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Abstract

Introduction The coronavirus disease 2019 (COVID-19) pandemic has gravely affected the lives and economies of the global population including Nigeria. The attainment of herd immunity through mass COVID-19 vaccination is the most promising control strategy, however, the deployments of COVID-19 vaccinations are facing challenges of non-acceptance. Despite the efforts of the Nigerian government and COVAX facility in making COVID-19 vaccination more available/accessible, the vaccination rate remains unexpectedly very low in Nigeria and Ebonyi state. It is thus important to investigate the acceptability of COVID-19 vaccinations and to elucidate the explanations for the very low coverage rate. This study aims to evaluate and explore COVID-19 vaccination acceptance and the determinants among community members and health workers in Ebonyi state, Nigeria.

Methods and analyses The study is an analytical cross-sectional survey with a concurrent-independent mixed method design. Quantitative data will be collected from all consenting community members aged 15 years and above in 28 randomly selected geographical clusters (villages/settlements), through structured interviewer-administered questionnaire household survey, using KoBoCollect installed in android devices. Quantitative data will be collected from all consenting health workers, selected via convenience and snowball techniques, through self-administered questionnaire survey distributed via online social media platforms (WhatsApp and Facebook). Qualitative data will be collected from purposively selected community members and health workers through focus group discussions. Quantitative analyses will involve descriptive statistics, generalized estimating equations (for community members data), and generalized linear model (for health workers data). Qualitative analyses will employ the thematic approach.

Ethics and dissemination Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and verbal consent will be obtained from participants. Study findings will be reported at local, national, and international levels in peer-reviewed journals and conferences as appropriate.

Trial registration number Registration is ongoing with ISRCTN

Strengths and limitations of this study

- Our study will be the first geographical-community based study, using mixed method approach, to investigate COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) in the context where there is very low vaccination rate despite relative vaccine availability and public access to vaccination.
- The study will be implemented after prospective registration with ISRCTN and based on available/accessible or disseminated protocol.
- The study is prone to reporting bias due to the questionnaire-based data collection method and the convenience and snowballing sampling will make the health worker survey prone to selection bias.

Introduction

Coronavirus disease 2019 (COVID-19), a severe acute respiratory syndrome disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged by the end of 2019 and became a pandemic. By 3rd January, 2022, the COVID-19 pandemic has affected more than 346 million persons and has taken over 5.5 million lives globally with more than 7.9 million cases and over 162000 deaths in Africa.[1] By 26th January, 2022, the total number of recorded confirmed cases of COVID-19 and COVID-19 related deaths were respectively over 252000 and 3100 in Nigeria and 2064 and 32 in Ebonyi state.[2] The pandemic has overstretched the capacity of many countries health care delivery and have disrupted the global economy due to lockdown measures[3–7]

Amongst the available control measures, perhaps the most cost-effective and sustainable control strategy is mass COVID-19 vaccination (with safe and effective vaccines). COVID-19 vaccination reduces the incidence, severity, and death from COVID-19,[8–11] and offers the safest, surest, and fastest way of achieving herd immunity especially when all population groups including adults and children are vaccinated[9–14] because both adults and children are susceptible to COVID-19 infection.[15–17] However, the deployments of COVID-19 vaccinations are facing some challenges such as non-acceptance and misinformation propagated by anti-vaccine campaigners. Non-acceptance and/or delay in accepting vaccinations/hesitancy had become a major public health challenge over the past decade[18,19] and was noted as one of the top ten threats to global health in 2019.[20] Moreover, the unprecedented disruptive impact of the pandemic with the associated conspiracy theories being propagated in conventional and social media, and the unprecedented rapid development and introduction of COVID-19 vaccines have generated an atmosphere of uncertainty and confusion which have further limited the acceptance of COVID-19 vaccination[21–23]

COVID-19 vaccination started in March, 2021 in Nigeria under the COVAX initiative.[24,25] Although the Nigerian government, with the support of the COVAX facility, is scaling up the availability/access to COVID-19 vaccination, the coverage rate is still very low in Nigeria, including Ebonyi state and Nigeria was not among the only five countries in Africa expected to meet the target of about 40% COVID-19 vaccination coverage by end of 2021.[26] As of 26th January, 2022, only about 4.6% of eligible Nigerians had received the second dose of COVID-19 vaccination,[27] about 10.5% had received the first dose,[28] and Ebonyi state had about the least coverage rate in Nigeria.[29] Moreover, these coverage rates are among the current eligible population of 18 years and above and, the rates among the population at risk, which is what is considered with regards to herds immunity, would be a fraction of the above.

Although the incidence of COVID-19 in Nigeria has been relatively lower compared to many other countries, high acceptance of COVID-19 vaccination among Nigerians is important in order to prevent any possible upsurge of the disease especially due to new strains of the virus. Resurgence of COVID-19 infections and COVID-19 related deaths are common especially among populations with low COVID-19 vaccination coverage.[9–11]

Although the issue of stock-out of COVID-19 vaccines and vaccination syringes cannot be ignored in Nigeria and other African countries,[26] the slow pace of coverage may be partly due to non-acceptance/hesitancy among the populace and health workers as we have observed anecdotally in Ebonyi state. However, to our knowledge, the extent of COVID-19 vaccination acceptance and the determinants among community members and health workers, as well as the degree to which the very low COVID-19 vaccination coverage is explained by non-acceptance as against non-availability/non-access, have not been rigorously investigated especially in Nigeria and particularly in Ebonyi state. Such investigation has become more imperative since the introduction and scale up of COVID-19 vaccination across Nigeria. The understanding of context-specific determinants of vaccination acceptance is a necessary

strategy in addressing the problem of non-acceptance of new vaccines such as the current COVID-19 vaccines.[30]

COVID-19 vaccination intentions among populations were assessed at the early phase of the pandemic by studies across the world[12–14,31–60] and in Nigeria (mostly based on social media platforms and among health workers)[61–67] during the development/clinical trial stage of COVID-19 vaccines. Few studies were done at the early stage of the introduction and deployment of COVID-19 vaccination.[68,69] However, these studies were done when COVID-19 vaccination had not been introduced for public use or was just being introduced. Thus, the perceptions of vaccination-related attributes such as importance, safety or side-effects, and effectiveness were perhaps largely distal. Moreover, the findings of those studies might markedly vary from that of studies conducted in situations where COVID-19 vaccination is readily/relatively available/accessible and there are close/real experiences/perceptions of vaccination activities and vaccination-related adverse events. Also, since the implementation of COVID-19 vaccination in Nigeria, the amplification of reports of serious side-effects and deaths following vaccination is common in the social media.

Moreover, decline in the intention to receive COVID-19 vaccination after the vaccine became available have been reported across countries.[70] Anecdotal evidence shows that the initial waves of fear of COVID-19 among the people, including health workers, has markedly waned overtime especially in Ebonyi state and Nigeria as a whole where the pandemic has been much less severe compared to some other climes. As a result, it is not surprising that COVID-19 vaccination uptake is reportedly very low and more importantly, the drive to scale up the availability and uptake of COVID-19 vaccination may be up against an unexpected bottle-neck if there is no intention or delayed intention to receive the vaccination among the people.

This study aims to evaluate and explore COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) and the determinants among community members and health workers in Ebonyi state, Nigeria, in order to generate evidence to inform policy interventions and strategies on optimal COVID-19 vaccination acceptance and coverage.

Study objectives

The primary objectives are to assess/evaluate the following among community members and health workers in Ebonyi state, Nigeria:

1. The intention to receive COVID-19 vaccination

2. Timeliness of the intention to receive COVID-19 vaccination

3. The uptake of COVID-19 vaccination

4. The hesitancy to COVID-19 vaccination

5. The determinants of COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy)

6. The predictive power of acceptance factor compared with availability/access factor regarding the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

The secondary objectives are to assess/evaluate the following among community members and health workers in Ebonyi state, Nigeria:

1. The COVID-19 experiences and perceptions

2. The COVID-19 vaccination expectations and perceptions

3. The COVID-19 vaccination process experiences and perceptions (availability/access factor)

4. The knowledge, attitude, and practices about COVID-19

5. The sources of information about COVID-19

6. The perceptions about COVID-19, COVID-19 vaccine/vaccination, and COVID-19 vaccination process

7. The determinants of COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions

8. The determinants of knowledge, attitude, and practices about COVID-19

9. The determinants of the sources of information about COVID-19

Study hypotheses

The primary hypotheses include:

1. Strong COVID-19 experience and perception increases COVID-19 vaccination acceptance (increases the intention to receive, timeliness of the intention to receive, and uptake and reduces hesitancy) compared with not strong COVID-19 experience and perception

2. Increase in COVID-19 experiences and perceptions score increases COVID-19 vaccination acceptance

3. Good COVID-19 vaccination expectation and perception increases COVID-19 vaccination acceptance compared with poor COVID-19 vaccination expectation and perception

4. Increase in COVID-19 vaccination expectations and perceptions score increases COVID-19 vaccination acceptance

5. Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)) is significantly associated with COVID-19 vaccination acceptance

6. Positive COVID-19 vaccination process experience and perception (positive availability/access factor) increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with negative COVID-19 vaccination process experience and perception (negative availability/access factor)

7. Increase in COVID-19 vaccination process experiences and perceptions score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

8. Acceptance-availability/access factor is significantly associated with the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

9. Increase in acceptance factor score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with increase in availability/access factor score

The secondary hypotheses include:

1. Knowledge, attitude, and practices about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions

2. Sources of information about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; and knowledge, attitude, and practices about COVID-19

3. Sociodemographic characteristics are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

4. Professional or work-related attributes of health workers are significantly associated with: COVID-19 vaccination acceptance, COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

The hypothesized relationships between the independent factors and the outcome measures are shown in the study's conceptual framework in figure 1. The conceptual framework was designed based on the study hypotheses which were informed by published data on COVID-19 and COVID-19 vaccination and the "3Cs" Vaccine Hesitancy Model by The SAGE Working Group on Vaccine Hesitancy.[18]

In the conceptual framework (figure 1), strong COVID-19 experience and perception (compared with not strong experience and perception) and increase in COVID-19 experiences and perceptions score are expected to be associated with decrease in complacency about COVID-19 vaccination which will result in increase in the intention to receive, timeliness of the intention to receive, and uptake and decrease in hesitancy to COVID-19 vaccination (increase in COVID-19 vaccination acceptance). Likewise, good COVID-19 vaccination

expectation and perception (compared with poor expectation and perception) and increase in COVID-19 vaccination expectations and perceptions score are expected to be associated with increase in confidence in COVID-19 vaccination which will lead to increase in COVID-19 vaccination acceptance.

Positive COVID-19 vaccination process experience and perception (compared with negative experience and perception) and increase in COVID-19 vaccination process experiences and perceptions score are expected to be associated with increase in convenience in COVID-19 vaccination and then increase in the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination. Acceptance factor is expected to be associated with increase in COVID-19 vaccination acceptance compared with availability/access factor.

As depicted in the conceptual framework (figure 1), knowledge, attitude, and practice about COVID-19; sources of information about COVID-19; sociodemographic characteristics; and professional or work-related attributes are expected to be associated with decrease in complacency, increase in confidence, and increase in convenience in COVID-19 vaccination and then increase in COVID-19 vaccination acceptance. These background characteristics are also expected to be associated with COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions (figure 1).

Methods and analyses

Design

The study is an analytical cross-sectional survey with a concurrent-independent mixed data collection and data analysis and interpretation method. In this design, the quantitative and qualitative aspects of the study will be implemented simultaneously and independently of each

other.[71] The study protocol development was guided by the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 checklist and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) 2007 checklist for cross-sectional studies.

Study area

The study will be implemented in Ebonyi state which is located in south-eastern geopolitical zone of Nigeria with land area of 5,953 sq. km. The population of the state is projected to be 3,313,228 in 2021 based on the 2006 national census figure and a growth rate of 2.8% and christianity is the mostly practiced religion. Ebonyi state has 13 Local Government Areas (LGAs) including the state capital (Abakaliki LGA) and 171 political wards.[72] Each LGA is made up of political wards and autonomous communities. Each autonomous community is made up of larger villages called autonomous villages which consist of smaller villages or settlements. Each village/settlement has a head or traditional leader. Most parts of Ebonyi state are rural and there are only six towns (urban or semi-urban areas), five of which are LGAs capitals with the adjoining areas.[73]

The federal ministry of health (FMOH) and its agencies provide the overarching guidance and policy framework for public and private health service delivery in in all states in Nigeria including Ebonyi state. The FMOH provides health services in the state through tertiary health facilities while the state ministry of health (SMOH) provides health service through secondary health facilities (general hospitals). The SMOH and the state primary health care development agency (SPHCDA) provide health care in the local governments through primary health care (PHC) facilities. There is at least one PHC centre in each political ward. The national primary health care development agency (NPHCDA) provides policy guidance and coordination for immunisation/vaccination services in all states in Nigeria including Ebonyi state. The

NPHCDA provides vaccines and related products while the SMOH and SPHCDA coordinates the implementation of immunisation/vaccination service delivery in the state (and LGAs) through the tertiary, secondary, and primary health care PHC facilities.

Participants

The participants will include clusters, the community members within clusters, and health workers in Ebonyi state. A cluster in this study is a geographical community (village(s)/settlement(s)) which is the immediate catchment area of a PHC centre. Clusters that will be eligible for inclusion in the study are those with at least 200 households or a population of 1000 people, whose PHC centres are providing basic maternal and child health care services including routine childhood immunisation, that can be easily accessed with a car, and where the cluster heads give verbal consent/permission. In each of the selected clusters, community members aged 15 years and above who give verbal consent/assent will be eligible to participate in a population-based household survey. Health workers (clinical and non-clinical staff) in public and private health care sectors, including the patent medicine vendors (PMVs), who work or live in Ebonyi state and give verbal consent will be eligible to participate in a health worker survey. Community members aged 15 years and above who have resided in the community for at least one year and who give verbal consent/assent will be eligible to participate in community-based focus group discussions (FGDs) while health workers (clinical and non-clinical staff) who work or live in Ebonyi state, have at least one year of working experience, and give verbal consent will be eligible to participate in health worker-based FGDs.

Independent factors and outcome measures

Independent factors, categories, scoring, and grading

The independent factors among community members and health workers (see table 1) are almost the same with few differences which include: occupation, monthly income, and residence among the community members; and professional or work category/cadre, years of working experience, and level of work among the health workers.

The independent factors are listed under seven headings labelled A–I: COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions (availability/access factor); Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception); Acceptance-availability/access factor; Knowledge, attitude, and practice about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; and Professional or work-related attributes. These three factors – COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions – will be respectively measured using eight, five, and five questionnaire items each having five categories grouped into positive and negative and scored from 0–4 as depicted in table 1.

The scoring will create three new continuous variables: COVID-19 experiences and perceptions score (ranging from 0–32 for each participant); COVID-19 vaccination expectations and perceptions score (ranging from 0–20); and COVID-19 vaccination process experiences and perceptions score (ranging from 0–20). These continuous variables will then be graded on two-level scales such that scores >=75% of the total versus <75% will respectively be considered to be: strong versus not strong COVID-19 experience and perception; good versus poor COVID-19 vaccination expectation and perception; and positive versus negative COVID-19 vaccination process experience and perception.

Acceptance factor will be created, as the combination of COVID-19 experiences and perceptions plus COVID-19 vaccination expectations and perceptions, and defined as COVID-

Table 1: Independent factors and their categories and category scores and grading among community members and health workers

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
A	COVID-19 experiences and perceptions					
1.	How fearful are you about getting COVID-19?	Very fearful (4)	A little fearful (3)	Not sure (2)	Not fearful (1)	Not fearful at all (0)
2.	How possible is it for you to get COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
3.	How possible is it for you to get severe COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
4.	Have you ever had COVID-19?	Yes, surely (4)	Yes, think so (3)	Not sure (2)	No, think so (1)	No, surely (0)
5.	Have you ever had severe COVID-19?	Yes, very serious (4)	Yes, a bit serious (3)	Not sure (2)	No, not serious (1)	No, not serious at all (0)
6.	Do you know any person who have had COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
7.	Do you know any person who have had severe COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
8.	Do you know any person who have died from COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
	Total	(32^{H})	–	–	–	(0^{L})
9.	COVID-19 experiences and perceptions score					
10.	Extent of COVID-19 experience and perception (COVID-19 risk perception)[A]	Strong experience and perception (high risk perception)	–	–	–	Not strong experience and perception (low risk perception)
B	COVID-19 vaccination expectations and perceptions					
11.	How important is it for you to receive COVID-19 vaccination?	Very important (4)	Important (3)	Not sure (2)	Not important (1)	Not important at all (0)
12.	How fearful are you about having severe side-effect from COVID-19 vaccination?	Not fearful at all (4)	Not fearful (3)	Not sure (2)	A little fearful (1)	Very fearful (0)
13.	What protection against COVID-19 will you get from receiving COVID-19 vaccination?	Full protection (4)	Partial protection (3)	Not sure (2)	No protection (1)	No protection at all (0)
14.	How do you trust the health workers who give COVID-19 vaccination?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
15.	How do you trust the government who made COVID-19 vaccination available?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
	Total	(20^{HH})	–	–	–	(0^{LL})
16.	COVID-19 vaccination expectations and perceptions score					
17.	COVID-19 vaccination expectation and perception level (COVID-19 vaccination benefit perception) [B]	Good expectation and perception (high benefit perception)	–	–	–	Poor expectation and perception (low benefit perception)
C	COVID-19 vaccination process experiences and perceptions (availability/access factor)					
18.	Ever heard about COVID-19 vaccination?	Many times (4)	Once/few times (3)	Not sure (2)	No time (1)	No time at all (0)
19.	Know a COVID-19 vaccination place?	A very close place (4)	A close place (3)	A far place (2)	A very far place (1)	No place (0)
20.	Frequency of COVID-19 vaccination at the vaccination place?	Daily, down to twice a week (4)	Once a weekly (3)	Once in two-four weeks (2)	No fixed time (1)	Do not know (0)
21.	Queue at the vaccination place?	No queue (4)	Short queue (3)	Do not know (2)	Long queue (1)	Very long queue (0)
22.	How caring are the health workers at the vaccination place?	Very caring (4)	Caring (3)	Not sure (2)	Not caring (1)	Not caring at all (0)
	Total	(20^{HHH})				(0^{LLL})
23.	COVID-19 vaccination process experiences & perceptions score (availability/access factor score)					
24.	COVID-19 vaccination process experience and perception level (availability/access factor level)[C]	Positive experience & perception (availability & access factor)	–	–	–	Negative experience & perception (availability & access factor)
D	Acceptance factor level	Defined as COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level. Categories: High disease risk-high remedy benefit perception or high-high DR-RB perception, high-low DR-RB perception, low-high DR-RB perception, and low-low DR-RB perception				
25.	Acceptance factor score	Defined as COVID-19 risk perception score plus COVID-19 vaccination benefit perceptions score or DR-RB perception score				
26.	Acceptance-availability/access factor level	High-high-positive, High-high-negative, High-low-positive, High-low-negative, low-high-positive, low-high-negative, low-low-positive, low-low-negative				
27.						

