Final Results Report for Approved Protocol:

Acceptability of COVID-19 Vaccination Among Higher-Risk Populations in Zambézia Province, Mozambique

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Contents

Acronyms and Abbreviations

2019-nCoV	Novel Coronavirus 2019
ACT	Access to COVID-19 Tools
ART	Combination antiretroviral treatment
CDC	Centers for Disease Control and Prevention
CEPI	Coalition for Epidemic Preparedness Innovations
CHW	Community Health Worker/s
CIBS-Z	Comité Institucional de Bioética para a Saúde – Zambézia (English: *Institutional Health Bioethics Committee of Zambézia*)
COVAX	COVID-19 Vaccines Global Assess Facility
COVID-19	Coronavirus Disease 2019
DGHT	Division of Global HIV/AIDS and Tuberculosis
DPS-Z	Provincial Health Directorate of Zambézia
DRC	Democratic Republic of the Congo
EIP	Extended Immunization Program
FGD	Focus group discussion/s
FGH	Friends in Global Health
Gavi	Global Alliance for Vaccine Initiative (often referred to as the “Vaccine Alliance”)
GCP	Good Clinical Practice
GLMM	Generalized linear mixed-effects models
HF	Health Facility
HIV	Human immunodeficiency virus
HPV	Human papilloma virus
IDI	In-depth interview/s
IEC	Information, education and communication
INS	Instituto Nacional de Saúde (English: *National Health Institute*)
IQR	Interquartile range/s
IRB	Institutional Review Board
MM	Mentor Mother/s
MOH	Ministry of Health
OR	Odds ratio/s
PE	Peer Educator/s
PPE	Personal protective equipment
PWH	Persons with HIV
SAGE	Strategic Advisory Group of Experts on Immunization
SARS-CoV-2	Severe acute respiratory syndrome - coronavirus 2
SOP	Standard operating procedures
SSA	Sub-Saharan Africa
TV	Television
WHO	World Health Organization
VUMC	Vanderbilt University Medical Center

Executive summary

Background

In March 2020, WHO declared the COVID-19 outbreak a pandemic. Globally, as of February 2021, there have been more than 107 million documented cases of COVID-19 infection, and in the WHO African Region, more than 2 million confirmed cases. Mozambique documented its first case on March 22nd, 2020 and as of February 1st, 2021, had reported a total of 38,970 confirmed cases with 386 reported deaths. Through the Access to COVID-19 Tools (ACT)-COVAX and other initiatives, Mozambique, along with other resource-constrained countries, benefited from the introduction of a COVID-19 vaccine in March 2021, where a phased roll-out of COVID-19 was planned. This study aimed to evaluate COVID-19 vaccine acceptability among higher-risk populations in Zambézia Province.

Methods

A mixed-method study in Zambézia Province assessed knowledge, perceptions and acceptability of COVID-19 vaccination. Structured questionnaire-based surveys with community health workers/volunteers, taxi drivers, and persons with HIV, in-depth interviews using semi-structured guides with schoolteachers, health professionals/ auxiliary staff, and focus group discussions using semi-structured guides with community/religious leaders, adults aged 18-49 years, and adults aged 50+ years were done in August–September 2021. Surveys were captured electronically using tablets; group discussions were recorded. Univariate analyses (Chi-square and Mann-Whitney tests) were performed for quantitative data, and thematic analysis was done for qualitative data.

Results

A total of 811 individuals participated (539 survey respondents; 192 discussion respondents; 60 interview respondents), 52% male (n=417), 74% urban residents (n=604). Most had heard about COVID-19 vaccines, mainly through TV and/or radio. Trustworthy sources mentioned were community leaders and health care providers.

Motivators for vaccination mentioned by survey respondents were: wanting protection for themselves (60%), believing it would protect their family (17%) and not wanting to be infected with COVID-19 (12%). In-depth interview respondents reported that people who are well informed about the vaccine and its benefits may be more receptive to the vaccine. Focus group discussion respondents mostly mentioned that seeing people who have already been vaccinated and are well and the need to have a vaccination card as motivators for vaccination.

Myths and beliefs, misinformation and long queues were main barriers mentioned in in-depth interviews and focus group discussions. Respondents from the same groups also frequently mentioned the fact that the vaccine does not guarantee prevention of becoming infected with COVID-19 and also the fact that some people do not believe and/or have doubts about the existence of the disease as factors that do not favorable for adherence to vaccination. Doubts regarding the vaccine were another main barrier mentioned in the in-depth interviews.

Participants suggested that strategies should focus on communication talks led by health professionals, in partnership with community leaders and/or community health workers/volunteers.

Conclusions

We saw that there was information delivered on COVID-19 vaccination, mainly through radio and television. There was a variable acceptance of vaccination. Early health promotion activities and targeted campaigns specific for rural and urban contexts can increase awareness and uptake of vaccination. Monitoring of rumors and disinformation is needed to correct as soon as possible during campaigns.

Background

On December 31st, 2019, a novel coronavirus (2019-nCoV) was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in Hubei Province, China, rapidly spreading in the country and worldwide. In February 2020, the World Health Organization (WHO) designated the disease as COVID-19, with the virus responsible for causing disease being designated as severe acute respiratory syndrome (SARS-CoV-2). On March 11, 2020, WHO declared the COVID-19 outbreak a pandemic. Globally, as of February 2021, there had been more than 107 million documented cases of COVID-19 infection. In the WHO African Region, by February 1st, 2021, there had been more than 2 million confirmed cases and more than 80,000 deaths [1].

Mozambique documented its first case on March 22nd, 2020; by February 1st, 2021 the country had reported a total of 37,705 confirmed cases, with a marked increase in COVID-19 case confirmation in early 2021 (for example, there were about 19,000 reported cases during the month of January 2021). By the end of 2022, the cumulative number of confirmed cases nationally was 231,039 [2].

Through the Access to COVID-19 Tools (ACT)-COVAX and other initiatives, Mozambique along with other resource-constrained countries, benefited from the introduction of a COVID-19 vaccine in March 2021 [3]. Priority groups for vaccination were indicated by the Ministry of Health (MOH), and initially included health care providers, older-aged/ elderly persons, persons with co-morbidities (e.g., diabetes mellitus, obesity, cancer, etc.), and other essential and at-risk workers such as schoolteachers, police officers, factory workers, etc.

The success of vaccination to mitigate the spread of COVID-19, however, depends on a high acceptability of the vaccine. According to the WHO, vaccine hesitancy is one of the main contributors to low acceptability and is mentioned as one of the 10 most significant threats to public health [4]. According to the Strategic Advisory Group of Experts on Immunization (SAGE), vaccine hesitancy is defined as “the delay in acceptance or refusal of vaccination even if vaccines and services are available [5] and consequently contributing to the problem of low vaccination coverage and a risk of not achieving the desired effect of population immunity or herd immunity. Herd immunity is defined as the immunity acquired in the population immunized by either vaccine or natural infection enough to protect the unvaccinated population. As it is not feasible to reach herd immunity through natural COVID-19 infection, vaccination should be the priority to combat the pandemic [6]. Vaccination herd immunity is defined as “immunization of a large proportion of the population to protect the non-vaccinated, immunologically naïve, and immunocompromised individuals by reducing the percentage of vulnerable hosts to a level below the transmission threshold” [7]. For SARS-CoV-2, a threshold of about 67%

is estimated to reach herd immunity, but this depends on the hypothesized basic reproduction number of the virus [8]. Reaching coverage depends on different factors, such as costs, and acceptability by the population. A survey conducted in 15 African countries by the Africa CDC, in collaboration with the London Institute of Tropical Medicine and Hygiene, between August and December 2020, concluded that on average the degree of acceptability in Africa for an effective COVID-19 vaccine would be approximately 79%, ranging from 95% in Ethiopia to as low as 65% acceptability in the Democratic Republic of the Congo (DRC) in the population greater than 18 years of age [9]. A survey administered to 612 health professionals in the DRC showed that only 28% of health professionals would accept COVID-19 vaccination and of these surveyed healthcare providers, nurses, although most exposed to the virus, were the cadre reporting the lowest vaccine acceptability [10]. An online survey of 7,664 persons in the community within several European countries concluded that 74% would accept vaccination with the remainder being unsure or outright refusing vaccination [11]. Vaccine safety, efficacy and adverse events were highlighted as the main reasons for refusing to be vaccinated [11]. Similarly, another survey in the United States involving 316 persons in the community found that 68% of respondents would agree to receive the vaccine, with similar factors contributing to decreased vaccine acceptance [12].

Identifying the factors that guide persons' decisions regarding vaccine uptake or refusal are important to help inform the design of information, education and communication (IEC) materials and messages. COVID-19 vaccine hesitancy can be related to a myriad of factors including social and cultural factors [13].

Consistent with prior practice pertaining to the introduction of new vaccines in Mozambique (e.g., cholera, human papilloma virus (HPV), etc.), acceptability studies are important to inform scale-up efforts. Although a small proportion of persons interviewed answered that the cholera vaccine could transmit cholera, the cholera vaccine acceptability survey did show that overall, a very high proportion of community-based study participants (95%) would agree to receive the vaccine [14]. A study focused on HPV vaccine introduction among adolescent girls (10-19 years of age) also showed a very favorable overall vaccination acceptability rate of greater than 91% [15].

Zambézia Province, located in the central region of Mozambique, is the third most affected province in terms of COVID-19 case burden, with 2,419 confirmed cases reported as of February 1st, 2021 [16]. In addition, Zambézia is the second most populous province, having a population of approximately 5.2 million persons [17] and an estimated HIV prevalence of 17.1% [18]. Moreover, the lack of water, poor infrastructure and the low proportion of health professionals (4 per 10,000 persons) below that recommended by the WHO [19] are among the list of factors adversely affecting health outcomes of persons residing in the province. This intersection of epidemiologic and socio-economic factors can put Zambézia Province in an even more vulnerable situation when it comes

to case burden and mounting a COVID-19 pandemic response given its significant physical and human infrastructure constraints.

Results of a 2020 sero-epidemiologic survey of SARS-CoV-2 in Quelimane, the provincial capital, showed that transportation workers (primarily bicycle taxi drivers) and healthcare providers (mainly auxiliary health staff) are among those most at risk for SARS-CoV-2 acquisition [20].

Purpose and questions

As herd community requires a high coverage, the need to assess acceptability before and even during vaccination campaigns, including understanding reasons for hesitancy, is crucial. Based on the significance of a COVID-19 vaccine acceptance, we herein aimed to determine the acceptability, knowledge and perceptions of the COVID-19 vaccination among priority groups for vaccination and among adult community members in Quelimane City and Mocuba, the two most populous districts in Zambézia Province.

