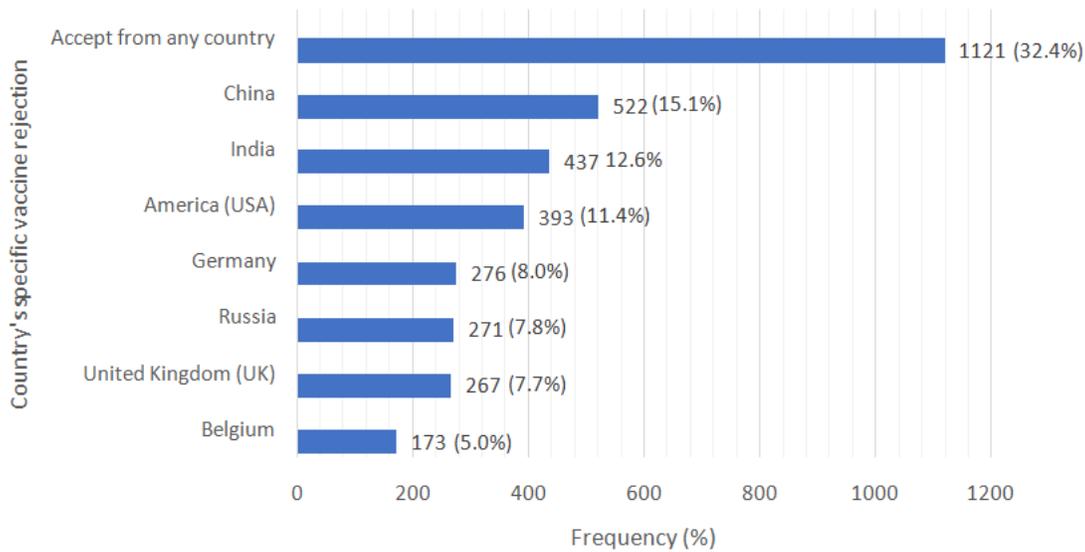
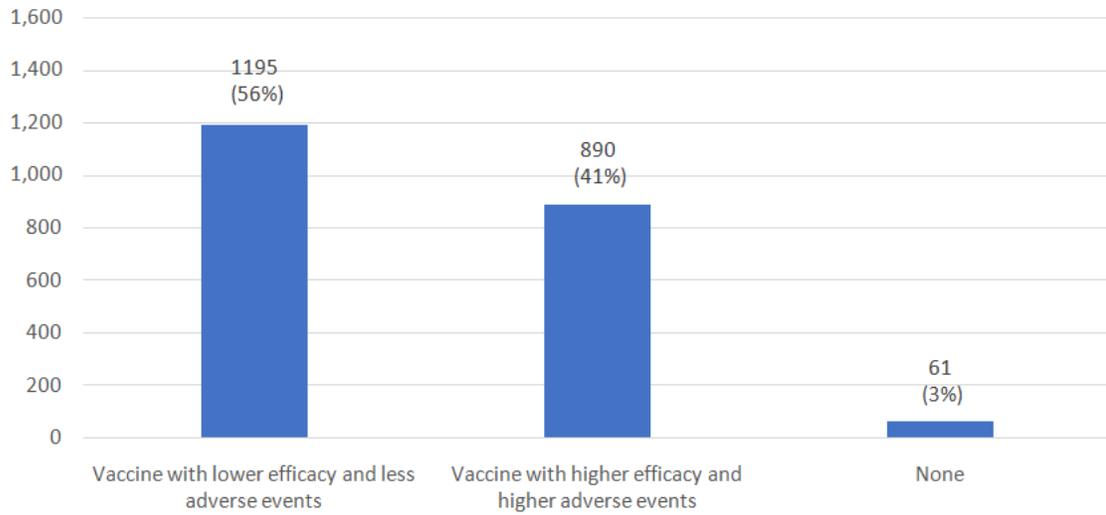


Figure 3

Country-specific vaccine rejection

### Acceptance by vaccine profile



**Figure 4**

Acceptance by vaccine profile

### Supplementary Files

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- [COVID19VaccineAcceptabilityandViewsAppendix.docx](#)