Table 1: Continued

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
F	Knowledge, Attitude, and Practice					
28.	Knowledge score					
29.	Level of knowledge of COVID-19 [D]	Good knowledge	–	–	–	Poor knowledge
30.	Attitude score					
31.	Level of attitude towards COVID-19 & COVID-19 vaccination[E]	Good attitude	–	–	–	Poor attitude
32.	Practice score					
33.	Level of practices about COVID-19[F]	Good practice	–	–	–	Poor practice
G	Source of information about COVID-19	Interpersonal (Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums); Traditional media (Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS (WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages)				
34.	Main source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
35.	Most trusted source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
H	Sociodemographic characteristics					
36.	Gender	Male, Female				
37.	Age					
38.	Marital status	Married, Divorced, Separated, Widowed, Never married (single)				
39.	Educational level	No formal education, Some primary, Completed primary, Some secondary, Completed secondary, Tertiary (diploma, first degree, masters/PHD/other equivalent)				
40.	Occupation*	Farmer, Trader, Other-self-employment, Private paid work, Government paid work, Housewife, Student, Apprentice, Youth service (Corper), None				
41.	Residence*	Rural, Semi-urban/Urban				
42.	Usual monthly income (NGN) & income score	Income categories: "no income" up to "more than 300,000" with interval of 20,000, giving 18 categories. "no income" is scored "one" & the score increases by "one" for each higher category up to the highest score of 17				
	Professional or work-related attributes^					
43.	Professional cadre or work category	non-Clinical staff, Clinical staff (PMV, health attendant, JCHEW, CHEW, CHO, nurse/midwife, medical laboratory scientist, medical laboratory technologist, pharmacist, pharmacy technician, house officer, medical officer, medical doctor in specialist training, specialist medical doctor)				
44.	Years of working experience					
45.	Level of work (primary place of work)	Primary health care level (facility), Secondary health care level (facility), Tertiary health care level (facility)				

[H]Highest attainable COVID-19 experiences and perceptions score for each participant ([L]Lowest attainable score). [A]COVID-19 experiences and perceptions score of >=75% of the highest attainable score of 32 is strong experience and perception, <75% is less strong experience and perception. [HH]Highest attainable COVID-19 vaccination expectations and perceptions score for each participant ([LL]Lowest attainable score). [B]COVID-19 vaccination expectations and perceptions score of >=75% of the highest attainable score of 20 is good expectation and perception, <75% is poor expectation and perception. [HHH]Highest attainable COVID-19 vaccination process experiences and perceptions score ([LLL]Lowest attainable score). [C]COVID-19 vaccination process experiences and perceptions score of >=75% of the highest attainable score of 20 is positive experience and perception, <75% is negative experience and perception. [D]Knowledge score of >=75% of the highest attainable score of 44 is good knowledge, <75% is poor knowledge (lowest attainable score is 0) (44 knowledge items scored "1" for each correct response and "0" for each incorrect response). [E]Attitude score of >=75% of the highest attainable score of 80 is good attitude, <75% is poor attitude (lowest attainable score is 16) (each of 16 attitude items respectively scored from "1" to "5" or "5" to "1" as appropriate for "strongly disagree", "disagree", "not sure", "agree", & "strongly agree"). [F]Practice score of >=75% of the highest attainable score of 24 is good practice, <75% is poor practice (lowest attainable score is 0) (24 practice items scored "1" for each correct response and "0" for each incorrect response). *Among only community members. ^Among only health workers. PMV=Patent Medicine Vendor. JCHEW=Junior Community Health Extension Worker. CHEW=Community Health Extension Worker. CHO=Community Health Officer.

19 risk-COVID-19 vaccination benefit perception (disease risk-remedy benefit perception (DR-RB/DRRB perception)). Acceptance factor will be in contrast to availability/access factor (COVID-19 vaccination process experience and perception). Acceptance-availability/access factor will be created as the combination of acceptance and availability/access factors. Acceptance factor score (ranging from 0–52 for each participant as the sum of disease-risk perception score (0–32) and remedy-benefit perception score (0–20)) and availability/access factor score (ranging from 0–20) will be converted to percentages of the maximum attainable

score for each participant so that the power of acceptance factor and availability/access factor in predicting COVID-19 vaccination acceptance can be compared by comparing the percentage point increase in scores. The predictive power of disease-risk perception and remedy-benefit perception will also be compared using similar technique.

Basic knowledge, attitude, and practices about COVID-19 will be assessed, scored, and categorised as stated in the legend of table 1.

Outcome measures

The outcome measures are as defined in table 2. The primary outcomes among community members and health workers include the intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination. The secondary outcomes include COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, COVID-19 vaccination process experiences and perceptions, knowledge of COVID-19, attitude towards COVID-19 and COVID-19 vaccination, practices about COVID-19, main source and most trusted source of information about COVID-19.

Measurement of independent factors and study outcomes

Quantitative data will be measured through population-based household survey using structured community members questionnaire and health worker survey using structured health worker questionnaire. The community members questionnaire and the health workers questionnaire are virtually the same except for the absence of identification section and the professional/work-related attributes in the sociodemographic section of the health worker questionnaire. The questionnaire was designed with the guide of data published by other studies,[12,31,39,44] the Report of the SAGE Working Group on Vaccine Hesitancy,[18] the WHO vaccination coverage questionnaire,[74] and basic facts about COVID-19 on WHO website.[75]

Table 2: Outcome measures and their definitions		
SN	**Primary Outcomes**	**Definitions**
	Among community members	
1.	The intention to receive COVID-19 vaccination	The proportion of community members aged 15 years and above, who have not received COVID-19 vaccination, who intend (or plan) to receive COVID-19 vaccination that is available for them to receive. The component outcomes are those who will surely go and receive and those who think they will go and receive the vaccination. This outcome is in contrast to those who do not intend (or plan) to receive COVID-19 vaccination that is available for them to receive – consisting of those who are not sure, those who think they will not go and receive, and those who will surely not go and receive the vaccination.
2.	Timeliness of the intention to receive COVID-19 vaccination	The time (in days or weeks) that community members aged 15 years and above, who intend (or plan) to receive COVID-19 vaccination, intend (or plan) to take before they go and receive the vaccination. The component outcomes are the intended time to vaccination among those who will surely go and receive and those who think they will go and receive the vaccination.
3.	The uptake of COVID-19 vaccination	The proportion of community members aged 18 years and above who have received COVID-19 vaccination
4.	The hesitancy to COVID-19 vaccination	The proportion of community members aged 18 years and above who have not received COVID-19 vaccination due to reasons that include only non-acceptance factor rather than only real/perceived non-availability/non-access factor or both non-acceptance and real/perceived non-availability/non-access factors. Non-acceptance factor is defined as consisting of one or more of: perceptions that the vaccination is not important, vaccine is not safe, vaccine is not effective, vaccine is new and/or waiting for others to take it first, and hearing of many bad stories about the vaccine. Real/perceived non-availability/non-access factor is defined as consisting of one or more of: ignorance of vaccination availability, ignorance of place and/or time of vaccination, long distance to vaccination site, being too busy, being ill and did not go for vaccination, being ill and went for vaccination but was not given, long waiting time, vaccine stock-out, absence of vaccinator, closure of health facility. The non-acceptance and real/perceived non-availability/non-access factors will be measured as the reasons given by respondents regarding why they have not received COVID-19 vaccination
5.	The intention for the children to receive COVID-19 vaccination	The proportion of community members aged 15 years and above who intend (or plan) for their children to receive COVID-19 vaccination if it is available for them to receive. The component outcomes are those who will surely take their children to receive and those who think they will take their children to receive the vaccination. This outcome is in contrast to those who do not intend (or plan) for their children to receive COVID-19 vaccination if it is available for them to receive – consisting of those who are not sure, those who think they will not take their children to receive, and those who will surely not take their children to receive the vaccination
6.	Timeliness of the intention for the children to receive COVID-19 vaccination	The time (in days or weeks) that community members aged 15 years and above, who intend (or plan) for their children to receive COVID-19 vaccination, intend (or plan) to take before they take their children to receive the vaccination. The component outcomes are the intended time to vaccination for their children among those who will surely take their children to receive and those who think they will take their children to receive the vaccination
	Among health workers	
7.	The intention to receive COVID-19 vaccination	As for community members above
8.	Timeliness of the intention to receive COVID-19 vaccination	As for community members above
9.	The uptake of COVID-19 vaccination	As for community members above
10.	The hesitancy to COVID-19 vaccination	As for community members above
SN	**Secondary Outcomes**	**Definitions**
	Among community members	
1.	COVID-19 experiences and perceptions	COVID-19 experiences and perceptions score among community members aged 15 years and above
2.		The proportion of community members aged 15 years and above who have strong COVID-19 experience and perception (in contrast to those who have less strong experience and perception)
3.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 experiences and perceptions (in contrast to those who have the negative categories)
4.	COVID-19 vaccination expectations and perceptions	COVID-19 vaccination expectations and perceptions score among community members aged 15 years and above
5.		The proportion of community members aged 15 years and above who have good COVID-19 vaccination expectation and perception (in contrast to those who have poor expectation and perception)
6.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination expectations and perceptions (in contrast to those who have the negative categories)
7.	COVID-19 vaccination process experiences and perceptions	COVID-19 vaccination process experiences and perceptions score among community members aged 15 years and above
8.		The proportion of community members aged 15 years and above who have positive COVID-19 vaccination process experience and perception (in contrast to those who have negative experience and perception)
9.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination process experiences and perceptions (in contrast to those who have the negative categories)

Table 2: Continued		
SN	**Secondary Outcomes**	**Definitions**
10.	The knowledge of COVID-19	Knowledge score among community members aged 15 years and above
11.		The proportion of community members aged 15 years and above who have good knowledge of COVID-19 (in contrast to those who have poor knowledge)
12.	The attitude towards COVID-19 and COVID-19 vaccination	Attitude score among community members aged 15 years and above
13.		The proportion of community members aged 15 years and above who have good attitude towards COVID-19 and COVID-19 vaccination (in contrast to those who have poor attitude)
14.	The practices about COVID-19	Practice score among community members aged 15 years and above
15.		The proportion of community members aged 15 years and above who have good practice about COVID-19 (in contrast to those who have poor practice)
16.	The main source of information about COVID-19*	The proportion of community members aged 15 years and above whose main source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS.
17.	The most trusted source of information about COVID-19*	The proportion of community members aged 15 years and above whose most trusted source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS
	Among health workers	
18.	COVID-19 experiences and perceptions	As for community members above
19.	COVID-19 vaccination expectations and perceptions	As for community members above
20.	COVID-19 vaccination process experiences and perceptions	As for community members above
21.	The knowledge of COVID-19	As for community members above
22.	The attitude towards COVID-19 and COVID-19 vaccination	As for community members above
23.	The practices about COVID-19	As for community members above
24.	The main source of information about COVID-19	As for community members above
25.	The most trusted source of information about COVID-19	As for community members above

* Interpersonal source includes Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums; Traditional media source includes Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS source includes WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages.

The electronic versions of both questionnaires were programmed using the KoBoToolbox software and were pre-tested in non-participating clusters.

The community members questionnaire will be interviewer administered. The interviewers will administer the electronic questionnaire with KoBoCollect installed in their android phones or tablet devices. The interviewers will receive two days training on how to administer the electronic questionnaire. The training will include a detailed review and explanation of the questionnaire items, how to obtain consent from respondents, interview techniques, the translation of key words in the questionnaire to local language, household revisiting techniques, and how to collect data and upload completed forms with KoBoCollect.

During the household survey, all the households will be enumerated and household members aged 15 years and above in households where verbal consent is given will be enlisted and assigned unique numbers on a separate paper form before administering the anonymised electronic questionnaire. To enhance coverage and response, local residents who have good knowledge of the cluster environment will preferably be the interviewers so that they can visit households when household members are expected to be around and revisit up to three times as necessary. The community members questionnaire has seven sections: Identification (including cluster number, household number, participant number); Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19.

The health worker questionnaire will be self-administered and the web link for the electronic questionnaire will be distributed via social media platforms such as WhatsApp and Facebook. The health workers questionnaire has six sections: Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19.

Qualitative data will be measured through focus group discussions (FGDs) with community members and health workers. A total of 20 FGDs with community members will be carried out across 10 clusters with two FGDs (one male-FGD and one female-FGD) per cluster. A total of 15 FGDs with health workers will be conducted, five with non-clinical staff and 15 with clinical staff (five at PHC facilities, two at secondary health facilities, and three at tertiary health facilities). The investigators will conduct the FGDs using FGD guide prepared in English and respectively pre-tested in non-participating clusters and among some health workers who will later be exempted from the study. The FGD guides contain step-by-step instructions and both

open-ended and more targeted questions designed to explore the participants' perceptions about COVID-19, COVID-19 vaccine/vaccination, COVID-19 vaccination process, and the determinants of COVID-19 vaccination acceptance.

Before commencement of each FGD, the investigators will collect background data of participants including age, sex, marital status, level of education, occupation or cadre, and years of working experience as appropriate. The community members FGDs will be conducted in local language and the health workers FGDs in English. Each FGD will consist of 8–9 participants (comprising a moderator, a note taker, and the respondents) and will last for about 45 minutes to one hour. The FGDs will be audio-recorded, the health workers FGDs will be transcribed and community members FGDs will be translated and transcribed verbatim into English.

Data management and quality control

The skip logic and validation criteria in KoBoToolbox software was utilized when programming the electronic questionnaire to enhance the quality of data collection. To minimise the potential bias in assessing the association between COVID-19 and COVID-19 vaccination related experiences and perceptions and uptake of COVID-19 vaccination, the questionnaire items on these factors are subdivided into two subgroups: "have not received COVID-19 vaccination" and "have received COVID-19 vaccination" and the items in each subgroup are framed differently, respectively in present tense versus in past tense. For example, those whose response to a preceding question indicate that they have not received COVID-19 vaccination will subsequently respond to the questions: "How fearful are you that you may have very serious side-effect if you receive COVID-19 vaccination?" "How fearful are you about getting COVID-19?" etc. In contrast, those who have received COVID-19 vaccination will subsequently respond to the questions: "Regarding your experiences and perceptions

before the day you received the first dose of COVID-19 vaccination: How fearful were you that you might have very serious side-effect if you received COVID-19 vaccination?" "How fearful were you about getting COVID-19?"

To enhance the validity of the questionnaires, after the first drafts, they were several rounds of systematic review-discussion-correction-redrafting by the research team. During this iterative process, attention was paid to relevance of the questionnaire items to the study objectives and the logical flow and order, wording, framing, clarity and appropriateness of the questions. The validation process continued until the final version of the questionnaires which were then pre-tested. During the pre-test, respondents' understanding and interpretation of the items and the options, their response time to individual items and time taken to complete a questionnaire were assessed and the completed questionnaires were reviewed for any problems. Minor adjustments were made thereafter.

The household interviewers will upload only completed anonymised questionnaires to the online survey records at the end of each day's survey and the transmitted questionnaires will be reviewed for missing, incoherent, and illogical data. Any identified error will immediately be communicated to the respective interviewers for correction by cross-checking with the respective respondents. The investigators will supervise the household survey interviewers and will revisit at least 20 eligible households per cluster with a specialised form of the survey questionnaire to double check on responses and coverage.

Multiple submissions of the self-administered electronic questionnaire from a health worker on the same device and browser will be prevented by deploying the questionnaire through the online-only (once per respondent) option in KoBoToolbox. However, in any case where a health worker who have completed the questionnaire agrees to giving the android phone to any co-worker – who do not have android phone or online address but is willing to participate in

the survey – to respond to the questionnaire, a web link for online-only (single submission) will be sent to such health worker. The data utility in Stata will be used to check for duplicated submissions (observations) and if found, only one will be kept, the duplicates will be deleted from the dataset. Participation of study participants in the FGDs before the questionnaire surveys will be prevented. During the translation and transcribing of the community members FGDs, exact and meaning-based translation will be used. The FGD transcripts will be compared with the original recording to check for 'accuracy' before conducting analyses.

Sample size

Sample size is estimated using Stata/SE version 15·1 (Stata Corp, College Station, TX, USA). For the community members survey, assuming a conservative estimate of 50% for the primary outcome (the proportion of community members who have not received COVID-19 vaccination who intend (or plan) to receive COVID-19 vaccination that is available for them to receive) among the community members who have not strong COVID-19 experience and perception and 56% among those who have strong COVID-19 experience and perception, 80% power at 2.5% probability of type one error (to correct for multiple comparisons),[76] 2630 is the minimum total sample size required to detect the 6%-point difference in this primary outcome between both comparison groups. Allowance for 70% response rate will increase the sample size to 3758. To account for cluster sampling, 3758 is multiplied by a conservative estimate of design effect of 4 to give a final minimum total sample size of 15032. As the clusters that will be selected to participate in the study are those with minimum population size of 1000 per cluster, and with 540 (54%) of the population expectedly falling withing the age group of 15 years and above,[77] the study requires 28 clusters (15032/540) for the community members survey.

Using similar parameters, the health workers survey requires a minimum total sample size of 940 to detect a 10%-point difference in this primary outcome between both comparison groups (50% versus 60%). Because of the nature of the survey, such as the use of social media platforms for distribution of the (self-administered) questionnaire, the length of the questionnaire, and the sampling technique (convenience and snowball), allowance for 50% acceptance rate to account for both non-response and incomplete response will increase the minimum total sample size for the health worker survey to 1880. Also, due to the nature of the survey, the I880 is perhaps more of the number of health workers that will be targeted for distribution of the questionnaire rather than for selection to participate in the survey.

Sampling technique (Recruitment)

Community members will be selected by stratified cluster sampling technique. The sampling frame will be the list of clusters obtained from the Ebonyi state ministry of health. The eligible clusters will be stratified into two: rural and urban/semi-urban. A random sample of 21 clusters will be selected from the rural stratum and a random sample of 7 clusters will be selected from the urban/semi-urban stratum using the "sample" command in Stata, after random-number seed is set with the "set seed" command. This will give a 3:1 rural to urban ratio. If verbal consent/permission is not given by any of the selected cluster(s) head(s) before commencement of household survey, replacement cluster(s) will be selected from the remaining list of eligible clusters using the same technique. The study profile is shown in figure 2. In each of the selected clusters, all the households will be enumerated and all individuals aged 15 year and above in each household will be selected for the community members survey. About six to seven eligible male and female community members, both those who have received and those who have not receive COVID-19 vaccination, in 10 clusters will be selected purposively for FGDs.