Evaluation Questions

- What are the reasons for acceptability or hesitancy for COVID-19 vaccination among healthcare providers, clinic- and community-based healthcare volunteers?
- What is the acceptability (perceived or actual) of COVID-19 vaccination among bicycle/motorcycle taxi drivers, schoolteachers, persons with HIV (PWH), community/faith leaders, as well as members of the general community at higher risk for more severe COVID-19 disease including the older-aged adults/ elderly, those with certain comorbidities (e.g., diabetes mellitus, cancer, obesity), etc.?
- What is the knowledge about the COVID-19 vaccination among healthcare workers, healthcare volunteers, bicycle/ motorcycle taxi drivers, schoolteachers, PWH, community/faith leaders, men and women of the community (adults, including older persons over 50 years of age)?
- What are the perceptions and attitudes towards COVID-19 vaccination and other prevention measures among healthcare workers, healthcare volunteers, bicycle/ motorcycle taxi drivers, schoolteachers, PWH, community/faith leaders, men and women of the community (adults, including older persons over 50 years of age)?

Objectives of the evaluation

The main objective of this evaluation was to estimate the acceptability, knowledge and perceptions of vaccination against COVID-19 among high-risk groups (health workers, health volunteers, bicycle/ motorcycle taxi drivers, schoolteachers, PWH, community/faith leaders, men and women of the community (adults, including older persons over 50 years of age)).

The specific objectives were:

1. Describe knowledge about COVID-19 vaccination among following high-risk groups: health workers, health volunteers, bicycle/ motorcycle taxi drivers, schoolteachers, PWH, community/faith leaders, men and women of the community (adults, including older persons over 50 years of age).

2. Describe the acceptability and/or hesitancy and the barriers and facilitators for COVID-19 vaccination among following high-risk groups: health workers, health volunteers, bicycle/ motorcycle taxi drivers, schoolteachers, PWH, community/faith leaders, men and women of the community (adults, including older persons over 50 years of age).

Design/methods/limitations

Evaluation type

The evaluation completed was an internal process evaluation.

Study setting and site selection

The evaluation took place in Zambézia Province, specifically in the districts of Quelimane and Mocuba (**Table 1**).

The city of Quelimane, the capital of the province, was selected for this evaluation because it had higher positivity rates for COVID-19 infection. Mocuba district was selected to be part of the evaluation to ensure the inclusion of other areas with less exposure and less registration of COVID-19 cases.

Two communities with a higher seroprevalence of SARS-CoV-2 were selected in Quelimane, located in two urban regions of the city [21]. Two referral health facilities and two primary or secondary schools in or around the selected neighborhoods were included in this evaluation. The markets with the higher seroprevalence of SARS-CoV-2 are included [21].

For the rural district, Mocuba, the health facility and nearby community locations of Mocuba and Mugeba were selected due to their rural location (i.e., less densely populated), having a large population and being located on the corridor to the north of the province. Main taxi stops located near markets were therefore included. Primary or secondary schools around the selected communities were included.

Table 1. Evaluation locations, Zambézia Province, Mozambique (2021)

Evaluation Location	Communities (2 per district)	Referral health facilities (selection of 2 out of the list)	Taxi stops (selection of 2)	Schools (selection of 2)*
Quelimane District	• Bairro Novo • Coalane 2B	Referral for Bairro Novo: • 17 de Setembro • 24 de Julho Referral for Coalane 2B • HF Coalane • HF Sangariveira	Taxi stops (bicycles/ motorcycles) at main public markets (Brandão, Sangariveira, Central Market)	Two primary or secondary schools in the neighborhoods of the selected communities: • Escola Primária 17 de Setembro. • Escola Secundária Sangariveira.
Mocuba District	• Mugeba Vila • Mocuba Vila	• HF Mugeba • HF Mocuba • Rural Hospital Mocuba	Taxi stops (bicycles/ motorcycles) and main public markets in Mugeba or Mocuba	Two primary or secondary schools in the neighborhoods of the selected community: • Escola Secundária Samora Machel. • Escola Primária de Mugeba.

Evaluation design

A cross-sectional, mixed methods design was used, combining quantitative (survey) and qualitative (in-depth interviews [IDI] and focus group discussions [FGD]) among the various target groups of this evaluation.

- Surveys: surveys using a structured guide were conducted among community health workers/ health volunteers, taxi drivers (bicycle/motorcycle), and PWH attending HIV services.
- In-depth interviews: interviews using a semi-structured guide were done among healthcare workers, health auxiliary workers and schoolteachers.
- Focus group discussions: discussions using a semi-structured guide were held among community/ faith leaders, adult population members 18-49 years of age, and adult population members older than 50 years of age.

Study population

The target groups were defined based on the National Vaccination Plan [21], whereby health care workers and community health volunteers, and elderly people were priority groups as they are at higher risk to be infected with the new coronavirus. PWH in antiretroviral treatment were added as they are persons with a chronic disease. Preliminary results of a 2020 sero-epidemiologic survey of SARS-CoV-2 in Quelimane, the provincial capital, showed that transportation workers (primarily bicycle taxi drivers) and healthcare providers (mainly auxiliary health staff) are among those most at risk for SARS-CoV-2 acquisition, and therefore included in this evaluation [21]. Schoolteachers were a target group with a high interest from the MOH to be included in the evaluation. **Table 2** below describes the evaluation populations with their respective evaluation method.

Table 2. Evaluation methods per target group, Zambézia Province, Mozambique (2021).

Evaluation population	**Method**		
	Survey	In-depth interview	Focus Group Discussion
Healthcare workers		X	
Health Auxiliaries (Service agents and Counselors)		X	
Community health workers/ health volunteers (peer educator, mentor mother)	X		
Adult bicycle/ motorcycle taxi drivers	X		
Schoolteachers		X	
PWH attending HIV/ART services	X		
Community/faith leaders			X
Adult population (18-49 years of age)			X
Population greater than 50 years of age			X

Inclusion and Exclusion Criteria

General inclusion criteria (for all evaluation population groups) included being adult (18 years of age or older), are able to provide informed verbal consent; and be based in the city, community, school, or health facility selected for the evaluation.

Specific inclusion and exclusion criteria are described in the table below (**Table 3**).

Table 3. Specific inclusion and exclusion criteria, per target group, Zambézia Province, Mozambique (2021)

Participant Group	Inclusion Criteria	Exclusion Criteria
Healthcare workers	• Being 18 years of age or older • Having a management or technical position • Working as a medical doctor, nurse, technical officer in one of the following sectors: Maternal and Child Health, outpatient clinic, Emergency, Laboratory, Pharmacy, Hospital Administration, Extended Immunization program.	• Allocated to the selected HF less than 3 months from the beginning of data collection
Health auxiliary Service Agents (housekeeping, health counselors)	• Being 18 years of age or older • Being a service agent in service in the health facility unit or community selected for the evaluation in the Quelimane and Mocuba districts • Being a health counselor allocated in the selected district	• Allocated to the selected HF less than 3 months from the beginning of data collection
Community Health Workers (CHW) and Volunteers (Mentor Mothers [MM] and Peer Educators [PE])	• Being 18 years of age or older • Being either a Peer Educator or Mentor Mother, doing the work of connecting with the community and selected HF • Being CHW in the selected districts	• Allocated to the selected HF less than 3 months from the beginning of data collection
Bicycle/motorcycle taxi drivers	• Being 18 years of age or older • Community individuals working as bicycle or motorized taxi drivers in Quelimane city or Mocuba district	
Schoolteachers	• Be 18 years of age or older • Working as a teacher at a primary or secondary school • Allocated to one of the selected schools for the evaluation	• Allocated to selected school less than 3 months from the beginning of data collection
PWH attending HIV/ART services	• Being 18 years of age or older	

	• Attending HIV/ART services on the day of data collection (new patient or patient in follow-up)	
Community/faith leaders	• Being 18 years of age or older • Being a community/faith leader and resident in one of the neighborhoods surrounding the HF selected for the evaluation	
Adult population from the community	• Being 18-49 years of age • Individual of the community living in one of the neighborhoods surrounding the HF selected for the evaluation	
Older-aged adult population from the community	• Being 50 years of age or older • Individual of the community living in one of the neighborhoods surrounding the HF selected for the evaluation	

Stakeholder engagement

Various staff from the Instituto Nacional de Saúde (INS; in English, the National Health Institute), MOH and Friends in Global Health (FGH)/Vanderbilt University Medical Center (VUMC) have been involved in the evaluation activities. From the MOH, this included the head of the MOH's Extended Program for Immunization, and at provincial level, the head of the Provincial Operational Research Center from the Provincial Health Directorate of Zambézia (DPS-Z). All collaborators have been involved since the design of the study, through the monitoring of the evaluation implementation, and throughout discussion of evaluation results. The summary of each role can be found in **Appendix 2**. From the CDC Mozambique (Maputo), the Project Officer has been involved since the beginning of the evaluation.

Sampling strategy

Healthcare Professionals, Counselors, Service Aides

An information session on the evaluation was held at each of the selected health facility locations. Interested and available persons were referred to the evaluation team members, who checked eligibility criteria, provided more detailed information about the evaluation, and obtained consent from those eligible to participate. Recruitment was done via convenience sampling, whereby eligible individuals who were available on the day of data collection were recruited, with a maximum of 10 participants per day, per location and per surveyor.

Community Health Workers and Health Volunteers

An information session on the evaluation was held at each of the selected health facility locations. Recruitment of community health workers and health volunteers was done via convenience sampling, whereby eligible individuals who were available on the day of data collection were recruited. Interested and available persons were invited to receive more information from evaluation team members, who determined an individual's eligibility criteria, provided more detailed information about the evaluation, and obtained consent from those eligible to participate.

Schoolteachers

Prior to any data collection, the evaluation team presented the evaluation objectives and procedures for this evaluation group to the management at each of the selected schools' locations and held information sessions for schoolteachers. Following the information session, any schoolteacher available and interested in participating could be recruited, with a maximum of 10 participants per day, per location and per surveyor. Interested and available persons were referred to the evaluation team members, who checked eligibility criteria, provided more detailed information about the evaluation, and obtained consent for those eligible to participate.