Health workers will be selected by convenience and snowballing techniques. To increase acceptance rate, the research team will first make a physical and or phone contact with as many health workers as possible to invite them to participate in the survey and seek their consent and permission for the web link for the self-administered electronic questionnaire to be sent to them via online platforms. For those who give consent and permission, the address or phone number of their preferred online platform will be recorded and the web link for the questionnaire will be sent to their private online pages. They will be implored to forward the web link to other health workers that they know within the study area after they have completed the questionnaires. The research team will send the web link for the questionnaire to the online contacts (such as WhatsApp phone numbers) of as many eligible health workers as possible, including both private and group pages. About six to seven eligible health workers, both those who have received and those who have not receive COVID-19 vaccination, will be selected purposively for FGDs.

Data analyses

Data will be analysed using Stata/SE version 15.1 (Stata Corp, College Station, TX, USA). All analyses will be on intention-to-treat bases. Analyses of the community members data will be based on population-averaged models that account for clustering. Point estimates of the outcome measures will be computed for each comparison group as defined in the study hypotheses. Each hypothesis with dichotomous or categorical independent factor will be tested by computing prevalence difference (with 95% CI and p-values) in binary outcome measure using binomial identity, and mean difference (with 95% CI and p-values) in continuous outcome measure using gaussian identity, generalized estimating equations (GEE) with an exchangeable correlation matrix and robust standard errors. Each hypothesis with continuous independent factor will be tested by computing coefficient (with 95% CI and p-values) in

binary and continuous outcome measures, respectively using the binomial identity and gaussian identity GEE models.

For each independent factor (in a hypothesis) being tested, adjusted analysis will be done by in-putting into the GEE model the other independent factors as appropriate. For clarity, the potential independent factors to control for are presented in table 3. Both unadjusted and adjusted results will be reported. If the binomial identity GEE model fails to run or convergence is not achieved, gaussian identity GEE model, or generalized least square (GLS) random-effects linear regression model (with robust standard errors), or maximum likelihood (ML) random-effects linear regression model will be used instead.[78]

The same analytic technique will be used for the analyses of the health workers data except that generalized linear model (GLM) with robust standard errors will be used in place of GEE model because of the absence of cluster design in the health worker survey.

Summary statistics will be used to assess COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy); COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19 among community members and health workers.

The qualitative data (focus group discussion transcripts) will be analysed thematically based on pre-determined themes in the study's conceptual framework.

Ethics and dissemination

Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023).

Table 3: Independent factors to in-put into multivariate models in adjusted analyses		
	Independent factors under test	**Independent factors to control for (as appropriate)**
	Primary hypotheses	
1.	Extent of COVID-19 experience and perception	COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19 (Main source and Most trusted source of information about COVID-19); Sociodemographic characteristics (Gender, Age, Marital status, Educational level, Occupation*, Residence*, Monthly income/income score*); Professional or work-related attributes^ (Work category, Years of working experience, Level of work (primary place of work)
2.	COVID-19 experiences and perceptions score	COVID-19 vaccination expectations and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
3.	COVID-19 vaccination expectation and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
4.	COVID-19 vaccination expectations and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
5.	Acceptance factor level (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level)	Availability/access factor level (COVID-19 vaccination process experience and perception level); Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
6.	COVID-19 vaccination process experience and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
7.	COVID-19 vaccination process experiences and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination expectations and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
8.	Acceptance-availability/access factor level	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
9.	Acceptance factor score and availability/access factor score	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^
	Secondary hypotheses	
1.	Knowledge of COVID-19	Attitude towards COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
2.	Attitude towards COVID-19	Knowledge of COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
3.	Practices about COVID-19	Knowledge of COVID-19; Attitude towards COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
4.	Main source of information about COVID-19	Most trusted source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
5.	Most trusted source of information about COVID-19	Main source of information about COVID-19; Sociodemographic characteristics; Professional or work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
6.	A sociodemographic characteristic	Other sociodemographic characteristics; Source of information about COVID-19; Professional or work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
7.	A professional or work-related attribute^	Other professional or work-related attributes^; Source of information about COVID-19; Sociodemographic characteristics; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level

*Among only community members. ^Among only health workers.

The investigators will obtain verbal consent/permission from the heads of the selected clusters and the interviewers will obtain verbal consent and assent from the heads of households and household members aged 15 years and above during the household survey.

The health workers will be informed that only those that give consent should take the online survey. The moderators of the focus group discussions (FGDs) will obtain verbal consent from the respondents before each FGD.

The purpose the study, the kind of participation, likely duration of participation, voluntary nature of participation, absence of potential harm, potential benefit, and confidential nature of the study will be communicated to participants as required. The online record of the anonymised quantitative data will be passworded and the audio recordings and the electronic verbatim transcript of the FGDs will be stored in a passworded computer to prevent unauthorised access.

Study findings will be reported at local, national, and international levels in high impact peer-reviewed journals and conferences as appropriate

Patients and public involvement

Patients or the public were not involved in the design and reporting or dissemination plans and will not be involved in the conduct of our research.

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Figure legend

Figure 1: Study conceptual framework

Figure 2: Summary of study profile

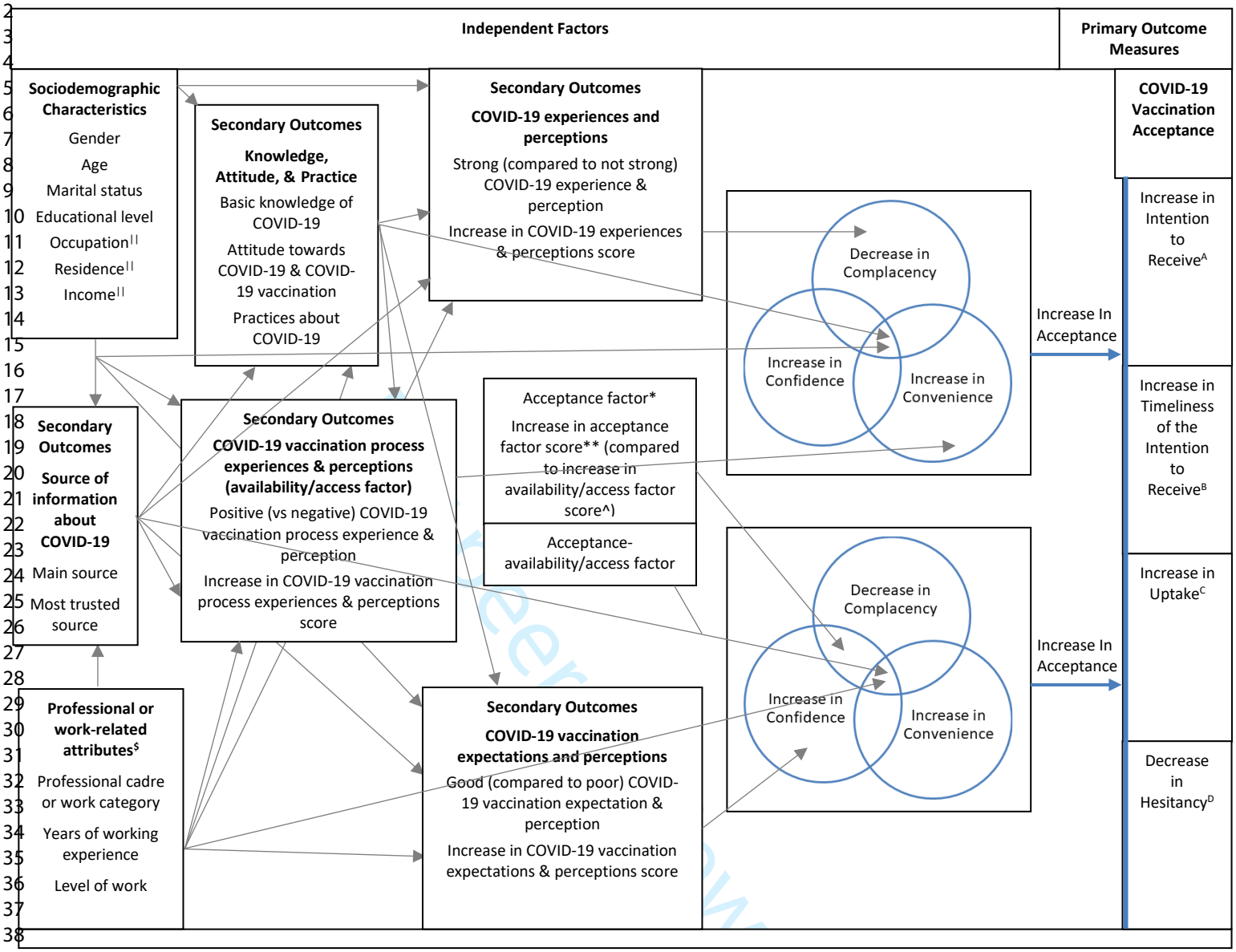

Figure 1: Study conceptual framework

*COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)). **Increase in COVID-19 risk-COVID-19 vaccination benefit perceptions score or DR-RB perception score. ^Increase in COVID-19 vaccination process experience & perception score. [A]Measured as the proportion of participants who intend to receive covid-19 vaccination that is available for them to receive at their catchment health facility. [B]Measured as the length of time the participants, who intend to receive covid-19 vaccination that is available for them to receive at their catchment health facility, intend to take before they go and receive the COVID-19 vaccination (increasing timeliness means reducing the length of time). [C]Measured as the proportion of participants who have received covid-19 vaccination (including those who have completed the doses and those who have not). [D]Measured as the proportion of participants who have not received covid-19 vaccination due to non-acceptance factor (perceptions that the vaccination is not important, vaccine is not safe, vaccine is not effective etc) rather than real or perceived non-availability (non-access) factor (ignorance of vaccination availability, long distance to vaccination site, vaccine stock-out etc) or both. ||Among only community members. $Among only health workers

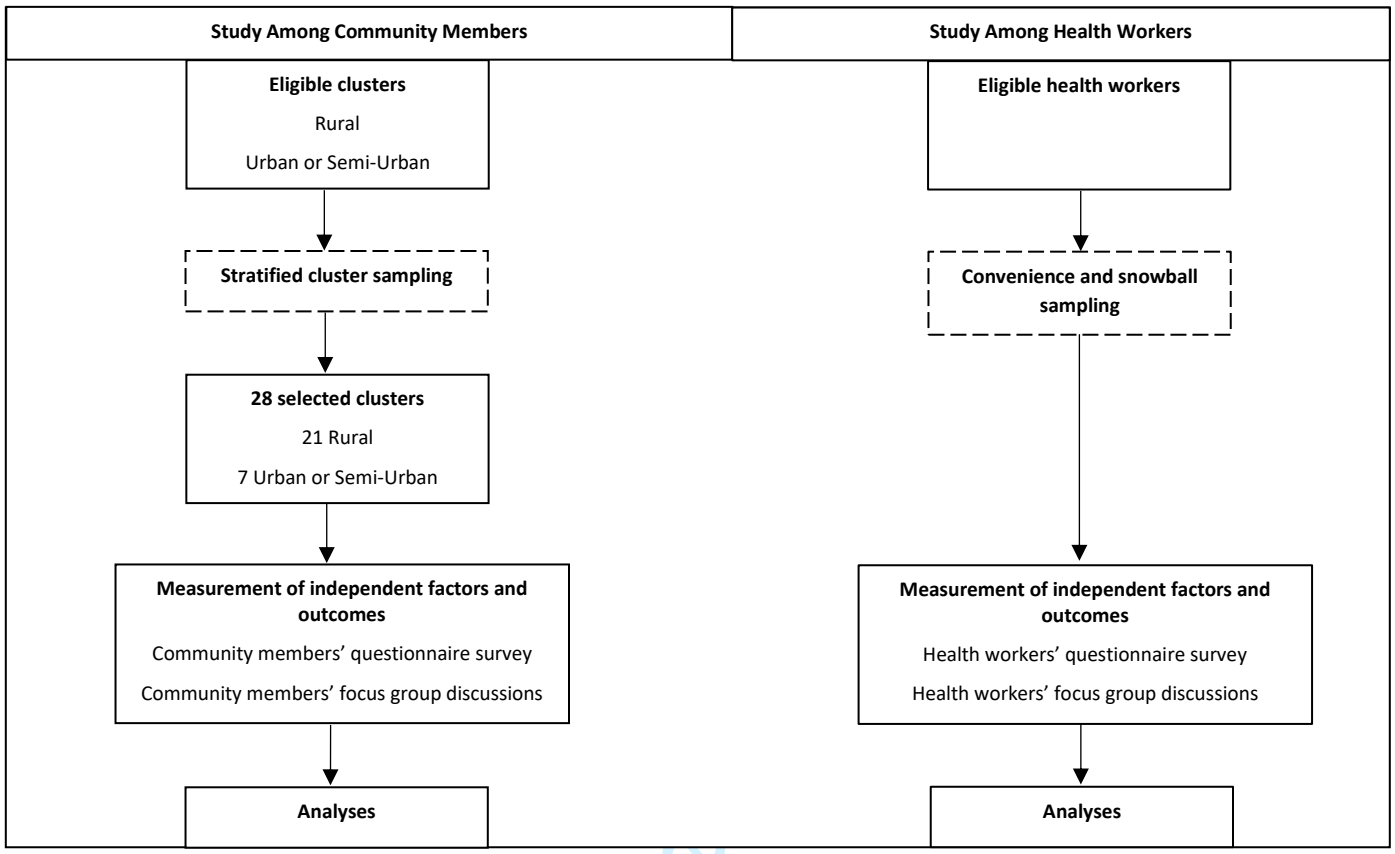

Figure 2: Summary of study profile

BMJ Open

COVID-19 vaccination acceptance among community members and health workers in Ebonyi state, Nigeria: study protocol for a concurrent-independent mixed method analyses of intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination and the determinants

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Abstract

Introduction The coronavirus disease 2019 (COVID-19) pandemic has gravely affected the lives and economies of the global population including Nigeria. The attainment of herd immunity through mass COVID-19 vaccination is the foremost control strategy, however, the deployments of COVID-19 vaccinations are facing challenges of non-acceptance. Despite the efforts of the Nigerian government and COVAX facility in making COVID-19 vaccination more available/accessible, the vaccination rate remains unexpectedly very low in Nigeria/Ebonyi state. It is thus important to investigate the acceptability of COVID-19 vaccination to elucidate the explanations for the very low coverage rate. This study aims to evaluate/explore COVID-19 vaccination acceptance and the determinants among community members and health workers in Ebonyi state, Nigeria.

Methods and analyses The study is an analytical cross-sectional survey with a concurrent-independent mixed method design. Quantitative data will be collected from all consenting/assenting community members aged 15 years and above in 28 randomly selected geographical clusters, through structured interviewer-administered questionnaire household survey, using KoBoCollect installed in android devices. Quantitative data will be collected from all consenting health workers, selected via convenience and snowball techniques, through structured self-administered questionnaire survey distributed via WhatsApp and interviewer-administered survey using KoBoCollect installed in android devices. Qualitative data will be collected from purposively selected community members and health workers through focus group discussions. Quantitative analyses will involve descriptive statistics, generalized estimating equations (for community members data), and generalized linear model (for health workers data). Qualitative analyses will employ the thematic approach.

Ethics and dissemination Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital Abakaliki (14/12/2021-17/02/2022) and verbal consent will be obtained from participants. Study findings will be reported at local, national, and international levels as appropriate.

Trial registration number ISRCTN16735844

Strengths and limitations of this study

- Our study will be the first geographical-community based study, using mixed method approach, to investigate COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) in the context where there is very low vaccination rate despite relative vaccine availability and public access to vaccination.
- The study will be implemented after prospective registration with ISRCTN and based on available/accessible or disseminated protocol.
- The study is prone to reporting bias due to the questionnaire-based data collection method. The convenience and snowballing sampling will make the health worker survey prone to selection bias.

Introduction

Coronavirus disease 2019 (COVID-19), a severe acute respiratory syndrome disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged by the end of 2019 and became a pandemic. By 10th August, 2022, the COVID-19 pandemic had affected more than 581 million persons and had resulted in the death of over 6.4 million persons globally with more than 9.2 million cases and over 174000 deaths in Africa.[1] By 10th August, 2022, the total number of recorded confirmed cases of COVID-19 and COVID-19 related deaths were respectively 262402 and 3147 in Nigeria and 2064 and 32 in Ebonyi state.[2] The pandemic has overstretched the capacity of many countries' health care delivery and disrupted the global economy due to lockdown measures.[3–7]

Amongst the available control measures, perhaps the most cost-effective and sustainable control strategy is mass COVID-19 vaccination (with safe and effective vaccines). COVID-19 vaccination reduces the incidence, severity, and death from COVID-19,[8–11] and is perhaps the foremost means of achieving herd immunity especially when all population groups including adults and children are vaccinated[9–14] because both adults and children are susceptible to COVID-19 infection.[15–17] However, the deployments of COVID-19 vaccinations are facing some challenges such as non-acceptance and misinformation propagated by anti-vaccine campaigners. Refusal and/or delay in accepting vaccinations (vaccine hesitancy) had become a major public health challenge over the past decade[18,19] and was noted as one of the top ten threats to global health in 2019.[20] Moreover, the unprecedented disruptive impact of the pandemic with the associated conspiracy theories being propagated in conventional and social media and the unprecedented rapid development and introduction of COVID-19 vaccines have generated an atmosphere of uncertainty and confusion which have further limited the acceptance of COVID-19 vaccination.[21–23]

COVID-19 vaccination started in March, 2021 in Nigeria under the COVAX initiative.[24,25] Although the Nigerian government, with the support of the COVAX facility, is scaling up the availability/access to COVID-19 vaccination, the coverage rate is still very low in Nigeria, including Ebonyi state and Nigeria was not among the only five countries in Africa expected to meet the target of about 40% COVID-19 vaccination coverage by end of 2021.[26] As of 26th January, 2022 (before this study was implemented), only about 4.6% of eligible Nigerians had received the second dose of COVID-19 vaccination,[27] about 10.5% had received the first dose,[28] and Ebonyi state had about the least coverage rate in Nigeria.[29] As of 11th August, 2022, about 25.2% of eligible Nigerians had received the second dose (fully vaccinated)[30] and about 10.6% had received the first dose (partially vaccinated)[31] and as of 12th August, 2022, Ebonyi state had the second least coverage rate in Nigeria.[32] Moreover, these coverage rates were among the current eligible population of 18 years and above and, the rates among the population at risk, which is what is considered with regards to herd immunity, would be a fraction of the above.