Bicycle/ Motorcycle taxi drivers

The evaluation team members presented the study objectives and procedures to the association of taxi drivers in both selected districts. Recruitment of taxi drivers took place at their taxi points or stops, near the markets, and/or within the surrounding selected neighborhoods. The team of evaluators were located at these strategic places and invited potential evaluation candidates who were present at the time of recruitment. The selection of participants was done via convenience sampling, depending on the availability and interest of the bicycle/ motorcycle taxi drivers who were approached, with a maximum of 10 participants per day, per location and per surveyor. Those taxi drivers who met the eligibility criteria and provided informed consent were invited to participate in the evaluation.

PWH enrolled in ART services

Prior to any data collection, the evaluation team members presented the evaluation objectives and procedures for this evaluation group to the health facility management and

clinical teams at the selected locations. A convenience sample was taken from among PWH visiting the health facility on the designated day for their routine care; this was done when their health facility visit has been completed. Those meeting eligibility criteria were invited to participate in the exit-survey. If the person voluntarily agreed to participate in the evaluation, informed consent was obtained.

Community or Faith Leaders, Community members (adult and older-aged adults)

The evaluation team met with community/faith leaders to explain the objectives of the evaluation and evaluation procedures, before any data collection. Community/faith leaders facilitated the dissemination of the information regarding the evaluation within their respective communities. Among individuals referred by the community/religious leaders and/or self-referred directly to the evaluation team, a convenience sample was taken depending on the availability and interest of the people presenting to the evaluation team. Interested and available persons were referred to the evaluation team, who checked eligibility criteria, provided more detailed information about the evaluation and obtained informed consent from those eligible to participate.

Procedures

Before any data collection, verbal consent was obtained from all participants.

Survey

For the survey, a structured interview guide was used, with open and closed questions. The survey was administered in Portuguese or a local language, depending on the preference of the participants. The survey was administered on site or in a nearby place that was comfortable for participants, considering the recommended measures of social distancing.

In-depth Interviews

In-depth interviews (IDI) were conducted with schoolteachers and healthcare professionals, including managers and clinicians from different categories such as medical doctor, nurse, and medical officer (“Técnico de Medicina”). The interviews were conducted at a time and place convenient for the participant, and were carried out in Portuguese or a local language, as per the preference of the participant. The mean length of time of the interview was 20 minutes.

Focus Group Discussions

Each focus group consisted of 5-10 members and had a mean length of time of 1 hour and 20 minutes. A semi-structured guide was used to facilitate the discussions. Conversations were held in Portuguese or a local language, as per preference of the participant group, and were recorded with the individual consent of each participant in the focus group.

Each member of the discussion group was allocated an identification number from 1 to X, where X corresponds to the total number of participants of the group. Participants were asked to sit in a circle so that they can see everyone's face and thus ensure that participants can look at each other as the discussion took place, creating a favorable communication environment. All participants were invited to complete a brief anonymous demographic data collection form to accurately describe the composition of the group.
An appropriate time for holding the FGD were scheduled with the group participants and the discussions took place in environments that allowed recommended social distancing measures to be followed.

COVID-19 prevention measures

Data collection was done during the period that MOH-issued COVID-19-related restriction measures were in place. Each member of the evaluation team used personal protective equipment (PPE) in accordance with MOH guidelines for COVID-19 prevention measures and FGH's organizational policy. Verbal informed consent was obtained from all participants to avoid contact through pens and paper. All consent processes, interviews, FGD and surveys were held in open air, or in ventilated rooms, whereby participants and evaluation team members maintained a distance of at least 1.5 meters (i.e., isolated space away from others), while still also securing confidentiality and privacy during the data collection activities. Throughout the data collection period, referral was available for any individual (including evaluation staff) who presented symptoms of COVID-19, in which case they would be referred to a HF providing COVID-19 testing for follow-up. There was no reporting of any such cases requiring referral.

Sample size

The sample size for the qualitative methods was based on literature available at time of protocol writing for qualitative research regarding hesitancy for COVID-19 vaccination [22], and hesitancy for other vaccines [23, 24], as only few publications specifically on COVID-19 vaccine hesitancy using qualitative methods were available at the time. The sample size for IDI and FGD activities was determined by saturation of content, as per qualitative methodology [25].

For the quantitative survey, we hypothesized an acceptability of 75%, based on existing data in African countries [9]. With a confidence interval of 95%, we estimated that at least 47 participants from each group (health activists, taxi drivers and PWH) would be sufficient to estimate the underlying acceptability, assuming an absolute margin of error of 12.5%. As we were interested in two different settings (rural and urban), we expected to survey a total of 141 individuals in each location. Sample size estimations are presented in **Table 4**.

Table 4. Sample size estimations for evaluation activities, Zambézia Province, Mozambique (2021)

	Survey/by location	IDI/by location	FGD/by location (groups/participants)
Healthcare professionals			
• **Managers**	-	1-3	-
• **Physician/Technical officer/ Psychologist**	-	1-3	-
• **Laboratory/ Pharmacy technicians**		1-3	
• **Nurses**	-	1-3	-
Health Auxiliary			
• **Service Agents (cleaner)**		1-3	-
• **Counselors**	-	1-3	-
Health Activists (PE, APE, MM)	47	-	-
Bicycle/ Motorcycle Taxi Drivers	47	-	-
Schoolteachers	-	3-5	-
PWH	47	-	
Community and Faith Leaders	-	-	1-2 (5-10)
Adult population at community (18-49 years of age)	-	-	2 (10)
Older-aged adults population at community (50+ years of age)	-	-	2 (10)
Total per location	**141**	**9-23**	**5-6 (25-30)**
Total (4 locations)	**564**	**36-92**	**20-24 (100-120)**

Ethical considerations

The protocol (including the protocol amendment) and all protocol-related instruments were approved by the institutional health ethics committee (CIBS-Z, reference 22/CIBS-Z/22), the VUMC Institutional Review Board (IRB) (#201887) [26, 27][i]. All participants gave verbal informed consent prior to data collection.

Deviations from the protocol

One protocol deviation occurred during implementation of the evaluation and was reported to the local ethics committee on 13 May 2022 (Ref 56/2022): during the verification of consent forms, the consent form of one participant was not found, despite the individual being included in the recruitment log. Data of this participant were removed from the study database and were not considered for analysis. No evaluation-related incidents in the selected communities or health facilities occurred during the evaluation.

Quality Assurance

Training

Prior to data collection, training was provided to all evaluation staff about human subject research ethics and/or Good Clinical Practices (GCP), evaluation protocol, techniques for conducting surveys, IDI and FGD, as well as data management. Additionally, team members received training on COVID-19 prevention measures.

Monitoring and Data Safety

Continuous internal monitoring and supervision was carried out during the data collection period, in coordination with the DPS-Z focal point. Standard operational procedures (SOP) were developed to ensure compliance with the protocol.

Survey data were entered into a password-secured cloud-based repository (REDCap™) that was only accessible to the study investigators. Interview and focus group discussion

[i] See 45 C.F.R. part 46.101(c); 21 C.F.R. part 56

data were transcribed into Word documents, were password-protected upon storage and were only accessible to study investigators.

All study team members signed a confidentiality agreement.

Analysis plan

Surveys

Descriptive statistics were used and presented as medians (with interquartile ranges [IQR]) for continuous variables and frequency breakdown (percentages) for categorical variables. Results for vaccine acceptance, defined as having received at least one vaccine dose, were presented as percentages. Multivariable generalized linear mixed-effects models (GLMM) were used to assess how vaccine acceptance varied with age, gender, and target groups (PWH, health activities and taxi drivers). Evaluation locations were treated as random effects. The R statistical software [28] was used for the quantitative analysis.

Qualitative data were analyzed using thematic analysis [29]. Coding was done by two teams of two independent researchers and compared to assess inter-rater reliability. The software STATA.SE Version 15.0 (StataCorp LLC, Texas, USA) supported the quantitative analysis and the software MAXQDA Standard 18 (Verbi GmbH Berlin, Germany) was used in the qualitative analysis.

Limitations of design

Data are not representative for the country, as the study was only done in select sites in one province in Mozambique. Additionally, convenience sampling was used for recruiting survey participants, which imposed a limitation related to representativeness of the evaluation sample.

Results

Training of the evaluation team was conducted August 9-14, 2021. Data collection was done from August 17, 2021 – September 24, 2021. Recruitment and enrollment is described in **Table 5**.

Table 5. Recruitment/ enrollment, per target group. Zambézia Province, Mozambique (2021)

Target Group	*Recruited*	*Enrolled*	*% enrolled*
Survey			
Health Activists	188	165	91%
Taxi Drivers	188	188	100%
PWH	188	186	100%
In-Depth Interview			
Health care professionals and service staff of health care services	69	60	97%
Schoolteachers	20	20	100%
Focus Group Discussion			
Community/ Faith Leaders	39	39	90%
Adult population (19-49 years)	90	77	80%
Adult population (50+ years)	79	76	80%

Sociodemographic characteristics of study population

A total of 811 participants were enrolled: 539 participants responded to the surveys, 192 participants were included in the FGD, and 80 IDI were conducted. Sociodemographic characteristics are included in **Table 6**.

Table 6. Sociodemographic characteristics, per study group. Zambézia Province, Mozambique (2021)

	Total (n=811)	**Survey respondents (n=539)**	**FGD respondents (n=192)**	**IDI respondents (n=80)**
District (n, %)				
Mocuba	420 (52%)	281 (52%)	97 (51%)	42 (53%)
Quelimane	391 (48%)	258 (48%)	95 (49%)	38 (48%)
Area (urban or rural) (n, %)				
Rural	207 (25%)	137 (25%)	50 (26%)	20 (25%)
Urban	604 (75%)	402 (75%)	142 (74%)	60 (75%)
Group				
CHW/ Volunteers	165 (20%)	165 (31%)	0	0
PWH	186 (23%)	186 (35%)	0	0
Taxi Drivers	188 (23%)	188 (35%)	0	0
Adults 18-49 years of age	76 (9%)	0	76 (40%)	0
Adults 50+ years of age	77 (9%)	0	77 (40%)	0
Community/ Faith leaders	39 (5%)	0	39 (20%)	0
Health care staff/ auxiliary	60 (7%)	0	0	60 (75%)
Schoolteachers	20 (2%)	0	0	20 (25%)
Sex (n, %) (2 missing)				
Female	392 (48%)	260 (48%)	85 (44%)	47 (60%)

Male	417 (52%)	279 (52%)	107 (56%)	31 (40%)
Age, years (6 missing)				
Mean (sd)	35.5 (13)	32.2 (9.8)	45.7 (16.8)	34 (8.5)
Median (IQR)	32 (25-43)	30 (24-37)	50 (32-58)	33 (28-39)
Age, years (categorized, n[%]) (6 missing)				
18-24 years	178 (22%)	137 (26%)	32 (17%)	9 (11%)
25-34 years	269 (33%)	212 (40%)	22 (12%)	35 (44%)
35-49 years	218 (27%)	148 (28%)	37 (20%)	33 (41%)
50+ years	140 (17%)	39 (7%)	98 (52%)	3 (4%)
Educational level (n, %) (2 missing)				
No formal education/incomplete primary	192 (26%)	128 (24%)	64 (33%)	*
Primary (7th grade)	217 (30%)	161 (30%)	56 (29%)	*
Secondary (10th grade)	136 (19%)	110 (20%)	26 (14%)	*
Pre-university (12th grade)	165 (23%)	129 (24%)	36 (19%)	*
Superior/University	12 (2%)	3 (1%)	9 (5%)	*
Technical professional	7 (1%)	6 (1%)	1 (1%)	*
Marital status (n, %) (3 missing)				
Divorced/separated/Widow	119 (16%)	80 (15%)	39 (20%)	*
Married/Living together	472 (65%)	355 (66%)	117 (61%)	*
Single (not living with partner)	137 (19%)	101 (19%)	36 (19%)	*
Income status				
Has any income	584 (80%)	478 (89%)	106 (55%)	*
Has no income	147 (20%9	61 (11%)	86 (45%)	*
Mother language (n, %) (4 missing)				
Local language	603 (83%)	476 (89%)	127 (66%)	*
Portuguese	124 (17%)	59 (11%)	65 (34%)	*
No information				*
Number of household members				
1	12 (2%)	10 (2%)	2 (1%)	*
2-5	432 (59%)	332 (62%)	100 (52%)	*
6-9	250 (34%)	171 (32%)	79 (41%)	*
10+	37 (5%)	26 (5%)	11 (6%)	*

*no information available

Knowledge about COVID-19 and COVID-19 vaccination

Knowledge about COVID-19

Surveys

Almost half (247/539, 46%) of the surveyed participants said they knew a bit or a lot related to COVID-19. The most frequently mentioned symptoms of COVID-19 were fever, cough and headache. Regarding transmission, they reported most frequently coughing/sneezing, contaminated subjects or surfaces and touching as ways to get infected with COVID-19. About 10% reported that most people would not develop any COVID-19 symptoms, but almost 60% (n=314) felt that most people infected with COVID-19 would get very sick and need hospitalization, and a difference was seen between respondents from rural and urban areas regarding perception of the severity of the disease (p<0.001). Self-reported behaviors related to prevention measures were reported, with a higher percentage reporting washing hands (96%), using facemask (91%), and keeping distance (86%). See **Table 7** for details.

Table 7. Knowledge about COVID-19 and COVID-19 vaccination among survey respondents (n=539), Zambézia Province, Mozambique (2021)

	Total (n=539)	Rural (n=137)	Urban (n=402)	p-value
How do you classify your knowledge on COVID-19? (2 missing)				0.62
Don't know anything	18 (3.3%)	5 (3.7%)	13 (3.2%)	
Know a little bit	272 (50.7%)	71 (52.2%)	201 (50.1%)	
Know a bit	213 (39.7%)	49 (36.0%)	164 (40.9%)	
Know a lot	34 (6.3%)	11 (8.1%)	23 (5.7%)	
What are symptoms of COVID-19?*				
Fever	413 (76.6%)	94 (68.6%)	319 (79.4%)	0.014
Cough	413 (76.6%)	101 (73.7%)	312 (77.6%)	0.417
Headache	343 (63.6%)	88 (64.2%)	255 (63.4%)	0.948
Short of breath	234 (43.4%)	24 (17.5%)	210 (52.2%)	<0.001
Pain in throat	229 (42.5%)	39 (28.5%)	190 (47.3%)	<0.001
Muscle Pain	100 (18.6%)	20 (14.6%)	80 (19.9%)	0.211
Shivering	75 (13.9%)	29 (21.2%)	46 (11.4%)	0.007
Change in taste	51 (9.5%)	6 (4.4%)	45 (11.2%)	0.029
Fatigue	50 (9.3%)	26 (19.0%)	24 (6.0%)	<0.001
Diarrhea	38 (7.1%)	14 (10.2%)	24 (6.0%)	0.138
Running nose	16 (3.0%)	2 (1.5%)	14 (3.5%)	0.381
Change in smell	15 (2.8%)	2 (1.4%)	13 (3.2%)	0.376
Stomach pain	10 (1.9%)	4 (2.9%)	6 (1.5%)	0.284
Other symptoms	27 (5.0%)	6 (4.4%)	21 (5.2%)	0.869
How can you be infected with COVID-19?*				
Coughing/ sneezing	391 (72.5%)	105 (76.6%)	286 (71.1%)	0.257
Contaminated subjects or surfaces	286 (53.1%)	86 (62.8%)	200 (49.8%)	0.011
Touching	280 (51.9%)	54 (39.4%)	226 (56.2%)	0.001
Contact at home	216 (40.1%)	28 (20.4%)	188 (46.8%)	<0.001
Contact at work	168 (31.2%)	25 (18.2%)	143 (35.6%)	<0.001
Eating/ drinking from same plate/glass	115 (21.3%)	24 (17.5%)	91 (22.6%)	0.253
Sexual contact	56 (10.4%)	14 (10.2%)	42 (10.4%)	1.000
Blood	18 (3.3%)	2 (1.46%)	16 (4.0%)	0.268
Witchcraft	4 (0.7%)	0 (0.0%)	4 (1.00%)	0.577
Mosquito/ insects	3 (0.6%)	0 (0.0%)	3 (0.7%)	0.575

Other	56 (10.4%)	19 (13.9%)	37 (9.2%)	0.167
How can you prevent COVID-19 infection?*				
Washing hands	517 (95.9%)	131 (95.6%)	386 (96.0%)	1.000
Use facemask	492 (91.3%)	123 (89.8%)	369 (91.8%)	0.586
Keep distance	461 (85.5%)	113 (82.5%)	348 (86.6%)	0.301
Disinfecting	216 (40.1%)	24 (17.5%)	192 (47.8%)	<0.001
Not touching face	167 (31.0%)	55 (40.1%)	112 (27.9%)	0.01
Covering nose/ mouth	128 (23.7%)	40 (29.2%)	88 (21.9%)	0.105
Stay home	46 (8.5%)	7 (5.1%)	39 (9.70%)	0.138
Self-isolation	41 (7.6%)	12 (8.8%)	29 (7.2%)	0.687
Vaccination	35 (6.5%)	4 (2.9%)	31 (7.7%)	0.078
Traditional medicine	15 (2.8%)	0 (0.0%)	15 (3.7%)	0.016
Vitamins	6 (1.1%)	4 (2.9%)	2 (0.5%)	0.039
Supplements with herbs	3 (0.5%)	1 (0.7%)	2 (0.5%)	1.000
Antimalaria medication	3 (0.5%)	0 (0.0%)	3 (0.8%)	0.575
Antibiotics	2 (0.4%)	0 (0.0%)	2 (0.5%)	1.000
How serious do you think COVID-19 can be (how many people will feel sick)? (6 missing)				0.001
Most will not have any symptoms	51 (9.57%)	4 (2.9%)	47 (11.8%)	
You can get sick but you will not need to be hospitalized	151 (28.3%)	32 (23.7%)	119 (29.9%)	
Many people will be very sick and will need to be hospitalized	314 (58.9%)	97 (71.9%)	217 (54.5%)	
Don't Know	17 (3.2%)	2 (1.5%)	15 (3.8%)	
Do you think there is treatment for COVID-19?				0.771
Yes	205 (38.6%)	53 (39.0%)	152 (38.4%)	
No	198 (37.2%)	53 (39.0%)	145 (36.6%)	
Not sure/ don't know	129 (24.2%)	30 (22.0%)	99 (25.0%)	
How can you prevent COVID-19 infection?*				
Traditional Medicine	15 (2.8%)	0 (0.0%)	15 (3.7%)	0.016
Covering nose/mouth	128 (23.7%)	40 (29.2%)	88 (21.9%)	0.105
Using facemask	492 (91.3%)	123 (89.8%)	369 (91.8%)	0.586
Antibiotics	2 (0.4%)	0 (0.0%)	2 (0.5%)	1
Social Distance	461 (85.5%)	113 (82.5%)	348 (86.6%)	0.301
Vaccination	35 (6.5%)	4 (2.9%)	31 (7.7%)	0.078
Do you know if there are vaccines against COVID-19? (3 missing)				0.001
Yes	427 (79.7%)	122 (90.4%)	305 (76.0%)	
No	40 (7.4%)	6 (4.4%)	34 (8.5%)	
Don't know	69 (12.9%)	7 (5.2%)	62 (15.5%)	
How did you hear about the vaccine?				
TV	375 (69.6%)	56 (40.9%)	319 (79.4%)	<0.001
TV at health facility	23 (4.3%)	10 (7.3%)	13 (3.2%)	0.074
Radio	365 (67.7%)	85 (62.0%)	280 (69.7%)	0.124
Newspaper	30 (5.6%)	7 (5.1%)	23 (5.7%)	0.957
Information session at HF	99 (18.4%)	37 (27.0%)	62 (15.4%)	0.004
Leaflet	33 (6.1%)	7 (5.1%)	26 (6.4%)	0.714
Conversation with family or friends	194 (36.0%)	42 (30.7%)	152 (37.8%)	0.16
Conversation with health care workers	213 (39.5%)	49 (35.8%)	164 (40.8%)	0.348
Social Media	60 (11.1%)	7 (5.1%)	53 (13.2%)	0.015
Do you think the information was sufficient? (yes, no):				0.043
Yes	392 (73.5%)	108 (80.6%)	284 (71.2%)	
No	141 (26.5%)	26 (19.4%)	115 (28.8%)	