Although the incidence of COVID-19 in Nigeria has been relatively lower compared to many other countries, high acceptance of COVID-19 vaccination among Nigerians is important in order to prevent any possible upsurge of the disease especially due to new strains of the virus. Resurgence of COVID-19 infections and COVID-19 related deaths are common especially among populations with low COVID-19 vaccination coverage.[9–11]

Although the issue of stock-out of COVID-19 vaccines and vaccination syringes cannot be ignored in Nigeria and other African countries,[26] the slow pace of coverage may be partly due to non-acceptance/hesitancy among the populace and health workers as we have observed anecdotally in Ebonyi state. However, to our knowledge, the extent of COVID-19 vaccination acceptance and the determinants among community members and health workers, as well as the degree to which the very low COVID-19 vaccination coverage is explained by non-

acceptance as against non-availability/non-access, have not been rigorously investigated especially in Nigeria and particularly in Ebonyi state. Such investigation has become more imperative since the introduction and scale up of COVID-19 vaccination across Nigeria. The understanding of context-specific determinants of vaccination acceptance is a necessary strategy in addressing the problem of non-acceptance of new vaccines such as the current COVID-19 vaccines.[33]

COVID-19 vaccination intentions among populations were assessed at the early phase of the pandemic by studies across the world[12–14,34–63] and in Nigeria (mostly based on social media platforms and among health workers)[64–70] during the development/clinical trial stage of COVID-19 vaccines. Few studies were done at the early stage of the introduction and deployment of COVID-19 vaccination.[71,72] However, these studies were done when COVID-19 vaccination had not been introduced for public use or was just being introduced. Thus, the perceptions of vaccination-related attributes such as importance, safety or side-effects, and effectiveness were perhaps largely distal. Moreover, the findings of those studies might markedly vary from that of studies conducted in situations where COVID-19 vaccination is readily/relatively available/accessible and there are close/real experiences/perceptions of vaccination activities and vaccination-related adverse events. Also, since the implementation of COVID-19 vaccination in Nigeria, the amplification of reports of serious side-effects and deaths following vaccination is common in the social and conventional media and on the grapevine.

Moreover, decline in the intention to receive COVID-19 vaccination after the vaccine became available have been reported across countries.[73] Anecdotal evidence shows that the initial waves of fear of COVID-19 among the people, including health workers, has markedly waned overtime especially in Ebonyi state and Nigeria as a whole where the pandemic has been much less severe compared to some other climes. As a result, it is not surprising that COVID-19

vaccination uptake is reportedly very low and more importantly, the drive to scale up the availability and uptake of COVID-19 vaccination may be up against an unexpected bottle-neck if there is no intention or delayed intention to receive the vaccination among the people.

This study aims to evaluate and explore COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) and the determinants among community members and health workers in Ebonyi state, Nigeria, in order to generate evidence to inform policy interventions and strategies on optimal COVID-19 vaccination acceptance and coverage.

Study objectives

The primary objectives are to evaluate and explore the following among community members and health workers in Ebonyi state, Nigeria:

1. The intention to receive COVID-19 vaccination and the determinants

2. Timeliness of the intention to receive COVID-19 vaccination and the determinants

3. The uptake of COVID-19 vaccination and the determinants

4. The hesitancy to COVID-19 vaccination and the determinants

5. The predictive power of acceptance factor compared with availability/access factor regarding the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

The secondary objectives are to evaluate and explore the following among community members and health workers in Ebonyi state, Nigeria:

1. The COVID-19 experiences and perceptions and their determinants

2. The COVID-19 vaccination expectations and perceptions and their determinants

3. The COVID-19 vaccination process experiences and perceptions (availability/access factor) and their determinants

4. The knowledge, attitude, and practices about COVID-19 and their determinants

5. The sources of information about COVID-19 and their determinants

6. The perceptions about COVID-19, COVID-19 vaccine/vaccination, and COVID-19 vaccination process

Study hypotheses

The primary hypotheses include:

1. Strong COVID-19 experience and perception increases COVID-19 vaccination acceptance (increases the intention to receive, timeliness of the intention to receive, and uptake and reduces hesitancy) compared with not strong COVID-19 experience and perception

2. Increase in COVID-19 experiences and perceptions score increases COVID-19 vaccination acceptance

3. Good COVID-19 vaccination expectation and perception increases COVID-19 vaccination acceptance compared with poor COVID-19 vaccination expectation and perception

4. Increase in COVID-19 vaccination expectations and perceptions score increases COVID-19 vaccination acceptance

5. Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)) is significantly associated with COVID-19 vaccination acceptance

6. Positive COVID-19 vaccination process experience and perception (positive availability/access factor) increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with negative COVID-19 vaccination process experience and perception (negative availability/access factor)

7. Increase in COVID-19 vaccination process experiences and perceptions score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

8. Acceptance-availability/access factor is significantly associated with the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

9. Increase in acceptance factor score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with increase in availability/access factor score

10. The positive categories of COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions respectively increase COVID-19 vaccination acceptance compared with the negative categories (as depicted in table 1)

The secondary hypotheses include:

11. Knowledge, attitude, and practices about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions

12. Sources of information about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination

expectations and perceptions; COVID-19 vaccination process experiences and perceptions; and knowledge, attitude, and practices about COVID-19

13. Sociodemographic characteristics are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

14. Professional or work-related attributes of health workers are significantly associated with: COVID-19 vaccination acceptance, COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

The hypothesized relationships between the independent factors and the outcome measures are shown in the study's conceptual framework in figure 1. The conceptual framework was designed based on the study hypotheses which were informed by published data on COVID-19 and COVID-19 vaccination and the "3Cs" Vaccine Hesitancy Model by The SAGE Working Group on Vaccine Hesitancy.[18]

In the conceptual framework (figure 1), strong COVID-19 experience and perception (compared with not strong experience and perception), increase in COVID-19 experiences and perceptions score, and the positive categories of COVID-19 experiences and perceptions (compared with the negative categories) are expected to be associated with decrease in complacency about COVID-19 vaccination which will result in increase in the intention to receive, timeliness of the intention to receive, and uptake and decrease in hesitancy to COVID-19 vaccination (increase in COVID-19 vaccination acceptance). Likewise, good COVID-19

vaccination expectation and perception (compared with poor expectation and perception), increase in COVID-19 vaccination expectations and perceptions score, and the positive categories of COVID-19 vaccination expectations and perceptions (compared with the negative categories) are expected to be associated with increase in confidence in COVID-19 vaccination which will lead to increase in COVID-19 vaccination acceptance.

Positive COVID-19 vaccination process experience and perception (compared with negative experience and perception), increase in COVID-19 vaccination process experiences and perceptions score, and the positive categories of COVID-19 vaccination process experiences and perceptions (compared with the negative categories) are expected to be associated with increase in convenience in COVID-19 vaccination and then increase in the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination. Acceptance factor is expected to be associated with increase in COVID-19 vaccination acceptance compared with availability/access factor.

As depicted in the conceptual framework (figure 1), knowledge, attitude, and practice about COVID-19; sources of information about COVID-19; sociodemographic characteristics; and professional or work-related attributes are expected to be associated with decrease in complacency, increase in confidence, and increase in convenience in COVID-19 vaccination and then increase in COVID-19 vaccination acceptance. These background characteristics are also expected to be associated with COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions (figure 1).

Methods and analyses

Design

The study is an analytical cross-sectional survey with a concurrent-independent mixed data collection and data analysis and interpretation method. In this design, the quantitative and qualitative aspects of the study will be implemented simultaneously and independently of each other.[74] The study protocol development was guided by the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 checklist and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) 2007 checklist for cross-sectional studies.

Study area

The study is planned to be implemented between March and April, 2022, in Ebonyi state which is located in south-eastern geopolitical zone of Nigeria (supplementary file 1) with land area of 5,953 sq. km. The population of the state was projected to be 3,313,229 in 2021 based on the 2006 national census figure and a growth rate of 2.8% and christianity is the most practiced religion. Ebonyi state has 13 Local Government Areas (LGAs) including the state capital (Abakaliki LGA) and 171 political wards.[75] Each LGA is made up of political wards and autonomous communities. Each autonomous community is made up of larger villages called autonomous villages which consist of smaller villages or settlements. Each village/settlement has a head or traditional leader. Most parts of Ebonyi state are rural and there are only six towns (urban or semi-urban areas), five of which are LGAs capitals with the adjoining areas.[76]

The federal ministry of health (FMOH) and its agencies provide the overarching guidance and policy framework for public and private health service delivery in all states in Nigeria including Ebonyi state. The FMOH provides health services in the state through tertiary health facilities while the state ministry of health (SMOH) provides health service through secondary health facilities (general hospitals). The SMOH and the state primary health care development agency (SPHCDA) provide health care in the local governments through primary health care (PHC)

facilities. There is at least one PHC centre in each political ward. The national primary health care development agency (NPHCDA) provides policy guidance and coordination for immunisation/vaccination services in all states in Nigeria including Ebonyi state. The NPHCDA provides vaccines and related products while the SMOH and SPHCDA coordinates the implementation of immunisation/vaccination service delivery in the state (and LGAs) through the tertiary, secondary, and primary health care (PHC) facilities.

Participants

The participants include clusters, the community members within clusters, and health workers in Ebonyi state. A cluster in this study is a geographical community (village(s)/settlement(s)) which is the immediate catchment area of a PHC centre. Eligible clusters for inclusion in the study are those with at least 200 households or a population of 1000 people, whose PHC centres are providing basic maternal and child health care services including routine childhood immunisation, that can be easily accessed with a car, and where the cluster heads give verbal consent/permission. In each of the selected clusters, community members aged 15 years and above who give verbal consent/assent will be eligible to participate in a population-based household survey. Health workers (both clinical and non-clinical staff) in public and private health care sectors, including the patent medicine vendors (PMVs), who work or live in Ebonyi state and give verbal consent will be eligible to participate in a health worker survey. Community members aged 15 years and above who have resided in the community for at least one year and who give verbal consent/assent will be eligible to participate in community-based focus group discussions (FGDs) while health workers (both clinical and non-clinical staff) who work or live in Ebonyi state, have at least one year of working experience, and give verbal consent will be eligible to participate in health worker-based FGDs.

Independent factors and outcome measures

Independent factors, categories, scoring, and grading

The independent factors among community members and health workers (see table 1) are almost the same with few differences which include: occupation, monthly income, and residence among the community members; and professional or work category/cadre, years of working experience, and level of work among the health workers.

The independent factors are listed under seven headings labelled A–I: COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions (availability/access factor); Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception); Acceptance-availability/access factor; Knowledge, attitude, and practice about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; and Professional or work-related attributes. These three factors – COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions – will be respectively measured using eight, five, and five questionnaire items each having five categories grouped into positive and negative and scored from 0–4 as depicted in table 1.

The scoring will create three new continuous variables including COVID-19 experiences and perceptions score (ranging from 0–32 for each participant); COVID-19 vaccination expectations and perceptions score (ranging from 0–20); and COVID-19 vaccination process experiences and perceptions score (ranging from 0–20). These continuous variables will then be graded on a two-level scale such that scores >=50% of the total versus <50% will respectively be considered to be: strong versus not strong COVID-19 experience and perception; good versus poor COVID-19 vaccination expectation and perception; and positive versus negative COVID-19 vaccination process experience and perception.

Acceptance factor will be created as the combination of COVID-19 experiences and

Table 1: Independent factors and their categories and category scores and grading among community members and health workers

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
A	COVID-19 experiences and perceptions					
1.	How fearful are you about getting COVID-19?	Very fearful (4)	A little fearful (3)	Not sure (2)	Not fearful (1)	Not fearful at all (0)
2.	How possible is it for you to get COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
3.	How possible is it for you to get severe COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
4.	Have you ever had COVID-19?	Yes, surely (4)	Yes, think so (3)	Not sure (2)	No, think so (1)	No, surely (0)
5.	Have you ever had severe COVID-19?	Yes, very serious (4)	Yes, a bit serious (3)	Not sure (2)	No, not serious (1)	No, not serious at all (0)
6.	Do you know any person who have had COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
7.	Do you know any person who have had severe COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
8.	Do you know any person who have died from COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
	Total	(32^{H})	–	–	–	(0^{L})
9.	COVID-19 experiences and perceptions score					
10.	Extent of COVID-19 experience and perception (COVID-19 risk perception)[A]	Strong experience and perception (high risk perception)	–	–	–	Not strong experience and perception (low risk perception)
B	COVID-19 vaccination expectations and perceptions					
11.	How important is it for you to receive COVID-19 vaccination?	Very important (4)	Important (3)	Not sure (2)	Not important (1)	Not important at all (0)
12.	How fearful are you about having severe side-effect from COVID-19 vaccination?	Not fearful at all (4)	Not fearful (3)	Not sure (2)	A little fearful (1)	Very fearful (0)
13.	What protection against COVID-19 will you get from receiving COVID-19 vaccination?	Full protection (4)	Partial protection (3)	Not sure (2)	No protection (1)	No protection at all (0)
14.	How do you trust the health workers who give COVID-19 vaccination?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
15.	How do you trust the government who made COVID-19 vaccination available?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
	Total	(20^{HH})	–	–	–	(0^{LL})
16.	COVID-19 vaccination expectations and perceptions score					
17.	COVID-19 vaccination expectation and perception level (COVID-19 vaccination benefit perception) [B]	Good expectation and perception (high benefit perception)	–	–	–	Poor expectation and perception (low benefit perception)
C	COVID-19 vaccination process experiences and perceptions (availability/access factor)					
18.	Ever heard about COVID-19 vaccination?	Many times (4)	Once/few times (3)	Not sure (2)	No time (1)	No time at all (0)
19.	Know a COVID-19 vaccination place?	A very close place (4)	A close place (3)	A far place (2)	A very far place (1)	No place (0)
20.	Frequency of COVID-19 vaccination at the vaccination place?	Daily, down to twice a week (4)	Once a weekly (3)	Once in two-four weeks (2)	No fixed time (1)	Do not know (0)
21.	Queue at the vaccination place?	No queue (4)	Short queue (3)	Do not know (2)	Long queue (1)	Very long queue (0)
22.	How caring are the health workers at the vaccination place?	Very caring (4)	Caring (3)	Not sure (2)	Not caring (1)	Not caring at all (0)
	Total	(20^{HHH})				(0^{LLL})
23.	COVID-19 vaccination process experiences & perceptions score (availability/access factor score)					
24.	COVID-19 vaccination process experience and perception level (availability/access factor level)[C]	Positive experience & perception (availability & access factor)	–	–	–	Negative experience & perception (availability & access factor)
D	Acceptance factor level	Defined as COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level. Categories: High disease risk-high remedy benefit perception or high-high DR-RB perception, high-low DR-RB perception, low-high DR-RB perception, and low-low DR-RB perception				
25.	Acceptance factor score	Defined as COVID-19 risk perception score plus COVID-19 vaccination benefit perceptions score or DR-RB perception score				
26.	Acceptance-availability/access factor level	High-high-positive, High-high-negative, High-low-positive, High-low-negative, low-high-positive, low-high-negative, low-low-positive, low-low-negative				
27.						

Table 1: Continued

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
F	Knowledge, Attitude, and Practice					
28.	Knowledge score					
29.	Level of knowledge of COVID-19 [D]	Good knowledge	–	–	–	Poor knowledge
30.	Attitude score					
31.	Level of attitude towards COVID-19 & COVID-19 vaccination[E]	Good attitude	–	–	–	Poor attitude
32.	Practice score					
33.	Level of practices about COVID-19[F]	Good practice	–	–	–	Poor practice
G	Source of information about COVID-19	Interpersonal (Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums); Traditional media (Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS (WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages)				
34.	Main source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
35.	Most trusted source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
H	Sociodemographic characteristics					
36.	Gender	Male, Female				
37.	Age					
38.	Marital status	Married, Divorced, Separated, Widowed, Never married (single)				
39.	Educational level	No formal education, Some primary, Completed primary, Some secondary, Completed secondary, Tertiary (diploma, first degree, masters/PHD/other equivalent)				
40.	Occupation*	Farmer, Trader, Other-self-employment, Private paid work, Government paid work, Housewife, Student, Apprentice, Youth service (Corper), None				
41.	Residence*	Rural, Semi-urban/Urban				
42.	Usual monthly income (NGN) & income score	Income categories: "no income" up to "more than 300,000" with interval of 20,000, giving 18 categories. "no income" is scored "one" & the score increases by "one" for each higher category up to the highest score of 17				
I	Professional or work-related attributes^					
43.	Professional cadre or work category	non-Clinical staff, Clinical staff (PMV, health attendant, JCHEW, CHEW, CHO, nurse/midwife, medical laboratory scientist, medical laboratory technologist, pharmacist, pharmacy technician, house officer, medical officer, medical doctor in specialist training, specialist medical doctor)				
44.	Years of working experience					
45	Primary place of work	Public and private				
46.	Level of primary place of work	Primary health care level (facility), Secondary health care level (facility), and Tertiary health care level (facility)				

[H]Highest attainable COVID-19 experiences and perceptions score for each participant ([L]Lowest attainable score). [A]COVID-19 experiences and perceptions score of >=50% of the highest attainable score of 32 is strong experience and perception, <50% is not strong experience and perception. [HH]Highest attainable COVID-19 vaccination expectations and perceptions score for each participant ([LL]Lowest attainable score). [B]COVID-19 vaccination expectations and perceptions score of >=50% of the highest attainable score of 20 is good expectation and perception, <50% is poor expectation and perception. [HHH]Highest attainable COVID-19 vaccination process experiences and perceptions score ([LLL]Lowest attainable score). [C]COVID-19 vaccination process experiences and perceptions score of >=50% of the highest attainable score of 20 is positive experience and perception, <50% is negative experience and perception. [D]Knowledge score of >=75% of the highest attainable score of 44 is good knowledge, <75% is poor knowledge (lowest attainable score is 0) (44 knowledge items scored "1" for each correct response and "0" for each incorrect response). [E]Attitude score of >=75% of the highest attainable score of 80 is good attitude, <75% is poor attitude (lowest attainable score is 16) (each of 16 attitude items respectively scored from "1" to "5" or "5" to "1" as appropriate for "strongly disagree", "disagree", "not sure", "agree", & "strongly agree"). [F]Practice score of >=75% of the highest attainable score of 24 is good practice, <75% is poor practice (lowest attainable score is 0) (24 practice items scored "1" for each correct response and "0" for each incorrect response). *Among only community members. ^Among only health workers. PMV=Patent Medicine Vendor. JCHEW=Junior Community Health Extension Worker. CHEW=Community Health Extension Worker. CHO=Community Health Officer.

perceptions plus COVID-19 vaccination expectations and perceptions and defined as COVID-19 risk-COVID-19 vaccination benefit perception (disease risk-remedy benefit perception (DR-RB/DRRB perception)). Acceptance factor will be in contrast to availability/access factor (COVID-19 vaccination process experience and perception). Acceptance-availability/access factor will be created as the combination of acceptance and availability/access factors. Acceptance factor score (ranging from 0–52 for each participant as the sum of disease-risk perception score (0–32) and remedy-benefit perception score (0–20)) and availability/access

factor score (ranging from 0–20) will be converted to percentages of the maximum attainable score for each participant so that the power of acceptance factor and availability/access factor in predicting COVID-19 vaccination acceptance can be compared by comparing how unit increase in the percentage scores (percentage point increase) affect COVID-19 vaccination acceptance. The predictive power of disease-risk perception and remedy-benefit perception will also be compared using similar technique.