What source of information do you trust?*				
TV	351 (65.1%)	52 (38.0%)	299 (74.4%)	<0.001
TV at health facility	15 (2.8%)	7 (5.1%)	8 (2.0%)	0.07
Radio	327 (60.7%)	77 (56.2%)	250 (62.2%)	0.255
Newspaper	26 (4.8%)	7 (5.1%)	19 (4.7%)	1
Information session	70 (13.0%)	34 (24.8%)	36 (9.0%)	<0.001
Leaflet	26 (4.8%)	6 (4.4%)	20 (5.0%)	0.96
Conversation with family or friends	94 (17.4%)	13 (9.4%)	81 (20.1%)	0.007
Conversation with health care workers	191 (35.4%)	31 (22.6%)	160 (39.8%)	<0.001
Social Media	27 (5.0%)	6 (4.4%)	21 (52%)	0.869
Community leaders	34 (6.3%)	9 (6.6%)	25 (6.2%)	1
Community meetings	14 (2.6%)	0	14 (3.5%)	0.026
Church	5 (0.9%)	3 (2.2%)	2 (0.5%)	0.107
What is the priority group for COVID-19 vaccination?*				
HCW	366 (67.9%)	75 (54.7%)	291 (72.4%)	<0.001
Older persons	329 (61.0%)	66 (48.2%)	263 (65.4%)	0.001
Teacher	294 (54.5%)	58 (42.3%)	236 (58.7%)	0.001
Police	191 (35.4%)	24 (17.5%)	167 (41.5%)	<0.001
People with chronic disease	83 (15.4%)	12 (8.8%)	71 (17.7%)	0.018
People with TB and/or HIV	57 (10.6%)	18 (13.1%)	39 (9.7%)	0.333
Priest	44 (8.2%)	15 (10.9%)	29 (7.2%)	0.231
Diabetes	26 (4.8%)	11 (8.0%)	15 (3.7%)	0.072
Children	22 (4.1%)	8 (5.8%)	14 (3.4%)	0.34
People who had COVID19 before	20 (3.7%)	6 (4.3%)	14 (3.4%)	0.827
Pregnant and breastfeeding women	3 (0.6%)	1 (0.7%)	2 (0.50%)	1.000
Obese persons	4 (0.7%)	1 (0.7%)	3 (0.7%)	1.000
Don't know	234 (43.4%)	53 (38.7%)	181 (45.0%)	0.233
Other	43 (8.0%)	17 (12.4%)	26 (6.5%)	0.042
Do you think people who had COVID-19 infection can get vaccine?				0.252
Yes	356 (67.0%)	98 (71.5%)	258 (65.5%)	
No	43 (8.1%)	7 (5.1%)	36 (9.1%)	
Don't know	132 (24.9%)	32 (23.4%)	100 (25.4%)	

*respondents were asked to mention all that applied

In-depth interviews

All schoolteachers, healthcare professionals, and health auxiliary staff were aware of the existence of COVID-19, with both groups speaking more prominently about the prevention measures that people should take, drawing attention to the fact that despite many people already being vaccinated, they should continue to take preventive measures.

> *"…there is a problem that society is now facing, (...) I have already been vaccinated, I am already well, it has nothing to do with COVID; which is not true, because I have experience of people who were vaccinated and contracted it and lost their lives; so we have to*

continue, eh..., the vaccine does not give us a guarantee of not getting it, this vaccine only helps us to increase our immunity in our body simply, (...) so to avoid getting it we have to continue still with prevention measures, distancing, use of masks, alcohol gel, washing hands with soap, etc., etc., we have to..., and avoid these crowds..." (Schoolteacher, Quelimane District, Urban)

Respondents were also aware that COVID-19 was a serious disease, some healthcare professionals spoke in detail showing that they had knowledge about the place of origin of the disease and its spread over the months until it reached Mozambique.

"COVID-19 is a disease, the name 19 says it all that it started, I think it was around December 2019, I don't know, I'm a little lost in the month, but I think it was in December and it started first in China then spread to other countries and now it has arrived here in Mozambique and I also know what the transmission routes are, how it is possible for people to catch this disease, this COVID-19 disease really is a pandemic that is now almost everywhere the world…" (Health Care Worker, Quelimane District, Urban)

<u>Focus group discussion</u>

About all participants had heard about COVID-19. Community leaders were best informed regarding COVID-19. Other groups who showed knowledge on the disease and its origin were women aged 18-49 years and men aged 50 years and older.

There was a general consensus among FGD participants that COVID-19 was a severe and dangerous disease that could quickly lead to death after becoming infected.

"…yes, we have already heard about the coronavirus, it is a disease that, uh, this disease came from China as we have seen ..." (Community leader, Mocuba District, Rural)

"*…a disease that emerged in 2019 in China and spread throughout the world, ah Mozambique, it entered Mozambique in 2019 (or) 2020 and it is expanding, (…) I mean it is spreading, it is killing many people and a lot of people are also getting infected with this disease, we are all afraid of this disease, it is a deadly disease, anyone is afraid of it, (…) so it really is a disease that we know and are very afraid of ..." (Community leader, Quelimane District, Urban)*

"*…yes, it is also worth mentioning what I have heard that it really is a very dangerous disease, it kills in less time ...*" (*Adult man, 18-49 years of age, Mocuba District, Urban*)

Knowledge about COVID-19 vaccination

Surveys

Almost all survey participants (434, 99%) had heard of vaccines to combat COVID-19 . The most frequently mentioned information sources were television (TV) (70%), radio (68%) and conversations with family/ friends (40%). These were seen as reliable sources. It is to note that TV was a less frequently reported source of information in rural areas compared to urban areas (41% versus 79%, $p<0.001$). Respondents reported that priority groups for getting the vaccine were: healthcare workers (68%), older people (61%), and schoolteachers (54%). Two-thirds of the respondents felt that persons that had COVID-19 infection in the past can still receive the vaccine, but one quarter did not know if a person in that situation could receive the vaccine (**Table 7**).

In-depth interviews

During the IDI, schoolteachers, healthcare professionals and health auxiliary staff all said that they had already heard about the vaccine, and that it serves to prevent COVID-19, explaining that it does not prevent the disease but rather serious forms of the disease.

> *"Hey, I heard that the vaccine against COVID-19 … I can say that it is not for the disease to pass, but rather to maintain immunization. (…) Yes for when you are going to catch the disease so as not to be more serious yes…" (Schoolteacher, Quelimane District, Urban)*

Some respondents (e.g., health auxiliary staff persons) mentioned that they had heard that getting the vaccine may also be associated with future illnesses and even lead to death. But in the healthcare professionals' comments, it was observed that they were more confident about the benefits of the vaccine.

> *"…While other comments from outside people say that the vaccine causes illness, it is meant to reduce years of life yes, but according to here, we have even commented now that if this is the case, it is meant to kill people, is it possible that government wants to see all employees dead? So who's going to stay working?" (Health facility auxiliary staff, Mocuba District, Rural)*

Focus group discussions

Focus group discussion analysis revealed that some participants agreed that a vaccine could prevent COVID-19 infection, although some were waiting to see if it could indeed prevent infection before they got vaccinated.

> "*I don't know if coronavirus has a cure, but I know we can prevent it through the vaccine." (Adult woman, 18-49 years of age, Quelimane District, Urban)*

"*…now they said vaccines are coming, so that you can get vaccinated to see if this disease will end, so we are waiting for these vaccines to see if we don't get this disease, thank you." (Adult man, 50+ years of age, Mocuba District, Rural)*

Perceptions regarding COVID-19 vaccination

Surveys

About one-fifth (103, 20%) of the survey participants did not feel worried about being infected by COVID-19, while 40% (n=207) reported being very worried. Almost half participants of the survey felt the vaccine is safe/ secure (47%), where a difference was seen between rural and urban areas (56% rural versus 44% urban). Only about a third (34%) thought the vaccine has side effects, more reported by health activists and PWH. Interestingly, only 2% thought that no preventive measures using mask and social distancing is needed after vaccination. (**Table 8**).

Table 8. Perceptions regarding COVID-19 vaccination among survey respondents (n=539), Zambézia Province, Mozambique (2021)

	Total (n=539)	Rural (n=137)	Urban (n=402)	P-Value
How worried are you to get infected? (15 missing)				0.739
Not worried	103 (19.7%)	27 (20.0%)	76 (19.5%)	
A little bit worried	112 (21.4%)	34 (25.2%)	78 (20.1%)	
Somewhat worried	95 (18.1%)	22 (16.3%)	73 (18.8%)	
Very worried	207 (39.5%)	50 (37.0%)	157 (40.4%)	
Not sure	7 (1.34%)	2 (1.48%)	5 (1.29%)	
Would you feel comfortable to go to the HF to get COVID19 vaccine? (2 missing)				0.027
Yes	489 (91.1%)	125 (91.2%)	364 (91.0%)	
No	28 (5.21%)	11 (8.03%)	17 (4.25%)	
Not sure	20 (3.72%)	1 (0.73%)	19 (4.75%)	
What would be your preferred place to get COVID19 vaccine?				0.004
Community vaccination post	72 (13.4%)	12 (8.76%)	60 (14.9%)	
Health facility	407 (75.5%)	114 (83.2%)	293 (72.9%)	
Other	32 (5.94%)	5 (3.65%)	27 (6.72%)	
School	13 (2.41%)	6 (4.38%)	7 (1.74%)	
Workplace	15 (2.78%)	0 (0.00%)	15 (3.73%)	
Do you think vaccine is safe/secure?				<0.001
Very secure	253 (46.9%)	77 (56.2%)	176 (43.8%)	
Moderately secure	45 (8.35%)	6 (4.38%)	39 (9.70%)	
A little bit secure	82 (15.2%)	7 (5.11%)	75 (18.7%)	
Not secure at all	25 (4.64%)	7 (5.11%)	18 (4.48%)	

Don't know	134 (24.9%)	40 (29.2%)	94 (23.4%)	
Do you trust health staff that they can give vaccine? (2 missing)				<0.001
Yes	480 (89.4%)	115 (83.9%)	365 (91.2%)	
No	33 (6.15%)	20 (14.6%)	13 (3.25%)	
Not sure	24 (4.47%)	2 (1.46%)	22 (5.50%)	
Do you think vaccine has side effects? (1 missing)				0.335
Yes	182 (33.8%)	40 (29.2%)	142 (35.4%)	
No	181 (33.6%)	52 (38.0%)	129 (32.2%)	
Not sure	175 (32.5%)	45 (32.8%)	130 (32.4%)	
Do you think you will need to use mask and keep distance after vaccination? (6 missing)				<0.001
Yes, still necessary	498 (93.4%)	116 (85.3%)	382 (96.2%)	
No, vaccine is sufficient	10 (1.88%)	6 (4.41%)	4 (1.01%)	
Don't know	25 (4.69%)	14 (10.3%)	11 (2.77%)	

Interviews

Regarding perceptions about the COVID-19 vaccine, schoolteachers, healthcare professionals and health auxiliary staff, most were vaccinated and responses were mainly based on their personal experience, showed confidence in the vaccine, claiming that it is important and very useful, recognizing that even in cases where side effects have been observed, these are also expected after the application of any vaccine.