Basic knowledge, attitude, and practices about COVID-19 will be assessed, scored, and categorised as stated in the legend of table 1.

Outcome measures

The outcome measures are as defined in table 2. The primary outcomes among community members and health workers include the intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination. The secondary outcomes include COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, COVID-19 vaccination process experiences and perceptions, knowledge of COVID-19, attitude towards COVID-19 and COVID-19 vaccination, practices about COVID-19, main source and most trusted source of information about COVID-19.

Measurement of independent factors and study outcomes

Quantitative data will be measured through population-based household survey using structured community members questionnaire (supplementary file 2) and health worker survey using structured health worker questionnaire (supplementary file 3). The community members questionnaire and the health workers questionnaire are virtually the same except for the absence of identification section and the professional/work-related attributes in the sociodemographic section of the health worker questionnaire.

Table 2: Outcome measures and their definitions		
SN	**Primary Outcomes**	**Definitions**
	Among community members	
1.	The intention to receive COVID-19 vaccination	The proportion of community members aged 15 years and above, who have not received COVID-19 vaccination, who intend (or plan) to receive COVID-19 vaccination that is available for them to receive. The component outcomes are those who will surely go and receive and those who think they will go and receive the vaccination. This outcome is in contrast to those who do not intend (or plan) to receive COVID-19 vaccination that is available for them to receive – consisting of those who are not sure, those who think they will not go and receive, and those who will surely not go and receive the vaccination.
2.	Timeliness of the intention to receive COVID-19 vaccination	The time (in days or weeks) that community members aged 15 years and above, who intend (or plan) to receive COVID-19 vaccination, intend (or plan) to take before they go and receive the vaccination. The component outcomes are the intended time to vaccination among those who will surely go and receive and those who think they will go and receive the vaccination.
3.	The uptake of COVID-19 vaccination	The proportion of community members aged 18 years and above who have received COVID-19 vaccination
4.	The hesitancy to COVID-19 vaccination	The proportion of community members aged 18 years and above who have not received COVID-19 vaccination due to reasons that include only non-acceptance factor rather than only real/perceived non-availability/non-access factor or both non-acceptance and real/perceived non-availability/non-access factors. Non-acceptance factor is defined as consisting of one or more of: perceptions that the vaccination is not important, vaccine is not safe, vaccine is not effective, vaccine is new and/or waiting for others to take it first, and hearing of many bad stories about the vaccine. Real/perceived non-availability/non-access factor is defined as consisting of one or more of: ignorance of vaccination availability, ignorance of place and/or time of vaccination, long distance to vaccination site, being too busy, being ill and did not go for vaccination, being ill and went for vaccination but was not given, long waiting time, vaccine stock-out, absence of vaccinator, closure of health facility. The non-acceptance and real/perceived non-availability/non-access factors will be measured as the reasons given by respondents regarding why they have not received COVID-19 vaccination
5.	The intention for the children to receive COVID-19 vaccination	The proportion of community members aged 15 years and above who intend (or plan) for their children to receive COVID-19 vaccination if it is available for them to receive. The component outcomes are those who will surely take their children to receive and those who think they will take their children to receive the vaccination. This outcome is in contrast to those who do not intend (or plan) for their children to receive COVID-19 vaccination if it is available for them to receive – consisting of those who are not sure, those who think they will not take their children to receive, and those who will surely not take their children to receive the vaccination
6.	Timeliness of the intention for the children to receive COVID-19 vaccination	The time (in days or weeks) that community members aged 15 years and above, who intend (or plan) for their children to receive COVID-19 vaccination, intend (or plan) to take before they take their children to receive the vaccination. The component outcomes are the intended time to vaccination for their children among those who will surely take their children to receive and those who think they will take their children to receive the vaccination
	Among health workers	
7.	The intention to receive COVID-19 vaccination	As for community members above
8.	Timeliness of the intention to receive COVID-19 vaccination	As for community members above
9.	The uptake of COVID-19 vaccination	As for community members above
10.	The hesitancy to COVID-19 vaccination	As for community members above
SN	**Secondary Outcomes**	**Definitions**
	Among community members	
1.	COVID-19 experiences and perceptions	COVID-19 experiences and perceptions score among community members aged 15 years and above
2.		The proportion of community members aged 15 years and above who have strong COVID-19 experience and perception (in contrast to those who have less strong experience and perception)
3.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 experiences and perceptions (in contrast to those who have the negative categories)
4.	COVID-19 vaccination expectations and perceptions	COVID-19 vaccination expectations and perceptions score among community members aged 15 years and above
5.		The proportion of community members aged 15 years and above who have good COVID-19 vaccination expectation and perception (in contrast to those who have poor expectation and perception)
6.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination expectations and perceptions (in contrast to those who have the negative categories)
7.	COVID-19 vaccination process experiences and perceptions	COVID-19 vaccination process experiences and perceptions score among community members aged 15 years and above
8.		The proportion of community members aged 15 years and above who have positive COVID-19 vaccination process experience and perception (in contrast to those who have negative experience and perception)
9.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination process experiences and perceptions (in contrast to those who have the negative categories)

Table 2: Continued		
SN	**Secondary Outcomes**	**Definitions**
10.	The knowledge of COVID-19	Knowledge score among community members aged 15 years and above
11.		The proportion of community members aged 15 years and above who have good knowledge of COVID-19 (in contrast to those who have poor knowledge)
12.	The attitude towards COVID-19 and COVID-19 vaccination	Attitude score among community members aged 15 years and above
13.		The proportion of community members aged 15 years and above who have good attitude towards COVID-19 and COVID-19 vaccination (in contrast to those who have poor attitude)
14.	The practices about COVID-19	Practice score among community members aged 15 years and above
15.		The proportion of community members aged 15 years and above who have good practice about COVID-19 (in contrast to those who have poor practice)
16.	The main source of information about COVID-19*	The proportion of community members aged 15 years and above whose main source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS.
17.	The most trusted source of information about COVID-19*	The proportion of community members aged 15 years and above whose most trusted source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS
	Among health workers	
18.	COVID-19 experiences and perceptions	As for community members above
19.	COVID-19 vaccination expectations and perceptions	As for community members above
20.	COVID-19 vaccination process experiences and perceptions	As for community members above
21.	The knowledge of COVID-19	As for community members above
22.	The attitude towards COVID-19 and COVID-19 vaccination	As for community members above
23.	The practices about COVID-19	As for community members above
24.	The main source of information about COVID-19	As for community members above
25.	The most trusted source of information about COVID-19	As for community members above

*Interpersonal source includes Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums; Traditional media source includes Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS source includes WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages.

365

366 The questionnaire was designed with the guide of data published by other studies,[12,34,42,47] the
367 Report of the SAGE Working Group on Vaccine Hesitancy,[18] the WHO vaccination coverage
368 questionnaire,[77] and basic facts about COVID-19 on WHO website.[78] The electronic versions
369 of both questionnaires were programmed using the KoBoToolbox software and were pre-tested
370 in non-participating clusters.

371 The community members questionnaire will be interviewer administered. The interviewers will
372 administer the electronic questionnaire with KoBoCollect installed in their android phones or
373 tablet devices. The interviewers will receive two days training on how to administer the
374 electronic questionnaire. The training will include a detailed review and explanation of the

questionnaire items, how to obtain consent from respondents, interview techniques, the translation of key words in the questionnaire to local language, household revisiting techniques, and how to collect data and upload completed forms with KoBoCollect.

During the household survey, all the households will be enumerated and household members aged 15 years and above in households where verbal consent is given by the heads of households will be enlisted and assigned unique numbers on a separate paper form before administering the anonymised electronic questionnaire. To enhance coverage and response, local residents who have good knowledge of the cluster environment will preferably be the interviewers so that they can visit households when household members are expected to be around and revisit up to three times as necessary. The community members questionnaire has seven sections: Identification (including cluster number, household number, participant number); Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19 (supplementary file 2).

The health worker questionnaire will be self-administered and the web link for the electronic questionnaire will be distributed via social media platform such as WhatsApp. However, interviewers will administer the health workers questionnaire via KoBoCollect installed in android devices to health workers who do not have online contact and those living in remote areas with poor internet access. The health workers questionnaire has six sections: Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19 (supplementary file 3).

Qualitative data will be measured through focus group discussions (FGDs) with community members and health workers. A total of 20 FGDs with community members will be carried out

across 10 clusters with two FGDs (one male-FGD and one female-FGD) per cluster. A total of 14 FGDs with health workers will be conducted, five with non-clinical staff and nine with clinical staff (five at PHC facilities and four at secondary/tertiary health facilities). The investigators will conduct the FGDs using FGD guide (supplementary file 4) prepared in English and pre-tested in non-participating clusters and among some health workers who will later be exempted from the study. The FGD guides (supplementary file 4) contain step-by-step instructions and both open-ended and more targeted questions designed to explore the participants' perceptions about COVID-19, COVID-19 vaccine/vaccination, COVID-19 vaccination process, and the determinants of COVID-19 vaccination acceptance.

Before commencement of each FGD, the investigators will collect background data of participants including age, sex, marital status, level of education, occupation or cadre, and years of working experience as appropriate. The community members FGDs will be conducted in local language and the health workers FGDs in English. Each FGD will consist of 7–8 participants (comprising a moderator, a note taker, and the respondents) and will last for about 45 minutes. The FGDs will be audio-recorded, the health workers FGDs will be transcribed and community members FGDs will be translated and transcribed verbatim into English.

Data management and quality control

The skip logic and validation criteria in KoBoToolbox software was utilized when programming the electronic questionnaire to enhance the quality of data collection. To minimise the potential bias in assessing the association between COVID-19 and COVID-19 vaccination related experiences and perceptions and uptake of COVID-19 vaccination, the questionnaire items on these factors are subdivided into two subgroups: "have not received COVID-19 vaccination" and "have received COVID-19 vaccination" and the items in each subgroup are framed differently, respectively in present tense versus in past tense. For example,

those whose response to a preceding question indicate that they have not received COVID-19 vaccination will subsequently respond to the questions: "How fearful are you that you may have very serious side-effect if you receive COVID-19 vaccination?" "How fearful are you about getting COVID-19?" etc. In contrast, those who have received COVID-19 vaccination will subsequently respond to the questions: "Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination: How fearful were you that you might have very serious side-effect if you received COVID-19 vaccination?" "How fearful were you about getting COVID-19?"

To enhance the validity of the questionnaires, after the first drafts, there were several rounds of systematic review-discussion-correction-redrafting by the research team. During this iterative process, attention was paid to relevance of the questionnaire items to the study objectives and the logical flow and order, wording, framing, clarity and appropriateness of the questions. The validation process continued until the final version of the questionnaires which were then pre-tested. During the pre-test, respondents' understanding and interpretation of the items and the options, their response time to individual items and time taken to complete a questionnaire were assessed and the completed questionnaires were reviewed for any problems. Minor adjustments were made thereafter.

The household interviewers will upload only completed anonymised questionnaires to the online survey records at the end of each day's survey and the transmitted questionnaires will be reviewed for missing, incoherent, and illogical data. Any identified error will immediately be communicated to the respective interviewers for correction by cross-checking with the respective respondents. The investigators will supervise the household survey interviewers and will revisit at least 20 eligible households per cluster with a specialised form of the survey questionnaire to double check on responses and coverage.

Multiple submissions of the self-administered electronic questionnaire from a health worker on the same device and browser will be prevented by deploying the questionnaire through the online-only (once per respondent) option in KoBoToolbox. However, in any case where a health worker who has completed the questionnaire agrees to give the android phone to any co-worker – who do not have android phone or online address but is willing to participate in the survey – to respond to the questionnaire, a web link for online-only (single submission) will be sent to such health worker. The data utility in Stata will be used to check for duplicated submissions (observations) and if found, only one will be kept, the duplicates will be deleted from the dataset. Participation of study participants in the FGDs before the questionnaire surveys will be prevented. During the translation and transcribing of the community members FGDs, exact and meaning-based translation will be used. The FGD transcripts will be compared with the original recording to check for 'accuracy' before conducting analyses.

Sample size

Sample size is estimated using Stata/SE version 15·1 (Stata Corp, College Station, TX, USA). For the community members survey, assuming a conservative estimate of 50% for the primary outcome (the proportion of community members who have not received COVID-19 vaccination who intend (or plan) to receive COVID-19 vaccination that is available for them to receive) among the community members who have not strong COVID-19 experience and perception and 56% among those who have strong COVID-19 experience and perception, 80% power at 2.5% probability of type one error (to correct for multiple comparisons),[79] 2630 is the minimum total sample size required to detect the 6%-point difference in this primary outcome between both comparison groups. Allowance for 70% response rate will increase the sample size to 3758. To account for cluster sampling, 3758 is multiplied by a conservative estimate of design effect of 4 to give a final minimum total sample size of 15032. As the clusters that will be selected to participate in the study are those with minimum population size of 1000 per

cluster, and with 540 (54%) of the population expectedly falling withing the age group of 15 years and above,[80] the study requires 28 clusters (15032/540) for the community members survey.

Using similar parameters, the health workers survey requires a minimum total sample size of 940 to detect a 10%-point difference in this primary outcome between both comparison groups (50% versus 60%). Because of the nature of the survey, such as the use of social media platforms for distribution of the (self-administered) questionnaire, the length of the questionnaire, and the sampling technique (convenience and snowball), allowance for 50% acceptance rate to account for both non-response and incomplete response will increase the minimum total sample size for the health worker survey to 1880. Also, due to the nature of the survey, the I880 is perhaps more of the number of health workers that will be targeted for distribution of the questionnaire rather than for selection to participate in the survey.

Sampling technique (Recruitment)

Community members will be selected by stratified cluster sampling technique. The sampling frame will be the list of clusters obtained from the Ebonyi state ministry of health. The eligible clusters will be stratified into two: rural and urban/semi-urban. A random sample of 21 clusters will be selected from the rural stratum and a random sample of 7 clusters will be selected from the urban/semi-urban stratum using the "sample" command in Stata. This will give a 3:1 rural to urban ratio. If verbal consent/permission is not given by any of the selected cluster(s) head(s) before commencement of household survey, replacement cluster(s) will be selected from the remaining list of eligible clusters using the same technique. The study profile is shown in figure 2. In each of the selected clusters, all the households will be enumerated and all individuals aged 15 year and above in each household will be selected for the community members survey. About five to six eligible male and female community members, both those who have received

and those who have not received COVID-19 vaccination, in 10 clusters will be selected purposively for FGDs.

Health workers will be selected by convenience and snowballing techniques. To increase acceptance rate, the research team will first make a physical and or phone contact with as many health workers as possible to invite them to participate in the survey and seek their consent and permission for the web link for the self-administered electronic questionnaire to be sent to them via online platforms. For those who give consent and permission, the address or phone number of their preferred online platform will be recorded and the web link for the questionnaire will be sent to their private online pages. They will be implored to forward the web link to other health workers that they know within the study area after they have completed the questionnaires. The research team will send the web link for the questionnaire to the online contacts (such as WhatsApp phone numbers) of as many eligible health workers as possible, including both private and group pages. Interviewers will also use convenience sampling in administering the health workers questionnaire (via KoBoCollect installed in android devices) to those who do not have online contact and those living in remote areas with poor internet connectivity. About five to six eligible health workers, both those who have received and those who have not receive COVID-19 vaccination, will be selected purposively for FGDs.

Data analyses

Data will be analysed using Stata/SE version 15.1 (Stata Corp, College Station, TX, USA). All analyses will be on intention-to-treat bases. Analyses of the community members data will be based on population-averaged models that account for clustering. Point estimates of the outcome measures will be computed for each comparison group as defined in the study hypotheses. Each hypothesis with dichotomous or categorical independent factor will be tested by computing prevalence difference (with 97.5% CI and p-values) in binary outcome measure

using binomial identity, and mean difference (with 97.5% CI and p-values) in continuous outcome measure using gaussian identity, generalized estimating equations (GEE) with an exchangeable correlation matrix and robust standard errors. Each hypothesis with continuous independent factor will be tested by computing coefficient (with 97.5% CI and p-values) in binary and continuous outcome measures, respectively using the binomial identity and gaussian identity GEE models.

For each independent factor (in a hypothesis) being tested, adjusted analysis will be done by in-putting into the GEE model the other independent factors as appropriate. For clarity, the potential independent factors to control for are presented in table 3. Both unadjusted and adjusted results will be reported. If the binomial identity GEE model fails to run or convergence is not achieved, gaussian identity GEE model, or generalized least square (GLS) random-effects linear regression model (with robust standard errors), or maximum likelihood (ML) random-effects linear regression model will be used instead.[81]

The same analytic technique will be used for the analyses of the health workers data except that generalized linear model (GLM) with robust standard errors will be used in place of GEE model because of the absence of cluster design in the health worker survey.

Summary statistics will be used to assess COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy); COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19 among community members and health workers.

The qualitative data (focus group discussion transcripts) will be analysed thematically based on pre-determined themes in the study's conceptual framework. The qualitative data will be analysed, interpreted, and presented independently of the quantitative data.