> *"I can say that it has good quality because why would I suggest it like that? I suggest it because they are vaccines that are passed on to professionals in laboratories, they are vaccines that are observed and tried, I believe that the WHO has already approved these vaccines and they have already tried them and have seen that they are effective vaccines, so something effective/(effective)/ no there is no doubt…" (Health Professional, Quelimane District, Urban)*

> *"In my point of view, for those who have the right to convince their people, I think they are safe, I think they could never betray their own people (...) It varies from each organism, there are people who react and have their own effects. There are people to whom nothing happens." (Schoolteacher, Quelimane District, Urban)*

Although the majority of IDI participants stated that they believe that vaccines are safe, some felt that it was too early to give a clear opinion, because insufficient time had passed between the emergence of COVID-19 and the appearance of the vaccine. This raised some doubts for some respondents.

> *"However, I would say that quality is premature, why is it premature to answer that? Because we don't know how the situation is evolving, so it's difficult for us to say this*

quality is good, this quality is bad (...) I can't now detail qualities…" (Health professional, Mocuba District, Urban)

"But the biggest mistake among professionals is the time it took to manufacture the vaccine, the vaccine was made in less than a year, we already had signs of a vaccine against COVID-19, HIV is the average of centuries [has been here for centuries], but we don't have a vaccine against HIV. And then it was created [developed], and a doubt was identified: at what period was the vaccine test carried out, can you make an assessment? In less than 1 year, or was there was already a vaccine against COVID-19, and had only been reactivated, (...) so sometimes it creates insecurity." (Health professional, Mocuba District, Urban)

The fact that there were different types of vaccines to prevent COVID-19 also meant that people had different perceptions regarding them.

"The quality of the vaccine is doubtful, because there are several types of vaccine, it would be better if the vaccine was the same for everyone. The best quality for me was from best Astra-Zeneca vaccine." (Health Professional, Mocuba District, Rural)

"So, in my point of view, through this evidence, I can say that Johnson Johnson is the best [has the best quality] because once the staff, in this case, the vaccinated person does not have to be vaccinated again." (Schoolteacher, Quelimane District, Urban)

"My opinion regarding quality, I can't, I can't say here... because I don't have it, I'm not sure... I mean, it's support that is given to us from various places, so, when the vaccine practically appears from various places, we end up not staying in the same lineage because each manufacturer practically has its own lineage, so it is difficult for us to have an opinion on the quality of the vaccine that we will receive here in the country." (Schoolteacher, Mugeba District, Rural)

Focus Group Discussions

In the FGD, the participants said that they heard various things about the vaccine, but even so, the majority stated that they think the vaccine is good.

"Because there are people who, when they are on the other side, understand that the vaccine is not good, others because it did not sit well [was not well tolerated]and so on and so forth. But most of the people I have heard of have not yet complained of any illness that the vaccine has caused, at least since they had been vaccinated. I soon came to

understand that the vaccine is good…" (Adult man, 18-49 years of age, Mocuba District, Urban)

Some participants mentioned that hearing a lot of contradictory information makes them afraid of the COVID-19 vaccine as they are unable to know what really constitutes the truth.

> *"…so we are practically here without knowing if after all what the true information is, so that is what makes us panic, it makes us panic, but we are adhering to the vaccine we are, but still scared, not knowing what is what will happen to us…"* (*Community leader, Quelimane District, Urban)*

Acceptance of COVID-19 vaccination

Surveys

Nearly half (46% [249/539]) of survey respondents reported receiving at least one COVID-19 vaccine, of whom 93% (231/249) were completely vaccinated (having received all recommended doses of the vaccine). At the time of the study, CHW/volunteers, older adults (50+ years of age) and taxi drivers were eligible for vaccination, and we found a reported uptake of at least one vaccine among 61%, 69% and 41% of each group, respectively (**Figure 1**). The multivariable GLMM, with age, sex, and target group being fixed effects and evaluation locations being random effect, showed that per one-year increment in age, the odds of being vaccinated increased by 7% (Odds Ratio (OR) = 1.07; 95%CI: 1.04-1.09; p<0.001), while there was a trend seen of a lower odds of being vaccinated among men, but this was not significant (OR = 0.61; 95%CI: 0.35-1.05; p=0.075) (**Table 9**).

Table 9. Multivariable Generalized Linear Mixed Model of reception of COVID-19 vaccine among survey respondents (n=539), Zambézia Province, Mozambique (2021)

		Odds Ratios	95% CI	p
Fixed effects:				
Age		1.07	1.04 – 1.09	<0.001
Sex [Male]		0.61	0.35 – 1.05	0.075
Group [Persons with HIV]		0.35	0.21 – 0.57	<0.001
Group [Taxi drivers]		0.79	0.19 – 3.31	0.746
Random effects:				
Residual variance:	3.29			
Random variance:	0.83			
Intraclass correlation coefficient (ICC):	0.20			
Number of evaluation locations:	8			

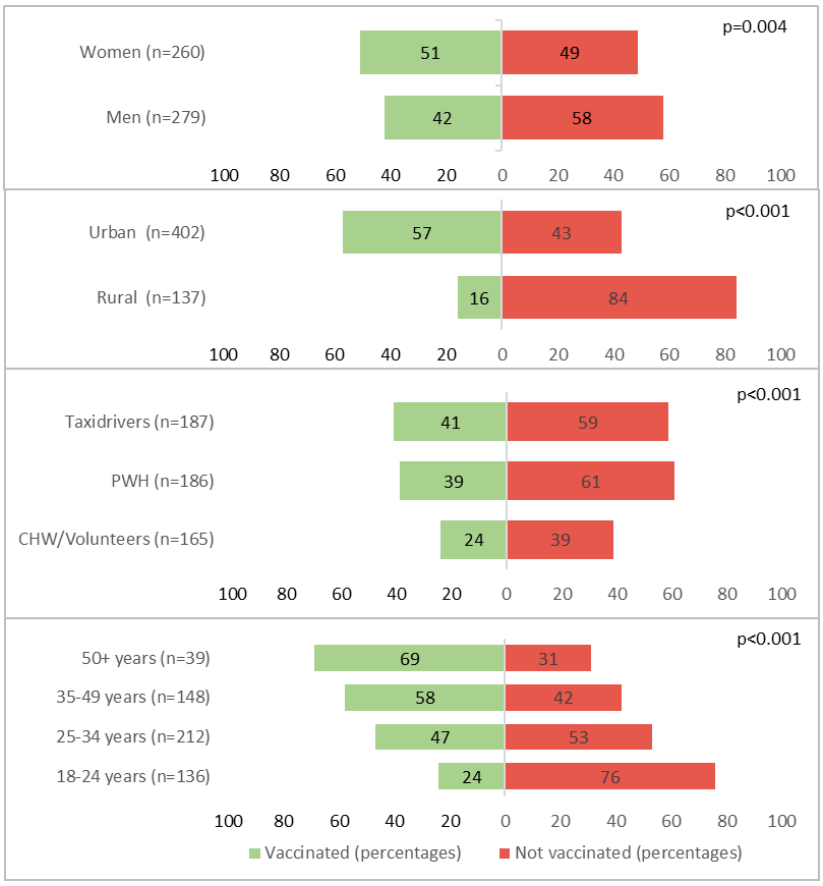

Figure 1. Uptake of at least one dose of COVID-19 vaccination, by sex, by rural vs urban area, by study group and by age group (percentages), Zambézia Province, Mozambique (2021)

Interviews

Despite recognizing that this vaccine came very quickly and was accompanied by many, sometimes contradictory, opinions, schoolteachers, healthcare professionals and health auxiliary staff all said during IDI that the majority of people were adhering to the vaccine.

In general, IDI respondents reported that there felt that there was an increased acceptance of the vaccine as time passed. They also mention that they do not have the capacity to assess whether or not the vaccines were safe, all they can do is believe in the recommendations of those who know the vaccines and medicines in general.

> *"Now, people are joining because they know that, with this vaccine, ehh, there is no longer that gathering, that noise [discussions]that they used to make. In place "X", there are so many, so many deaths and so much, so, now that people know that it is no longer there,*

there is no longer that noise [the discussions], people now adhere [to the vaccination]…"(Schoolteacher, Mocuba District, Rural)

"Eh scientifically I don't know, because I'm not a scientist, but as a medication [vaccine being considered as a form of treatment by respondent], I agree because even though we are here we don't know where the Coartem [anti-malaria medication] came from, who manufactured the Coartem, we take it and we believe in the Coartem, so I believe in the vaccine…" (Health professional, Mocuba District, Urban)

Focus Group Discussions

In general, in the focus groups, participants also demonstrated favorable acceptability of the vaccine. Most of the participants mentioned that they felt the majority of people in the community would accept the vaccine, but they recognized that there is a small part that would not accept it.

"When I was coming, I came across a lady and her friend asked, were you vaccinated? and she asked why? Even if I'm forced, I won't. Even if they come to destroy my house I won't go, they want to vaccinate…" (Adult woman, 18-49 years of age, Quelimane District, Urban)

Barriers and facilitators for COVID-19 vaccination

Most participants (149, 60%) accepted the vaccine to protect themselves and 42 (17%) accepted the vaccine to protect their family.

Regarding the motivations for not accepting vaccination, 35 (12%) of the participants did not vaccinate because they thought they were not eligible for the vaccine, 32 (11%) because of the long queues at vaccination posts and/or waiting time, 29 (10%) because they were not offered the vaccine, 20 (7%) because the campaign ended, 21 (7%) were breastfeeding, and 18 (6%) because the vaccination campaign did not reach their neighborhood. Among taxi drivers, main reasons for not accepting the vaccine were long queues (16%) or not having time/ not being offered (16%). PWH mentioned that the vaccination campaign had not arrived in their neighborhood (11%). (**Table 10**)

Table 10. Reasons to accept or not accept COVID-19 vaccination, by region, Zambézia Province, Mozambique (2021)

	Total	Rural	Urban	p-value
Why did you accept vaccine	n=249	n=22	n=227	0.164
Will protect me	149 (59.8%)	18 (81.8%)	131 (57.7%)	
Belief it will protect my family	42 (16.9%)	0 (0.00%)	42 (18.5%)	

Don't want to be infected with COVID19	29 (11.6%)	2 (9.09%)	27 (11.9%)
It is my right, am a person at risk	8 (3.21%)	1 (4.55%)	7 (3.08%)
Want to go back to normal life	8 (3.21%)	0 (0.00%)	8 (3.52%)
HCW told me to get	4 (1.61%)	0 (0.00%)	4 (1.76%)
Other	9 (3.61%)	1 (4.55%)	8 (3.52%)
Why did you not receive COVID-19 vaccine	n=289	n=114	n=175
Not eligible	35 (12.1%)	25 (21.9%)	10 (5.71%)
Long queue/ no time	32 (11.1%)	3 (2.63%)	29 (16.6%)
Nobody offered	29 (10.0%)	16 (14.0%)	13 (7.43%)
No information on campaign and its location	25 (8.65%)	17 (14.9%)	8 (4.57%)
Lactating	21 (7.27%)	2 (1.75%)	19 (10.9%)
Vaccines finished/ campaign finished	20 (6.92%)	8 (7.02%)	12 (6.86%)
Vaccination post is distant	19 (6.57%)	6 (5.26%)	13 (7.43%)
Campaign did not arrive in our neighbourhood	18 (6.23%)	16 (14.0%)	2 (1.14%)
Absence	16 (5.54%)	0 (0.00%)	16 (9.14%)
Sick	14 (4.84%)	0 (0.00%)	14 (8.00%)
Fear to get the virus through vaccination	12 (4.15%)	4 (3.51%)	8 (4.57%)
I don't believe it works/prevents	11 (3.81%)	7 (6.14%)	4 (2.29%)
Don't belief save, don't trust, undecided	10 (3.46%)	2 (1.75%)	8 (4.57%)
Pregnancy	10 (3.46%)	2 (1.75%)	8 (4.57%)
Other	17 (5.88%)	6 (5.26%)	11 (6.29%)

Both in IDI and FGD it was observed that most of the barriers are related to social or personal factors; while some are related to structural factors.

Both IDI participants groups (schoolteachers and health workers) mentioned that the following factors make it difficult (in general) to adhere to vaccination (ordered in descending frequency of mentioning):

a. Misinformation, beliefs/ myths

   "Some think the vaccine was made to make reduce the population size; yes, when you inject, is linked to religion that this is related to, to diabolism, whoever accepts the vaccine implies that it is sane to distance themselves from God; is accepting what the devil has prepared so that he can spread it to everyone in the world; so some people don't accept this aspect, religious issues, questions of doubt." (Health Professional, Mocuba District, Urban)

b. Vaccination does not guarantee that you will not contract the disease

c. Not believing that the disease (COVID-19) exists

d. Doubts regarding the vaccine

"Because truthfully and honestly, a lot of people behind the scenes are saying a lot about these vaccines, yes, that's why most of them are still confused about whether they can accept it or not." (Health Professionals, Quelimane District, Urban)

In FGD, participants also mentioned the following issues that serve as barriers to adhering to the vaccination recommendations:

a. Misinformation, beliefs/ myths

"I didn't even want to go, because of (…) what I heard on the phones: a lady saying (…) as soon as I was vaccinated, I took a coin and left it here [on my hand]. This coin has steel (…) Now I want to know from the government if the vaccine has magnetism? I shii, should I also go and get vaccinated (…) how does the same happen? (…) heee they said when you get the vaccine, you're done with 2 years, the next one you're dying..." (Community leader, Quelimane District, Urban)

[NOTE: One of the myths is that the vaccine has metal (which is considered a bad thing), and a coin is used to check if there is magnetism. Having metal in your body can lead to sickness and death over time.]

b. Doubts regarding the vaccine

"We even heard that those, that is not medicine, it is water Vumba [brand of drinking water], that they are vaccinating you with it, it is not medicine…" (Adult woman 50+ years, Quelimane District, Urban)

"There is a lot of speculation about the vaccine (…) some debates appear that it does not help us (…) sometimes debates appear, even some doctors (…) I also followed it on television saying that the vaccine cannot appear from one year to the next the vaccine at least has to be studied for 10 years (…) the effect of the future is not known, (…) so I, people sometimes get confused…" (Community Leader, Quelimane District, Urban)

c. Long queues at vaccination posts

"(…)now it's creating floods at the vaccination posts, it's creating, it's creating embarrassment for some people, for example I'm here and I've been trying to vaccinate my mother since yesterday, I'm not getting it, she's having problems with tension, high tension, I tried to take her there yesterday, but when I went there to see how she was, I couldn't take her for fear of her having other problems there, even this morning I sent my sister so she could try to mark a place in the queue, she said that even so it was very full…" (Community leader, Quelimane District, Urban)

d. Lack of having leadership figures who set an example by accepting to be vaccinated in public

"What I'm realizing here in the market is that the president's failure to vaccinate had a lot to do with our governor here in Zambézia, it had a lot to do with why they didn't vaccinate

and we saw it, that thing isn't it good thing, so we won't vaccinate until they vaccinate, that's what people are talking about…" (Adult woman 18-49 years, Quelimane District, Urban)

"I wouldn't accept it without seeing a leader, a leader, while his arm has already been vaccinated." (Adult man 18-49 years, Mocuba District, Rural)

"The deal was ruined at the beginning, even others said I should go and vaccinate, now the governor who didn't vaccinate, I go and vaccinate and the president who didn't vaccinate, that's it, that's stupid, we're not going to vaccinate…" (Adult man 50+ years, Mocuba District, Urban)

When asked about the factors that contribute to vaccination adherence, in both IDI and FGD it was observed that most of the facilitators are social and personal and some are structural. In IDI the participants mentioned the following factors which they felt served as motivators for adhering to the vaccination recommendations (ordered in descending frequency of mentioning):

a. Knowledge of the objective of the vaccine, namely, to prevent serious manifestations of the disease

   "In order to minimize the risks, in case the person perhaps catches COVID-19, not catch the more serious forms, so for me I make this assessment, hey, I'd rather get the vaccine than wait for after the disease attacks me, comes in a more serious form and I end up losing my life, so that's it, that conception is, the responsibility is individual." (Health Professional, Mocuba District, Rural)

b. Having a clear explanation/ information about the vaccine and the advantages of vaccinating

   "To better explain why people are being vaccinated? What is coronavirus? What is the vaccine for? Without this for patients, it makes it a little difficult to understand the vaccine (noise), but with these information patients can be vaccinated en masse." (Health Professional, Mocuba District, Rural)

   "The effectiveness of the vaccine, what type of information the population has about the negative effects of the vaccine; what type of information the population has about the benefits of this vaccine. If you can answer these questions, then this will help (…), so that the population can acknowledge [accept]." (Schoolteacher, Quelimane District, Urban)

   "I accepted it because, first, I understand the message, from the health agents; Why did people have to vaccinate; So, being a conscious person, I had to vaccinate for my own good." (Schoolteacher, Quelimane District, Urban)

c. Being aware that one is part of the at-risk group

"As I said, I got it because I'm a health worker and I'm a high-risk person, since this is where we deal with these patients or each type of disease, so I believe we are the priority because of this aspect of being the first to come into contact with the person with the disease, yes." (Health Professional, Quelimane District, Urban)

d. Emergence/increase in the number of positive cases and deaths

"The first phase when the vaccine was given, there were a lot of myths, rumors out there, I think people didn't believe that the vaccine would be effective, they said it would, it was supposed to, (...) they were going to be killed out there, but when the second wave occurred, things changed, they saw, I saw, it was seen a lot on television that there were many, many deaths, a lot of broadcasting, so they saw that it was no longer a joke thing, it was something more serious, so That's why people started getting vaccinated" (Health Professional, Quelimane District, Urban)

In relation to FGD, the participants considered that the greater motivating factors for adherence to the vaccine included:

a. Seeing people who have been vaccinated and are well

"They agree to go there when they see his friend is back, he said hahh, we're going too, it doesn't matter." (Adult woman 18-49 years, Mocuba District, Urban)

b. In order to have a card that shows you have been vaccinated

"People are agreeing to go get vaccinated because they are hearing comments that anyone who doesn't have this card won't travel or be treated in the hospital, so when people hear that they start going to get vaccinated…" (Adult woman 18-49 years, Quelimane District, Urban)

c. Following the example of your leaders

"…Which is teachers, health, the leaders, that's why the population in general is ready to vaccinate because the population had that thing of fear, we cannot be the first people to come forward because the leaders are people who are ahead, so that's why the population has free will…" (Community leader, Mocuba District, Rural)

d. To prevent serious illness

"Another reason is to immunize health despite there being no cure, but at least one immunized person when affected by this disease can delay a little and be able to get to the hospital." (Community leader, Mocuba District, Urban)

Communication strategy

Participants in the FGD and IDI felt that information about COVID-19 vaccine and vaccination campaigns in rural areas should be organized through communication talks led by health professionals in partnership with community leaders and/or CHW/volunteers, as rural areas usually lack other means such as cellphone/smartphone, radio or TV, which are more commonly used and/or found in urban areas.

> *"For those who live here in the city, I believe you already have this information about the COVID-19 vaccine and also for those who live in remote areas, some have some, some don't, as in the case of those who have a cell phone, there are who has a radio, but not everyone does. So, it would also be better if the group from the health unit, … to enter the hidden areas in person, because we can't just trust the transmission medium (social media), maybe not everyone heard it, so they could go there and expand the information in person with posters." (Adult woman, 18-49 years of age, Mocuba District, Urban)*

> *"A team should be created to go to the village, it can be done door-to-door, a door-to-door campaign, so no, the vaccine is like this because there are situations in which there is joint information, people see that a is an organization, go to a post, in a field for example, they will want?(…) but when it is door-to-door it is for everyone." (Schoolteacher, Quelimane District, Urban)*

Other suggestions mentioned by community members and schoolteachers included working with churches; having community activists, health staff and local influential personalities (such as the community leaders) disseminate information in the communities; conducting door-to-door campaigns to give clear and correct information regarding the vaccine.

> *"…unfortunately the churches are closed but there are means of meetings in which they can take advantage of these influential people! influential agents to ensure that the information reaches home in security way in the person's trust." (Schoolteacher, Quelimane District, Urban)*

> *"Also doing a door-to-door campaign would also be very good, as well as in neighborhood markets." (Adult woman, 18-49 years of age, Quelimane District, Urban)*

Discussion

This evaluation was done to assess the acceptance of COVID-19 vaccination during the vaccination campaigns in Zambézia Province, Mozambique. About half of the studied population received at least one dose of the vaccine, with a greater percentage in urban areas, and among elderly and women. Acknowledging that not all of the interviewed persons were eligible to receive the COVID-19 vaccine at that time of the study, we did note that the groups with priority eligibility for the vaccine at the time of data collection

(CHW/volunteers, taxi drivers, older adults 50+ years of age) did not have an optimal vaccine uptake. For one group (taxi drivers), the vaccination campaign had just started and this can explain a lower uptake. Among the non-vaccinated, misinformation especially regarding eligibility were the main reasons to refrain from vaccination. Schoolteachers, health workers, and healthcare service staff were eligible groups and showed a high acceptance, where they felt that as time passed, more information was available and they felt that vaccine acceptance had increased.