Table 3: Independent factors to in-put into multivariate models in adjusted analyses		
	Independent factors under test	**Independent factors to control for (as appropriate)**
	Primary hypotheses	
1.	Extent of COVID-19 experience and perception	COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19 (Main source and Most trusted source of information about COVID-19); Sociodemographic characteristics (Gender, Age, Marital status, Educational level, Occupation*, Residence*, Monthly income/income score*); Professional or work-related attributes^ (Work category (clinical and non-clinical), Years of working experience, Primary place of work (public and private), Level of primary place of work (primary, secondary, and tertiary))
2.	COVID-19 experiences and perceptions score	COVID-19 vaccination expectations and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
3.	COVID-19 vaccination expectation and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
4.	COVID-19 vaccination expectations and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
5.	Acceptance factor level (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level)	Availability/access factor level (COVID-19 vaccination process experience and perception level); Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
6.	COVID-19 vaccination process experience and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
7.	COVID-19 vaccination process experiences and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination expectations and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
8.	Acceptance-availability/access factor level	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
9.	Acceptance factor score and availability/access factor score	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
10.	COVID-19 experiences & perceptions[A], COVID-19 vaccination expectations & perceptions[B], COVID-19 vaccination process experiences & perceptions[C]	COVID-19 experiences & perceptions[A], COVID-19 vaccination expectations & perceptions[B], COVID-19 vaccination process experiences & perceptions[C] (as appropriate); Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
	Secondary hypotheses	
1.	Knowledge of COVID-19	Attitude towards COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
2.	Attitude towards COVID-19	Knowledge of COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
3.	Practices about COVID-19	Knowledge of COVID-19; Attitude towards COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
4.	Main source of information about COVID-19	Most trusted source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
5.	Most trusted source of information about COVID-19	Main source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
6.	A sociodemographic characteristic	Other sociodemographic characteristics; Source of information about COVID-19; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
7.	A professional or work-related attribute^	Other professional or work-related attributes^; Source of information about COVID-19; Sociodemographic characteristics; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level

*Among only community members. ^Among only health workers. [A]Fear of getting COVID-19, possible to get (severe) COVID-19, ever had COVID-19, and knowledge of any person who have had COVID-19. [B]Importance of COVID-19 vaccination, fear of having severe side-effect from COVID-19 vaccination, protection from receiving COVID-19 vaccination, trust for the health workers who give COVID-19 vaccination, trust for the government who made COVID-19 vaccination available [C]Ever heard COVID-19 vaccination was available for receipt and knowledge of a COVID-19 vaccination place.

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545 Ethics and dissemination

Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital Abakaliki (14/12/2021-17/02/2022). The investigators will obtain verbal consent/permission from the heads of the selected clusters. During the household survey the interviewers will obtain verbal consent from the household members aged 18 years and above and assent from household members aged less than 18 rears (after obtaining consent from the heads of households). The health workers will be informed that only those that give consent should take the online survey. The moderators of the focus group discussions (FGDs) will obtain verbal consent from the respondents before each FGD.

The purpose the study, the kind of participation, likely duration of participation, voluntary nature of participation, absence of potential harm, potential benefit, and confidential nature of the study will be communicated to participants as required. The online record of the anonymised quantitative data will be passworded and the audio recordings and the electronic verbatim transcript of the FGDs will be stored in a passworded computer to prevent unauthorised access.

Study findings will be reported at local, national, and international levels in high impact peer-reviewed journals and conferences as appropriate.

Patients and public involvement

Patients or the public were not involved in the design and reporting or dissemination plans and will not be involved in the conduct of our research.

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Contributors UIO conceived and designed the study, designed the data collection tools and programmed the software, and wrote the original protocol and the manuscript. OI, RLE, CIA, OUO, VUU, ASA, COI, OON, OOU, IMO, GEN, UIAN

contributed to the development of the study design, data collection tools, and original protocol. All authors read, edited, and approved the final manuscript.

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Figure legend

Figure 1: Study conceptual framework

Figure 2: Summary of study profile

Supplemental file

Supplementary file 1: Map showing the study area (Ebonyi state) in the south-east geopolitical zone of Nigeria

Supplementary file 2: COVID-19 Vaccination Questionnaire_Community Members

Supplementary file 3: COVID-19 Vaccination Questionnaire_Health Workers

Supplementary file 4: FGD Guide_Community Members & Health Workers

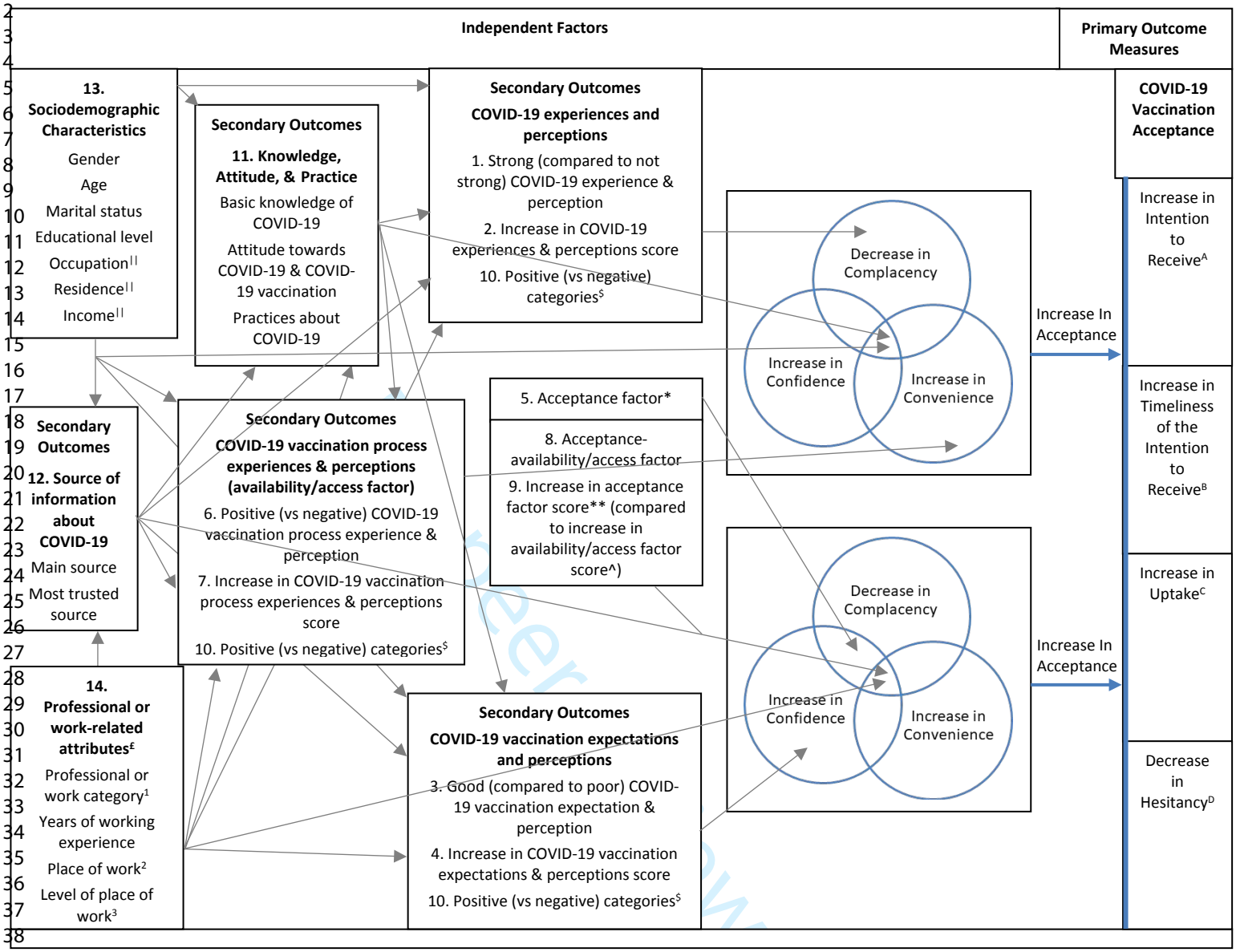

Figure 1: Study conceptual framework

$As depicted in table 1. *COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)). **Increase in COVID-19 risk-COVID-19 vaccination benefit perceptions score or DR-RB perception score. ^Increase in COVID-19 vaccination process experience & perception score. [A]Measured as the proportion of participants who intend to receive covid-19 vaccination that is available for them to receive at their catchment health facility. [B]Measured as the length of time the participants, who intend to receive covid-19 vaccination that is available for them to receive at their catchment health facility, intend to take before they go and receive the COVID-19 vaccination (increasing timeliness means reducing the length of time). [C]Measured as the proportion of participants who have received covid-19 vaccination (including those who have completed the doses and those who have not). [D]Measured as the proportion of participants who have not received covid-19 vaccination due only to non-acceptance factor (perceptions that the vaccination is not important, vaccine is not safe, vaccine is not effective etc) rather than real or perceived non-availability (non-access) factor (ignorance of vaccination availability, long distance to vaccination site, vaccine stock-out etc) or both. ||Among only community members. £Among only health workers. [1]Clinical and non-clinical. [2]Public and private. [3]Primary, secondary, and tertiary.

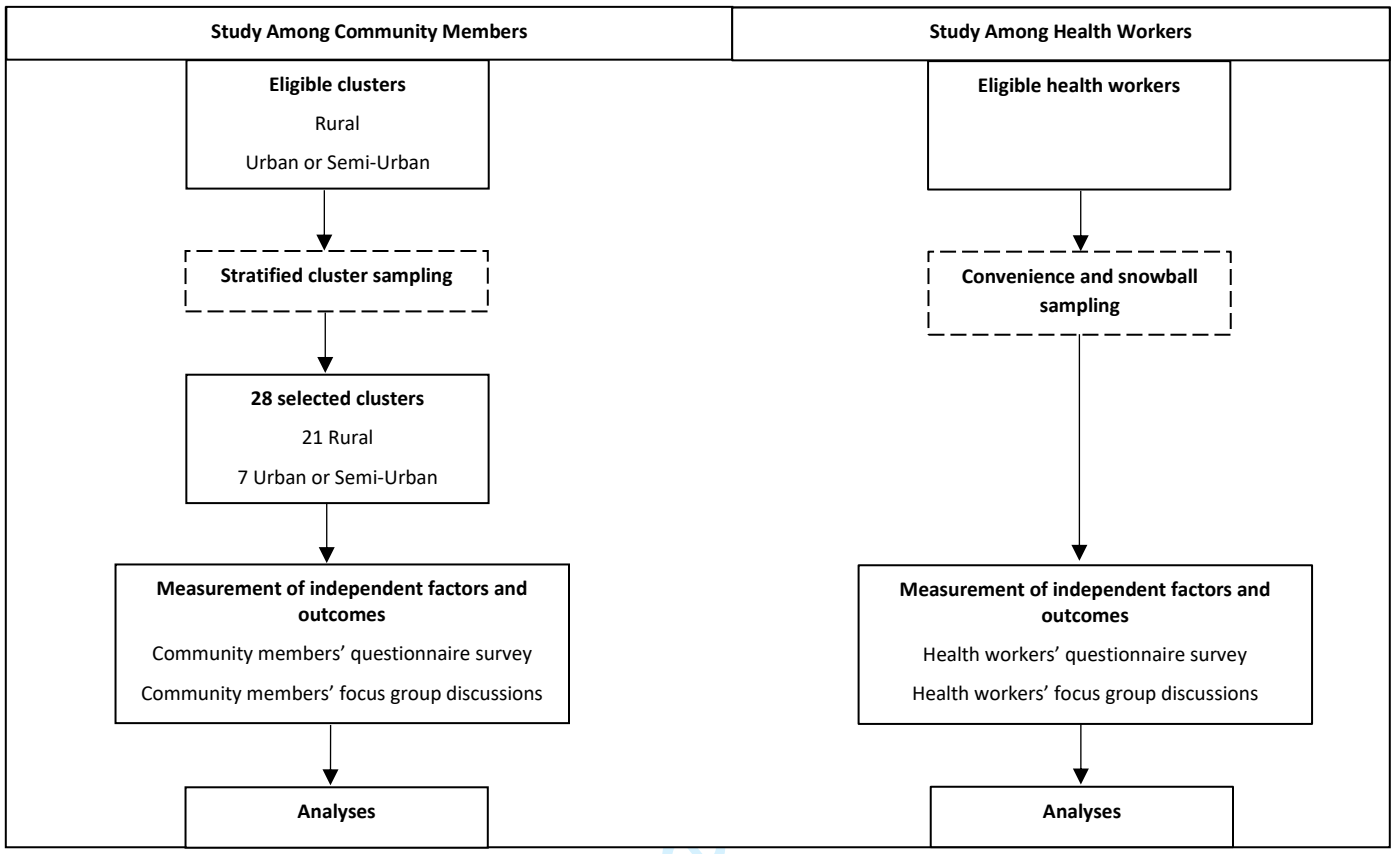

Figure 2: Summary of study profile

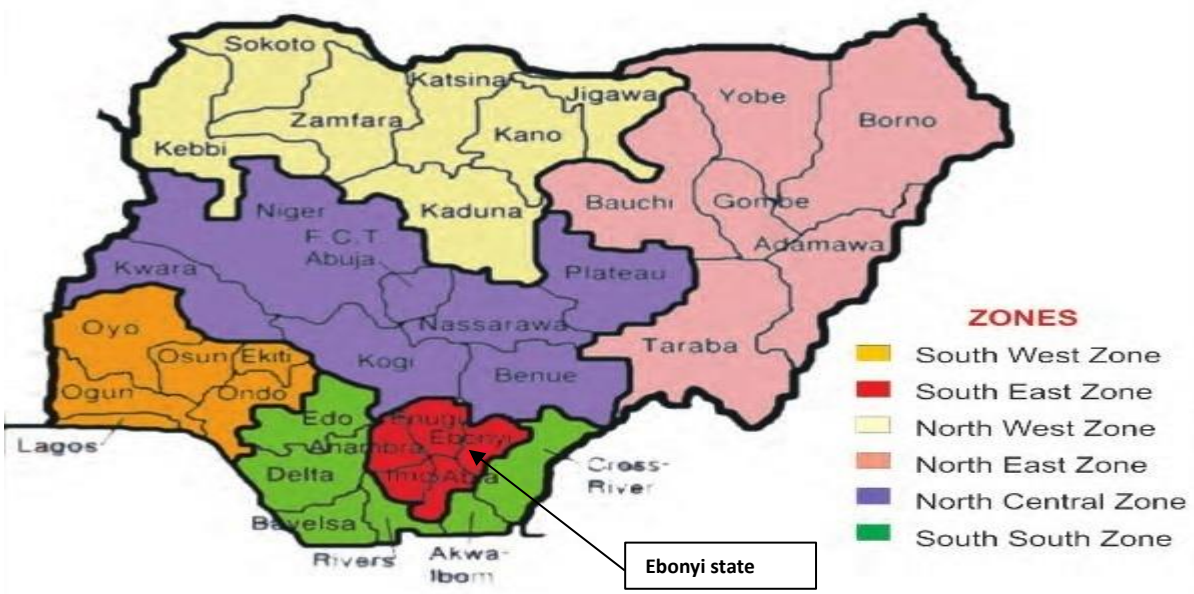

Figure: Map showing the study area (Ebonyi state) in the south-east geopolitical zone of Nigeria
(Source: National malaria strategic plan 2014–2020)

COVID-19 AND COVID-19 VACCINATION QUESTIONNAIRE FOR COMMUNITY MEMBERS

NOTE: Only Household Members Aged 15 years and Above Who Give Verbal Consent (or Assent) are Eligible to Participate in this Survey.

Identification – Section 1

1. Cluster ID Number: _____

2. Household ID Number (last 3 digits of household number): _____

3. Participant (Respondent) ID Number: _____

4. GPS

5. Date of interview (Year/Month/Day)

Sociodemographic Characteristics – Section 2

6. What is your Gender?
    1. Male
    2. Female

7. Age in years: How old were you during your last birthday? Number: _____

8. What is your Marital Status? **Probe:**
    1. Married
    2. Separated/Divorced
    3. Widowed
    4. Never married (Single)

9. What is your Educational Level? **Probe:**
    1. No formal education
    2. Some primary
    3. Completed primary
    4. Some secondary
    5. Completed secondary
    6. NCE/Diploma (ND, OND) (Tertiary)
    7. HND/First Degree (Tertiary)
    8. Masters/PHD/Other Equivalent (Tertiary)

10. What is your Main Occupation? **NOTE: Record the most suitable option:**

1. Farmer
2. Trader
3. Other-self-employment
4. Private paid work
5. Government paid work
6. Housewife
7. Student
8. Apprentice
9. Youth service (Corper)
10. None

11. What is your Usual Monthly Income in NGN from all sources including remittances and "pocket money" if any? **Probe:**

1. No income
2. 20,000 and less
3. 21,000–40,000
4. 41,000–60,000
5. 61,000–80,000
6. 81,000–100,000
7. 101,000–120,000
8. 121,000–140,000
9. 141,000–160,000
10. 161,000–180,000
11. 181,000–200,000
12. 201,000–220,000
13. 221,000–240,000
14. 241,000–260,000
15. 261,000–280,000
16. 281,000–300,000
17. More than 300,000

COVID-19 Vaccination Acceptance – Section 3

12. Have you received COVID-19 vaccination?

1. Yes
2. No

NOTE: No. 13–27 is for those who have received COVID-19 vaccination:

13. Which of the COVID-19 vaccination doses have you received? **Probe:**

1. First dose only
2. Second dose only
3. Second dose plus Booster

14. **If no. 13 above is 1:** Why have you not received the second dose of COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. No vaccine when you went (stock-out)
2. No vaccinator when you went (health facility not Closed)

3. Health facility was closed when you went
4. Place of vaccination was too far
5. You were too busy
6. You were ill and did not go for the remaining dose
7. You were ill, went but was not given the remaining dose
8. You had serious side effects from the first dose
9. The time for the second dose has not reached
10. Other (specify below)

15. **If no. 14 above includes 10:** Other reason, please specify. Phrase:_____

16. **If no. 13 above is 2:** Why have you not received a booster dose of COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You are not aware of booster dose
2. You do not need booster dose (it is not important)
3. No vaccine when you went (stock-out)
4. No vaccinator when you went (health facility not Closed)
5. Health facility was closed when you went
6. Place of vaccination was too far
7. You were too busy
8. You were ill and did not go for the booster dose
9. You were ill, went but was not given the booster dose
10. You had serious side effects from the second dose
11. The time for a booster dose has not reached
12. Other (specify below)

17. **If no. 16 above includes 12:** Other reason, please specify. Phrase:_____

18. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How often did you hear that COVID-19 vaccination was available for you to go and receive? **Probe:**

1. You heard about it many times before the day you received it
2. You heard about it few times (or once) before the day you received it
3. Not sure about it
4. You did not hear about it before the day you received it
5. You did not hear about it at all before the day you received it

19. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any place or health facility where they gave COVID-19 vaccination? **Probe:**

1. Yes, a place that was very close
2. Yes, a place that was close
3. Yes, a place that was far
4. Yes, a place that was very far
5. No, you did not know any place before the day you received COVID-19 vaccination

20. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How frequently were they giving COVID-19 vaccination at that place you mentioned above? **Probe:**

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. You did not know how frequently they were giving COVID-19 vaccination before the day you received it

21. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How was the queue (waiting time) at the place of vaccination that you mentioned above?

1. There was usually no queue (very short waiting time)
2. There was usually short queue (short waiting time)
3. You did not know what the queue (waiting time) was
4. There was usually long queue (long waiting time)
5. There was usually very long queue (very long waiting time)

22. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How caring (or kind/friendly) were the health workers at the place of vaccination that you mentioned above? **Probe:**

1. They were very caring
2. They were caring
3. Not sure whether they were caring or not
4. They were not caring
5. They were not caring at all

23. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How important did you think it was for you to receive COVID-19 vaccination? **Probe:**

1. It was very important
2. It was important

3. Not sure whether it was important or not
4. It was not important
5. It was not important at all

24. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How fearful were you that you might have severe or very serious side-effect if you received COVID-19 vaccination? **Probe:**

1. You were not fearful at all
2. You were not fearful
3. Not sure about it
4. You were a little fearful
5. You were very fearful

25. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** What protection did you think COVID-19 vaccination would give you if you received it? **Probe:**

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. You were not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

26. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How did you trust the health workers who gave COVID-19 vaccination?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

27. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How did you trust the federal and state governments who made the COVID-19 vaccination available for people to receive? **Probe:**

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

NOTE: No. 28–43 is for those who have not received COVID-19 vaccination:

28. Have you ever heard that COVID-19 vaccination is available for you to go and receive? **Probe:**

1. Yes, you heard about it many times
2. Yes, you heard about it few times (or once)
3. Not sure
4. No, you have not heard about it
5. No, you have not heard about it at all

29. Do you know any place or health facility where they give COVID-19 vaccination? **Probe:**

1. Yes, a place that is very close
2. Yes, a place that is close
3. Yes, a place that is far
4. Yes, a place that is very far
5. No, you do not know any place

30. **If no. 29 above is 1 or 2 or 3 or 4:** How frequently do they give COVID-19 vaccination at that place you mentioned above? **Probe:**

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. Do not know

31. **If no. 29 above is 1 or 2 or 3 or 4:** How is the queue (waiting time) at the place of vaccination that you mentioned above? **Probe:**

1. There is usually no queue (very short waiting time)
2. There is usually short queue (short waiting time)
3. Do not know
4. There is usually long queue (long waiting time)
5. There is usually very long queue (very long waiting time)

32. **If no. 29 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) are the health workers at the place of vaccination that you mentioned above? **Probe:**

1. They are very caring
2. They are caring
3. You are not sure about it
4. They are not caring
5. They are not caring at all

33. **If no. 12 above is 2 & no. 7 above is >=18:** Why have you not received COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (you think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or you want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. You have been too busy
9. You have been ill and did not go for vaccination
10. You have been ill, went but was not given vaccination
11. Long waiting time (long queue)
12. No vaccine (stock-out) when you went
13. No vaccinator (health facility not closed) when you went
14. Health facility was closed when you went
15. You are not aware of it
16. Other (specify below)

34. **If no. 33 above includes 16:** Other reason, please specify. Phrase: _____

35. How important is it for you to receive COVID-19 vaccination? **Probe:**

1. Very important for me to receive it
2. Important for me to receive it
3. Not sure about it
4. Not important for me to receive it
5. Not important at all for me to receive it

36. How fearful are you that you may have severe or very serious side-effect if you receive COVID-19 vaccination? **Probe:**

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

37. What protection will COVID-19 vaccination give you if you receive it? **Probe:**

1. Full or complete protection from COVID-19

2. Partial or incomplete protection from COVID-19
3. Not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

38. How do you trust the health workers who give COVID-19 vaccination? **Probe:**

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

39. How do you trust the federal and state governments who made the COVID-19 vaccination available for people to receive? **Probe:**

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

40. Do you intend (or plan) to receive COVID-19 vaccination that is available for you to receive? **Probe:**

1. Yes, you will surely go and receive the vaccination
2. Yes, you think you will go and receive the vaccination
3. Not sure about it
4. No, you think you will not go and receive the vaccination
5. No, you will surely not go and receive the vaccination

NOTE: If 3 or 4 or 5: Skip to no. 35

41. **If no. 40 above is 1 or 2:** How long will it take before you go and receive the COVID-19 vaccination? Number (in days):_____ **NOTE: Record Response in DAYS (Convert Weeks, Months, and Years to DAYS). NOTE: Record "2000" for "do not know"**

42. **If no. 40 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) to receive COVID-19 vaccination or are not sure about it? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective

4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or I want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. Other reason (specify below)

43. **If no. 42 above includes 8:** Other reason, please specify. Phrase: _____

NOTE: No. 44–51 is for all

44. Do you have a child or children? 1=Yes 2=No. **If 2: Skip to 52**

45. How important is it for your child or children to receive COVID-19 vaccination if it is available for them to receive? **Probe:**

1. Very important for them to receive it
2. Important for them to receive it
3. Not sure about it
4. Not important for them to receive it
5. Not important at all for them to receive it

46. How fearful are you that your child/children may have severe or very serious side-effect if they receive COVID-19 vaccination that is available for them to receive? **Probe:**

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

47. What protection will COVID-19 vaccination give your child or children if they receive the one that is available for them to receive? **Probe:**

1. It will give them full or complete protection from COVID-19
2. It will give them partial or incomplete protection from COVID-19
3. Not sure about it
4. It will give them no protection from COVID-19
5. It will give them no protection at all from COVID-19

48. Do you intend (or plan) for your child or children to receive COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY]?

1. Yes, you will surely take your child or children to receive the vaccination

2. Yes, you think you will take your child or children to receive the vaccination
3. Not sure about it
4. No, you think you will not take your child or children to receive the vaccination
5. No, you will surely not take your child or children to receive the vaccination

NOTE: If 3 or 4 or 5: Skip to 50

49. **If no. 48 above is 1 or 2:** How long will it take before you take your child or children to receive the COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY]? Number (in days): _____ **NOTE: Record Response in DAYS (Convert Weeks, Months, and Years to DAYS)**

50. **If no. 48 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) for your child or children to receive the COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY] or are not sure about it? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. The child/children do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or You want others to take it first
6. Other reason (specify below)

51. **If no. 49 above includes 6:** Other reason, please specify. Phrase:_____

COVID-19 Experiences and Perceptions – Section 4

NOTE: No. 52–63 is for those who have received COVID-19 vaccination:

52. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How fearful were you about getting COVID-19? **Probe:**

1. You were very fearful
2. You were a little fearful
3. Not sure about it
4. You were not fearful
5. You were not fearful at all

53. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Was it possible for someone like you to get COVID-19? **Probe:**

1. It was highly possible

2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

54. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Was it possible for someone like you to get severe or very serious COVID-19? **Probe:**

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

55. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you ever have COVID-19 before you received the vaccination? **Probe:**

1. Yes, you were sure
2. Yes, you thought so
3. Not sure about it
4. No, you thought so
5. No, you were sure

56. **If no. 55 above is 1 or 2: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you ever have severe or very serious COVID-19 before you received the vaccination? **Probe:**

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious
5. No, it was not serious at all

57. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any person who had COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

58. **If no. 57 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any person who had severe or very serious COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

59. **If no. 57 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the COVID-19 vaccination:** Did you know any person who died from COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

60. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** What were your sources of information about COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Family members/Relatives/Friends
2. Health care providers/Health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media
8. Internet sites — Internet, social media, & SMS
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc)
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

61. **If no. 60 above includes 12:** Please specify the other source. Word or Phrase: _____

62. **If more than one sources given in no. 60 above:** Which of the sources was your main source? **NOTE: Probe: Select the one mentioned:** 1–12 above

63. **If more than one sources given in no. 60 above:** Which of the sources did you trust most? **NOTE:**

Probe: Select the one mentioned: 1–12 above

NOTE: No. 64–75 is for those who have not received COVID-19 vaccination:

64. How fearful are you about getting COVID-19? **Probe:**

1. Very fearful
2. A little fearful
3. Not sure about it
4. Not fearful
5. Not fearful at all

65. Is it possible for someone like you to get COVID-19? **Probe:**

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

66. Is it possible for someone like you to get severe or very serious COVID-19? **Probe:**

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

67. Have you ever had COVID-19? **Probe:**

1. Yes, you are sure
2. Yes, you think so
3. Not sure about it
4. No, you think so
5. No, you are sure

68. **If no 67 above is 1 or 2:** Have you ever had severe or very serious COVID-19? **Probe:**

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious
5. No, it was not serious at all

69. Do you know any person who have had COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

70. **If no. 69 above is 1 or 2 or 3 or 4:** Do you know any person who have had severe or very serious COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

71. **If no. 69 above is 1 or 2 or 3 or 4:** Do you know any person who have died from COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

72. What are your sources of information about COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Family members/Relatives/Friends
2. Health care providers/Health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media — Internet, social media, & SMS
8. Internet sites
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc)
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

73. **If no. 72 above includes 12:** Please specify the other source. Word or Phrase: _____

74. **If more than one sources given in no. 72 above:** Which of the sources is your main source? **NOTE:**

Probe: Select the one mentioned: 1–12 above

75. **If more than one sources given in no. 72 above:** Which of the sources do you trust most? **NOTE:**

Probe: Select the one mentioned: 1–12 above

Basic Knowledge of COVID-19 – Section 5

76. What is COVID-19? **Probe:**

1. A new disease (caused by a new micro-organism)
2. An old disease (caused by an old micro-organism)
99. Do not know

77. How do people get COVID-19? **Probe:**

1. By staying close to infected persons when they cough or sneezes
2. From bat
3. From rat
4. From spiritual attack
5. Other (specify below)
99. Do not know

78. **If no. 77 above is 5:** Please specify how people get COVID-19. Word or Phrase: _____

79. When somebody gets COVID-19, how long does it usually take before the person starts to show symptoms? **Probe:**

1. 2–14 days (within 2 weeks)
2. 2–4 weeks
3. >4 weeks
99. Do not know

80. What are the symptoms of COVID-19 (symptoms that someone with COVID-19 can have)? **NOTE:**

Multiple responses: Probe for respondent to select all that apply:

1. Fever
2. Cough
3. Tiredness
4. Body aches and pains
5. Sore throat
6. Difficulty breathing or shortness of breath
7. Chest pain

8. Headache
9. Loss of taste or smell
10. Diarrhoea
11. Nausea or vomiting
12. other (specify below)
99. Do not know

81. **If no. 80 above includes 12:** Please specify the other symptom. Word or Phrase:_____

82. Can people also have COVID-19 without showing any symptoms?

1. Yes
2. No
99. Do Not Know

83. Who are more at risk of having severe COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Children
2. Younger adults
3. Elderly people
4. Slim people
5. Obese people
6. People with chronic illness
7. People who smoke
8. Pregnant women
99. Do not know

84. Is there a laboratory test to diagnose COVID-19?

1. Yes
2. No
99. Do not know**. If 2 OR 99: Skip to 87**

85. **If no. 84 above is 1:** Where is laboratory test to diagnose COVID-19 done in Ebonyi state? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. AEFUTHA
2. General hospitals
3. PHC centres
4. Missionary hospitals
5. Private hospitals
6. Private laboratory

7. Other (specify below)

99. Do not know

86. **If no. 85 above includes 7:** Please specify the other place lab test for COVID-19 is done in Ebonyi state. Word or Phrase:_____

87. Are there treatments for COVID-19?

1. Yes
2. No
99. Do Not Know

88. Are there vaccines for COVID-19?

1. Yes
2. No
99. Do Not Know

89. **If no. 88 above is 1:** Do you know any place where one can go and receive COVID-19 vaccination in Ebonyi state?

1. Yes
2. No

90. What are the ways to avoid/prevent getting COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of face mask in public places (especially indoor public places)
4. Frequent hands washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching of face (eyes, nose, & mouth) when one is in public places
7. COVID-19 vaccination
8. Taking chloroquine
9. Use of herbs or roots (“Agbo”)
10. Use of ginger or garlic
11. Taking hot drinks or “ogogoro”
12. Other (specify below)
99. Do Not Know

91. **If no. 90 above includes 12:** Please specify other way to avoid getting COVID-19. Word or Phrase: _____

Attitude Towards COVID-19 and COVID-19 Vaccination – Section 6

NOTE: Tell the respondents you will make statements and for each statement, they should: Strongly Disagree, Disagree, Say if they are Not Sure/Do Not Know, Agree, or Strongly Agree.

92. COVID-19 is real. **Probe:**

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

93. COVID-19 a serious illness that can kill.

94. Everybody is susceptible to COVID-19 infection (it is possible for anybody to get COVID-19).

95. The risk of getting COVID-19 can be reduced by avoiding crowd (large group of people).

96. The risk of getting COVID-19 can be reduced by maintaining at least 1–2 metre distance away from people coughing or sneezing

97. The risk of getting COVID-19 can be reduced if everybody covers the mouth and nose (with handkerchief or bent elbow) when coughing or sneezing

98. The risk of getting COVID-19 can be reduced by wearing face mask when going out to public places (especially indoor public places).

99. The risk of getting COVID-19 can be reduced by washing hands with soap and water frequently (e.g before touching the face, before eating).

100. The risk of getting COVID-19 can be reduced by cleaning hands with alcoholic sanitisers frequently.

101. Chloroquine is an effective treatment (prevention) for COVID-19.

102. Herbs and roots (“Agbo”) are effective treatments (prevention) for COVID-19.

103. Ginger and garlic are effective treatments (prevention) for COVID-19.

104. Hot drinks or “ogogoro” are effective treatments (prevention) for COVID-19

105. COVID-19 vaccines are safe for people to receive

106. The risk of COVID-19 can be reduced by receiving COVID-19 vaccination

107. Everybody should receive COVID-19 vaccination that is recommended by the government

Practices about COVID-19 – Section 7

108. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Avoid or Prevent transmission of COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was ever practiced

109. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Avoid or Prevent transmission of COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was practiced in the last two weeks

110. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Treat or Prevent COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)

3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was ever practiced

111. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Treat or Prevent COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)
3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was practiced in the last two weeks

COVID-19 AND COVID-19 VACCINATION QUESTIONNAIRE FOR HEALTH WORKERS

NOTE: All health workers (both clinical and non-clinical) working or living in Eboni state who give consent are eligible to participate in this survey.

Sociodemographic Characteristics

1. What is your Gender?
    1. Male
    2. Female

2. Age in years: How old were you during your last birthday? Number: _____

3. What is your Marital Status?
    1. Married
    2. Separated/Divorced
    3. Widowed
    4. Never married (Single)

4. What is your Educational Level?
    1. No formal education
    2. Some primary
    3. Completed primary
    4. Some secondary
    5. Completed secondary
    6. NCE/Diploma (ND, OND) (Tertiary)
    7. HND/First Degree (Tertiary)
    8. Masters/PHD/Other Equivalent (Tertiary)

5. What is your Category or Cadre?
    1. non-Clinical staff
    2. PMV
    3. Health attendant
    4. JCHEW
    5. CHEW
    6. CHO
    7. Nurse/Midwife
    8. Medical laboratory technologist

9. Medical laboratory scientist
10. Pharmacy technician
11. Pharmacist
12. House officer
13. Medical officer
14. Medical doctor in specialist training (Resident doctor)
15. Specialist medical doctor (Fellow)
16. Other (specify below)

6. **If no. 5 above is 16:** Please specify your Category or Cadre. Word or Phrase:_____

7. How many years of working experience do you have? **NOTE: Use "0" for less than one year**. Number: _____

8. Where is your current primary place of work?

1. PMV
2. PHC centre
3. Private laboratory
4. Private pharmacy
5. Private hospital/clinic
6. Missionary hospital
7. General hospital
8. NOFIC
9. AEFUTHA
10. Other (specify below)

9. **If no. 8 above is 10:** Please specify your current primary place of work. Word or Phrase:_____

COVID-19 Vaccination Acceptance

10. Have you received COVID-19 vaccination?

1. Yes
2. No

NOTE: No. 11–25 is for those who have received COVID-19 vaccination:

11. Which of the COVID-19 vaccination doses have you received?

1. First dose only
2. Second dose only
3. Second dose plus Booster

12. **If no. 11 above is 1:** Why have you not received the second dose of COVID-19 vaccination?

NOTE: select all that apply:

1. No vaccine when you went (stock-out)
2. No vaccinator when you went (health facility not Closed)
3. Health facility was closed when you went
4. Place of vaccination was too far
5. You were too busy
6. You were ill and did not go for the remaining dose
7. You were ill, went but was not given the remaining dose
8. You had serious side effects from the first dose
9. The time for the second dose has not reached
10. Other (specify below)

13. **If no. 12 above includes 10:** Other reason, please specify. Phrase:_____

14. **If no. 11 above is 2:** Why have you not received a booster dose of COVID-19 vaccination?

NOTE: select all that apply:

1. You are not aware of booster dose
2. You do not need booster dose (it is not important)
3. No vaccine when you went (stock-out)
4. No vaccinator when you went (health facility not Closed)
5. Health facility was closed when you went
6. Place of vaccination was too far
7. You were too busy
8. You were ill and did not go for the booster dose
9. You were ill, went but was not given the booster dose
10. You had serious side effects from the second dose
11. The time for a booster dose has not reached
12. Other (specify below)

15. **If no. 14 above includes 12:** Other reason, please specify. Phrase:_____

NOTE: No. 16–25 is about your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:

16. How often did you hear that COVID-19 vaccination was available for you to go and receive?

1. You heard about it many times before the day you received it
2. You heard about it few times (or once) before the day you received it
3. Not sure

4. You did not hear about it before the day you received it
5. You did not hear about it at all before the day you received it

17. Did you know any place or health facility where they gave COVID-19 vaccination?

1. Yes, a place that was very close
2. Yes, a place that was close
3. Yes, a place that was far
4. Yes, a place that was too far
5. No, you did not know any place before the day you received COVID-19 vaccination

18. **If no. 17 above is 1 or 2 or 3 or 4:** How frequently were they giving COVID-19 vaccination at that place you mentioned above?

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. You did not know how frequently they were giving COVID-19 vaccination before the day you received it

19. **If no. 17 above is 1 or 2 or 3 or 4:** How was the queue (waiting time) at the place of vaccination that you mentioned above?

1. There was usually no queue (very short waiting time)
2. There was usually short queue (short waiting time)
3. You did not know what the queue (waiting time) was
4. There was usually long queue (long waiting time)
5. There was usually very long queue (very long waiting time)

20. **If no. 17 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) were the health workers at the place of vaccination that you mentioned above?