A review of COVID-19 vaccine hesitancy in Africa conducted by Achka and colleagues found that the rate of acceptance of the COVID-19 vaccine ranged from 6.9 to 97.9% [30]. Being male, having a higher level of education, and fear of COVID-19 were the most reported factors associated with increased acceptability of the COVID-19 vaccine, while misinformation and concerns of vaccine safety resulted in hesitancy. Seeing other people being vaccinated was also supportive to accept vaccination[30].

Misinformation, beliefs/ myths, and doubts about vaccine and effectiveness were frequently mentioned barriers, especially by healthcare workers and schoolteachers, and highlight the importance of providing communities with early and clear information. Structural barriers included long queues at vaccination posts. In our study, the majority of respondents had already heard about COVID-19 and COVID-19 vaccination, with sources used being TV, radio and conversations with health care workers. Participants felt these seemed to be trustworthy sources.

In the early days of the vaccine roll-out, the World Health Organization (WHO) recommended using mass media to create demand and acceptance of COVID-19 vaccines. It endorsed delivering focused messages about vaccines and eligible populations via radio, TV, and other channels. The WHO guidelines also advocated that countries regularly track social and mainstream media to quickly identify misinformation and disinformation and provide real-time countermeasures to mitigate rumors [31]. A web-based cross-sectional study conducted in 2021, with 2,572 participants of sub-Saharan Africa (SSA) origin, living in or outside of Africa, examined the impact of information sources on COVID-19 vaccine hesitancy and resistance in SSA. The study reported that receiving information through TV, social media, healthcare staff, and family/friends was a predictor of having resistance to accepting COVID-19 vaccination [32]. In our study, we found that TV and radio were reported as the perceived most frequently used sources of information and also the most trustworthy. Though not a specific analysis done in this evaluation, the authors note that it would be interesting to assess if medium of communication influenced vaccine acceptance. In rural areas, healthcare workers and local leaders are perceived as the best persons to be at the forefront of awareness campaigns. As access to TV or radio is not available everywhere, the authors believe that in rural areas, communication strategies, such as door-to-door campaigns, personal contact and including local personalities in the campaigns, could be efficient ways to reach all communities. Additionally, we hypothesize that language differences could be a barrier in rural areas (in our study, only 17% of participants reported Portuguese as their

maternal language) as most nationally-launched radio and TV spots were in Portuguese, and therefore, adding the importance of including direct community talks that are performed in local language.

Historically, many African countries lack immunization experience among adults or young people [33]. As vaccines are becoming more available for diseases such as cholera, Ebola, HPV, etc., it is essential to evaluate COVID-19 vaccination experiences to inform future vaccination campaigns, where community engagement and clear communication have been shown to be crucial for success [34, 35]. A survey done in Mozambique on hypothetical COVID-19 acceptance showed a variable acceptance over time, and demonstrated the importance of good and efficient communication strategies, as well as trust between the health sector and communities [36]. Experiences such as employing "community champions", volunteers trained to support vaccination campaigns in the communities, have been shown to play a critical role at promoting vaccine acceptance/uptake, and could be adapted to other countries [37]. Experiences reported in South-Korea found that the following factors played a role in the success of the COVID-19 vaccination campaigns of first and booster doses: proactiveness; credibility; fighting misinformation; emphasizing social norms; and coherence [38]. Indeed, our study confirmed the importance of misinformation, and strategies targeted to the local context at playing a role in increasing acceptability for first and likely for booster vaccine doses.

The study has several limitations: firstly, the study was done in only two districts in one province, and thus cannot be representative for the country. Secondly, as there was a quick evolvement over a period of six months with expansion of eligibility criteria for vaccination, it was not possible by the study team to assess if a person was at that time eligible or not.

Conclusions/ Recommendations

This study showed that information campaigns regarding COVID-19 vaccination reached the target groups, up to the more rural settings in Mozambique. Vaccine acceptance/uptake was variable, however, not all target groups were eligible at the time of the study. Results show that early and continuous health promotion is essential for a high coverage of COVID-19 vaccination, and approaches should be contextualized (rural vs urban audience, etc.) to reach all those in need of a vaccine, where rural communities lean toward preferring community-based talks, and strong engagement/example from community leadership. A continuous contextual surveillance of coverage and influencing factors (rumor and disinformation) is essential to align awareness campaigns and correct misinformation as soon as possible during campaigns.

Dissemination plan

Preliminary and final results have been discussed within a priority stakeholders' group of investigators and collaborators.

Preliminary results were presented through a webinar on COVID-19 vaccination (March 31st, 2022), organized by FGH/MOH, and were presented as a poster at the INTEREST 2022 international scientific conference (May 10-13, 2022, Kampala, Uganda, Abstract #161) and the Regional Health Conference in 2022 (Tete, Mozambique, October 25-27, 2022). Additionally, a manuscript is currently being developed to submit to a peer-reviewed journal for wider public dissemination.

The findings from this evaluation will be made publicly available within 90 days of clearance by funder (CDC), through the posting of this final results report (in English and Portuguese) in the VUMC/FGH public website (https://www.vumc.org/friends-in-global-health/evaluations).

Statement of conflict of interest:

The authors of this report have no conflicts of interest to declare.

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Appendices

1. Approved protocol (Version 1.2), including data collection instruments, consent forms, conflict of interest statements (as separate PDF file).

2. Biosketches (abridged)

Principal Investigator

Igor Capitine is an experienced Research Scientist with a Doctoral Research Degree and over 11 years of professional expertise. He has an extensive background in conducting research and enhancing health system capacity for infectious disease prevention in various contexts. Led the construction and assembly of the vaccine trials unit at the Sofala Branch of the National Institute of Health (INS). Proficient in preventive vaccine clinical

trials, disease surveillance, surveys, qualitative studies, and cost intervention evaluations. Proven track record in coordinating scientific events and engaging with diverse stakeholders, including Government Officials. Skilled in both qualitative and quantitative data analysis.

Co- Principal Investigator

Caroline De Schacht graduated from Medical School at the University of Ghent (Belgium), where she specialized in Family Medicine (2000). She has a Diploma in Tropical Medicine (2001) from the Prince Leopold Institute of Tropical Medicine in Antwerp, Belgium, and a Masters in Science Degree in Clinical Trials (2008) from the London School of Hygiene and Tropical Medicine. She obtained her PhD Degree in Biomedical Sciences, studying Prevention of Mother-to-Child Transmission (PMTCT) of HIV in Mozambique (2015) at the University of Ghent, Belgium.

Dr. De Schacht has 25 years of experience as an HIV technical advisor and researcher, of which the last 20 years in Mozambique. As technical advisor, she worked closely with the Ministry of Health and the Provincial Health authorities, having gained valuable insight into the Mozambican Health System that helped the development of study protocols.

As a researcher, she has been involved in many clinical and operational research activities, and has been leading various public health evaluations in the field of Mother and Child Health Care, Enlarged Vaccination Program, and HIV, including cohort studies on HIV incidence, and on COVID-19 incidence. Since 2017, she is the Evaluations Director at Friends in Global Health, leading HIV-related operational research projects in Zambézia province, and manage various secondary data analyses of HIV-program results and has 30+ publications in peer-reviewed journals.

Capacity building on technical/clinical services and research methodologies have been important throughout her career. Together with the Provincial Health services, and/ or National Institute of Health Mozambique, she has been serving as a trainer in different capacity building areas (quantitative and qualitative research methods, GCP/research ethics, protocol/abstract/manuscript writing, etc.), and mentor/supervise young researchers and PhD students. She is also invited member of the UEM/INS Jury for the Masters in Field Epidemiology (FELTP), and member of the scientific committee of the Mozambican Health Conference.

Brief description of the roles of other evaluation collaborators:

Collaborator	Description of role in evaluation
IC	Protocol development, coordination, data analysis, results interpretation, report development, manuscript

CDS	Protocol development, training, coordination, supervision, analysis, results interpretation, report development, manuscript
CL	Training, technical oversight of program, data collection, result interpretation, report development
PP	Training, supervision, qualitative data analysis, result interpretation, report development
AM	Concept note development, input in protocol development, qualitative data analysis, results interpretation, report development
CB	Training, supervision, qualitative data analysis, result interpretation, report development
LN	Technical results interpretation, report development
GM	Input in protocol development, results interpretation, report development
CWW	Input in protocol development, results interpretation, report development
ZY	Quantitative data analysis, report development

3. Costs:

The total budget and annual expenditures related to the evaluation is included here in the evaluation report. The amount will be shared with the activity manager/project office for entry into the DATIM evaluation inventory. The costs of the evaluation were estimated at US$ $18,958, as per approved protocol and included expenses for hiring evaluation assistants, training of personnel involved in training, supervision and support visits, personal protection materials, transportation and travel of the evaluation team, personal protection material, purchase of evaluation recorders and data analysis.

Description	Amount (USD)	Amount (Mzn)	
-			
1. Human Resources			
Research Assistants	$5,000.00	MZN	310,000.00
Transcribers	$2,000.00	MZN	124,000.00
	$7,000.00	**MZN**	**434,000.00**
2. Training, office supplies			
Training of study team	$1,800.00	MZN	111,600.00
Study instruments (consent forms, copies survey and guides)	$200.00	MZN	12,400.00
	$2,000.00	**MZN**	**124,000.00**
3. Travel - data collection			
Per diem/ accommodation study team	$3,145.16	MZN	195.000.00
Per diem DPS Staff supervision visits	$580.65	MZN	36,000.00
Car rental amendment - data collection (20d, 2cars)	$4,320.00	MZN	267,840.00
Fuel amendment - supervision	$356.00	MZN	22,072.00
	$7,321.81	**MZN**	**453,952.00**
4. Supplies and other direct costs			
IRB	$200.00	MZN	12,400.00

Dissemination and translation costs	$950.00	MZN	58,900.00
Communication and Internet	$98.71	MZN	6,120.02
Voice Recorder batteries	$36.00	MZN	2,232.00
EPI for surveyors	$200.00	MZN	12,400.00
Surgical masks for FGD participants	$60.00	MZN	3,720.00
Incentive for participants (cloth face mask)	$666.00	MZN	41,292.00
Transport reimbursement participants FGH	$400.00	MZN	24,800.00
Digital thermometer for focal groups participants screening	$25.00	MZN	1,550.00
	$2,635.71	**MZN**	**163,414.00**
TOTAL	**$18,957.52**	MZN	2,226,732.00

4. Framework