1. They were very caring
2. They were caring
3. Not sure whether they were caring or not
4. They were not caring
5. They were not caring at all

21. How important did you think it was for you to receive COVID-19 vaccination?

1. It was very important
2. It was important

3. Not sure whether it was important or not
4. It was not important
5. It was not important at all

22. How fearful were you that you might have severe or very serious side-effect if you received COVID-19 vaccination?

1. You were not fearful at all
2. You were not fearful
3. Not sure about it
4. You were a little fearful
5. You were very fearful

23. What protection did you think COVID-19 vaccination would give you if you received it?

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. You were not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

24. How did you trust the health workers who gave COVID-19 vaccination?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

25. How did you trust the federal and state governments who made the COVID-19 vaccination available for people to receive?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

NOTE: No. 26–41 is for those who have not received COVID-19 vaccination:

26. Have you ever heard that COVID-19 vaccination is available for you to go and receive?

1. Yes, you heard about it many times
2. Yes, you heard about it few times (or once)

3. Not sure
4. No, you have not heard about it
5. No, you have not heard about it at all

27. Do you know any place or health facility where they give COVID-19 vaccination?

1. Yes, a place that is very close
2. Yes, a place that is close
3. Yes, a place that is far
4. Yes, a place that is very far
5. No, you do not know any place

28. **If no. 27 above is 1 or 2 or 3 or 4:** How frequently do they give COVID-19 vaccination at that place you mentioned above?

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. Do not know

29. **If no. 27 above is 1 or 2 or 3 or 4:** How is the queue (waiting time) at the place of vaccination that you mentioned above?

1. There is usually no queue (very short waiting time)
2. There is usually short queue (short waiting time)
3. Do not know
4. There is usually long queue (long waiting time)
5. There is usually very long queue (very long waiting time)

30. **If no. 27 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) are the health workers at the place of vaccination that you mentioned above?

1. They are very caring
2. They are caring
3. You are not sure about it
4. They are not caring
5. They are not caring at all

31. **If no. 10 above is 2 & no. 2 above is >=18:** Why have you not received COVID-19 vaccination? **NOTE: Select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (you think it is harmful)

3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or you want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. You have been too busy
9. You have been ill and did not go for vaccination
10. You have been ill, went but was not given vaccination
11. Long waiting time (long queue)
12. No vaccine (stock-out) when you went
13. No vaccinator (health facility not Closed) when you went
14. Health facility was closed when you went
15. You are not aware of it
16. Other (specify below)

32. **If no. 31 above includes 16:** Other reason, please specify. Phrase: _____

33. How important is it for you to receive COVID-19 vaccination?

1. Very important for me to receive it
2. Important for me to receive it
3. Not sure about it
4. Not important for me to receive it
5. Not important at all for me to receive it

34. How fearful are you that you may have severe or very serious side-effect if you receive COVID-19 vaccination?

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

35. What protection will COVID-19 vaccination give you if you receive it?

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. Not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

36. How do you trust the health workers who give COVID-19 vaccination?

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

37. How do you trust the federal and state governments who made the COVID-19 vaccination available for people to receive?

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

38. Do you intend (or plan) to receive COVID-19 vaccination that is available for you to receive?

1. Yes, you will surely go and receive the vaccination
2. Yes, you think you will go and receive the vaccination
3. Not sure about it
4. No, you think you will not go and receive the vaccination
5. No, you will surely not go and receive the vaccination

NOTE: If 3 or 4 or 5: Skip to no. 40

39. **If no. 38 above is 1 or 2:** How many DAYS or WEEKS or MONTHS or YEARS will it take before you go and receive the COVID-19 vaccination? Number plus Word: _____

40. **If no. 38 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) to receive COVID-19 vaccination? **NOTE: Select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or I want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. Other reason (specify below)

41. **If no. 40 above includes 8:** Other reason, please specify. Phrase: _____

COVID-19 Experiences and Perceptions

NOTE: No. 42–53 is for those who have received COVID-19 vaccination:

NOTE: No. 42–53 is about your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:

42. How fearful were you about getting COVID-19?

1. You were very fearful
2. You were a little fearful
3. Not sure about it
4. You were not fearful
5. You were not fearful at all

43. Was it possible for someone like you to get COVID-19?

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

44. Was it possible for someone like you to get severe or very serious COVID-19?

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

45. Did you ever have COVID-19 before you received the vaccination?

1. Yes, you were sure
2. Yes, you thought so
3. Not sure about it
4. No, you thought so
5. No, you were sure

46. **If no. 45 above is 1 or 2:** Did you ever have severe or very serious COVID-19 before you received the vaccination?

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious

5. No, it was not serious at all

47. Did you know any person who had COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

48. **If no. 47 above is 1 or 2 or 3 or 4:** Did you know any person who had severe or very serious COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

49. **If no. 47 above is 1 or 2 or 3 or 4:** Did you know any person who died from COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

50. What were your sources of information about COVID-19? **NOTE: Select all that apply:**

1. Family members/Relatives/Friends
2. Other health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media
8. Internet sites
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc) — Internet, social media, & SMS
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

51. **If no. 50 above includes 12:** Please specify the other source. Word or Phrase: _____

52. **If more than one sources given in no. 50 above:** Which of the sources was your main source?

53. **If more than one sources given in no. 50 above:** Which of the sources did you trust most?

NOTE: No. 54–65 is for those who have not received COVID-19 vaccination:

54. How fearful are you about getting COVID-19?

1. Very fearful
2. A little fearful
3. Not sure about it
4. Not fearful
5. Not fearful at all

55. Is it possible for someone like you to get COVID-19?

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

56. Is it possible for someone like you to get severe or very serious COVID-19?

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

57. Have you ever had COVID-19?

1. Yes, you are sure
2. Yes, you think so
3. Not sure about it
4. No, you think so
5. No, you are sure

58. **If no. 57 above is 1 or 2:** Have you ever had severe or very serious COVID-19?

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it

4. No, it was not serious
5. No, it was not serious at all

59. Do you know any person who have had COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

60. **If no. 59 above is 1 or 2 or 3 or 4:** Do you know any person who have had severe or very serious COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

61. **If no 59 above is 1 or 2 or 3 or 4:** Do you know any persons who have died from COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

62. What are your sources of information about COVID-19? **NOTE: Select all that apply:**

1. Family members/Relatives/Friends
2. Other health workers — Interpersonal
3. Television
4. Radio
5. Prints (Newspaper/Magazine) — Traditional media
6. WhatsApp
7. Facebook
8. Internet sites — Internet and social media
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc) — Internet, social media, & SMS
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

63. **If no. 62 above includes 12:** Please specify the other source. Word or Phrase: _____

64. **If more than one sources given in no. 62 above:** Which of the sources is your main source?

65. **If more than one sources given in no. 62 above:** Which of the sources do you trust most?

Basic Knowledge of COVID-19

66. What is COVID-19?

1. A new type of coronavirus disease
2. An old type of coronavirus disease
99. Do not know

67. How do people get COVID-19?

1. By staying close to infected persons when they cough or sneezes
2. From bat
3. From rat
4. From spiritual attack
5. Other (specify below)
99. Do not know

68. **If no. 67 above is 5:** Please specify how people get COVID-19. Word or Phrase: _____

69. When somebody gets COVID-19, how long does it usually take before the person starts to show symptoms?

1. 2–14 days (within 2 weeks)
2. 2–4 weeks
3. >4 weeks
99. Do not know

70. What are the symptoms of COVID-19? **NOTE: Select all that apply:**

1. Fever
2. Cough
3. Tiredness
4. Body aches and pains
5. Sore throat
6. Difficulty breathing or shortness of breath
7. Chest pain
8. Headache

9. Loss of taste or smell
10. Diarrhoea
11. Nausea or vomiting
12. other (specify below)
99. Do not know

71. **If no. 70 above includes 12:** Please specify the other symptom. Word or Phrase:_____

72. Can people also have COVID-19 without showing any symptoms?

1. Yes
2. No
99. Do Not Know

73. Who are more at risk of having severe COVID-19? **NOTE: Select all that apply:**

1. Children
2. Younger adults
3. Elderly people
4. Slim people
5. Obese people
6. People with chronic illness
7. People who smoke
8. Pregnant women
99. Do not know

74. Is there a laboratory test to diagnose COVID-19?

1. Yes
2. No
99. Do not know**. If 2 OR 99: Skip to 77**

75. Where is laboratory test to diagnose COVID-19 done in Ebonyi state? **NOTE: Select all that apply:**

1. AEFUTHA
2. General hospitals
3. PHC centres
4. Missionary hospitals
5. Private hospitals
6. Private laboratory
7. Other (specify below)
99. Do not know

76. **If no. 75 above includes 7:** Please specify the other place lab test for COVID-19 is done in Ebonyi state. Word or Phrase:_____

77. Are there treatments for COVID-19?

1. Yes
2. No
99. Do Not Know

78. Are there vaccines for COVID-19?

1. Yes
2. No
99. Do Not Know

79. **If no. 78 above is 1:** Do you know any place where one can go and receive COVID-19 vaccination in Ebonyi state?

1. Yes
2. No

80. What are the ways to avoid/prevent getting COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of face mask in public places (especially indoor public places)
4. Frequent hands washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching of face (eyes, nose, & mouth) when one is in public places
7. COVID-19 vaccination
8. Taking chloroquine
9. Use of herbs or roots (“Agbo”)
10. Use of ginger or garlic
11. Taking hot drinks or “ogogoro”
12. Other (specify below)
99. Do Not Know

81. **If no. 80 above includes 12:** Please specify other way. Word or Phrase: _____

Attitude Towards COVID-19 and COVID-19 Vaccination

NOTE: For each of the statements below, take one option whether you: Strongly Disagree, Disagree, Not Sure/Do Not Know, Agree, or Strongly Agree.

82. COVID-19 is real.

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

83. COVID-19 a serious illness that can kill.

84. Everybody is susceptible to COVID-19 infection (Anybody can get COVID-19).

85. The risk of getting COVID-19 can be reduced by avoiding crowd (large group of people).

86. The risk of getting COVID-19 can be reduced by maintaining at least 1–2 metre distance away from people coughing or sneezing

87.The risk of getting COVID-19 can be reduced if everybody covers the mouth and nose (with handkerchief or bent elbow) when coughing or sneezing

88. The risk of getting COVID-19 can be reduced by wearing face mask when going out to public places (especially indoor public places).

89. The risk of getting COVID-19 can be reduced by washing hands with soap and water frequently (e.g before touching the face, before eating).

90. The risk of getting COVID-19 can be reduced by cleaning hands with alcoholic sanitisers frequently.

91. Chloroquine is an effective treatment (prevention) for COVID-19.

92. Herbs and roots (“Agbo”) are effective treatments (prevention) for COVID-19.

93. Ginger and garlic are effective treatments (prevention) for COVID-19.

94. Hot drinks or “ogogoro” are effective treatments (prevention) for COVID-19

95. COVID-19 vaccines are safe for people to receive

96. The risk of COVID-19 can be reduced by receiving COVID-19 vaccination

97. Everybody should receive COVID-19 vaccination that is recommended by the government

Practices about COVID-19

98. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Avoid or Prevent transmission of COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was ever practiced

99. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Avoid or Prevent transmission of COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was practiced in the last two weeks

100. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Treat or Prevent COVID-19? **NOTE: Select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)
3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was ever practiced

101. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Treat or Prevent COVID-19? **NOTE: Select all that apply:**

1. Taking chloroquine
2. Using herbs or roots ("Agbo")
3. Using ginger or garlic
4. Using hot drinks or "ogogoro"
5. None of the above was practiced in the last two weeks

FGD Guide for FGD with Community Members

Q1. What is COVID-19?

Prompts:

1. Is COVID-19 real or not?
2. Is COVID-19 a new disease or an old disease?
3. Is COVID-19 a serious disease that can kill?

Probe: their views on cause, transmission, symptoms, diagnosis, treatment, and prevention of COVID-19

Prompt: Are there vaccines for COVID-19?

Q2. What are your views about COVID-19 vaccine/vaccination and the vaccination process?

Probe: safety, effectiveness, universal COVID-19 vaccination, and vaccination process

Q3. Some people have received COVID-19 vaccination but others have not received. What are the things that make people to receive or not to received COVID-19 vaccination?

Prompt: Why have some people not received COVID-19 vaccination?

Why have some people not received COVID-19 vaccination that *is available close to them?*

Q4. Among the people that currently have not received COVID-19 vaccination, some intend or plan to receive it but others do not intend or plan to receive it.

What are the things that make people to plan to receive or to plan not to received COVID-19 vaccination?

Prompt: Why do some people say they will not receive COVID-19 vaccination?

Q5. Among the people that say they will receive COVID-19 vaccination, some say they will go and receive it after some days, some say after some weeks, some say after some months, others say after some years.

What are the things that determines how long it takes before people go and receive COVID-19 vaccination?

Prompt: What will make some people go and receive the COVID-19 vaccination earlier and others to go later?

Q6. What do you think should be done so that people who have not received COVID-19 vaccination will go and receive or start planning to receive it?

Prompt: How can people be made to accept COVID-19 vaccination? Probe: Role of government, health workers etc.

Thank you very much for your time and views.

FGD Guide for FGD with Health Workers

Q1. What is COVID-19?

Prompts:

1. Is COVID-19 real or not?
2. Is COVID-19 a new disease or an old disease?
3. Is COVID-19 a serious disease that can kill?

Probe: their views on cause, transmission, symptoms, diagnosis, treatment, and prevention of COVID-19

Prompt: Are there vaccines for COVID-19?

Q2. What are your views about COVID-19 vaccine/vaccination and the vaccination process?

Probe: safety, effectiveness, universal COVID-19 vaccination, and vaccination process

Q3. Some health workers have received COVID-19 vaccination but others have not received. What are the things that make health workers to receive or not to received COVID-19 vaccination?

Prompt: Why have some health workers not received COVID-19 vaccination?

Why have some health workers not received COVID-19 vaccination that is *available close to them?*

Q4. Among the health workers that currently have not received COVID-19 vaccination, some intend or plan to receive it but others do not intend or plan to receive it.

What are the things that make health workers to plan to receive or to plan not to received COVID-19 vaccination?

Prompt: Why do some health workers say they will not receive COVID-19 vaccination?

Q5. Among the health workers that say they will receive COVID-19 vaccination, some say they will go and receive it after some days, some say after some weeks, some say after some months, others say after some years.

What are the things that determines how long it takes before health workers go and receive COVID-19 vaccination?

Prompt: What will make some health workers go and receive the COVID-19 vaccination earlier and others to go later?

Q6. What do you think should be done so that health workers who have not received COVID-19 vaccination will go and receive or start planning to receive it?

Prompt: How can health workers be made to accept COVID-19 vaccination? Probe: Role of government, other health workers etc.

Thank you very much for your time and views.

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COVID-19 vaccination acceptance among community members and health workers in Ebonyi state, Nigeria: study protocol for a concurrent-independent mixed method analyses of intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination and the determinants

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Abstract

Introduction The coronavirus disease 2019 (COVID-19) pandemic has gravely affected the lives and economies of the global population including Nigeria. The attainment of herd immunity through mass COVID-19 vaccination is the foremost control strategy, however, the deployments of COVID-19 vaccinations are facing challenges of non-acceptance. Despite the efforts of the Nigerian government and COVAX facility in making COVID-19 vaccination more available/accessible, the vaccination rate remains unexpectedly very low in Nigeria/Ebonyi state. It is thus important to investigate the acceptability of COVID-19 vaccination to elucidate the explanations for the very low coverage rate. This study aims to evaluate/explore COVID-19 vaccination acceptance and the determinants among community members and health workers in Ebonyi state, Nigeria.

Methods and analyses The study is an analytical cross-sectional survey with a concurrent-independent mixed method design. Quantitative data will be collected from all consenting/assenting community members aged 15 years and above, in 28 randomly selected geographical clusters, through structured interviewer-administered questionnaire household survey using KoBoCollect installed in android devices. Quantitative data will be collected from all consenting health workers, selected via convenience and snowball techniques, through structured self-administered questionnaire survey distributed via WhatsApp and interviewer-administered survey using KoBoCollect installed in android devices. Qualitative data will be collected from purposively selected community members and health workers through focus group discussions. Quantitative analyses will involve descriptive statistics, generalized estimating equations (for community members data), and generalized linear model (for health workers data). Qualitative analyses will employ the thematic approach.

Ethics and dissemination Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital Abakaliki (14/12/2021-17/02/2022) and verbal consent will be obtained from participants. Study findings will be reported at local, national, and international levels as appropriate.

Trial registration number ISRCTN16735844

Strengths and limitations of this study

- Our study will be the first geographical-community based study, using mixed method approach, to investigate COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) in the context where there is very low vaccination rate despite relative vaccine availability and public access to vaccination.
- The study will be implemented after prospective registration with ISRCTN and based on available/accessible or disseminated protocol.
- The study is prone to reporting bias due to the questionnaire-based data collection method. The convenience and snowballing sampling will make the health worker survey prone to selection bias.

Introduction

Coronavirus disease 2019 (COVID-19), a severe acute respiratory syndrome disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged by the end of 2019 and became a pandemic. By 7th August, 2022, the COVID-19 pandemic had affected more than 581 million persons and had resulted in the death of over 6.4 million persons globally with more than 9.2 million cases and over 174000 deaths in Africa.[1] By 10th August, 2022, the total number of recorded confirmed cases of COVID-19 and COVID-19 related deaths were respectively 262402 and 3147 in Nigeria and 2064 and 32 in Ebonyi state.[2] The pandemic has overstretched the capacity of many countries' health care delivery and disrupted the global economy due to lockdown measures.[3–7]

Amongst the available control measures, perhaps the most cost-effective and sustainable control strategy is mass COVID-19 vaccination (with safe and effective vaccines). COVID-19 vaccination reduces the incidence, severity, and death from COVID-19,[8–11] and is perhaps the foremost means of achieving herd immunity especially when all population groups including adults and children are vaccinated[9–14] because both adults and children are susceptible to COVID-19 infection.[15–17] However, the deployments of COVID-19 vaccinations are facing some challenges such as non-acceptance and misinformation propagated by anti-vaccine campaigners. Refusal and/or delay in accepting vaccinations (vaccine hesitancy) has become a major public health challenge over the past decade[18,19] and was noted as one of the top ten threats to global health in 2019.[20] Moreover, the unprecedented disruptive impact of the pandemic with the associated conspiracy theories being propagated in conventional and social media and the unprecedented rapid development and introduction of COVID-19 vaccines have generated an atmosphere of uncertainty and confusion which have further limited the acceptance of COVID-19 vaccination.[21–23]

COVID-19 vaccination started in March, 2021 in Nigeria under the COVAX initiative.[24,25] Although the Nigerian government, with the support of the COVAX facility, is scaling up the availability/access to COVID-19 vaccination, the coverage rate is still very low in Nigeria, including Ebonyi state and Nigeria was not among the only five countries in Africa expected to meet the target of about 40% COVID-19 vaccination coverage by end of 2021.[26] As of 26th January, 2022 (before this study was implemented), only about 4.6% of eligible Nigerians had received the second dose of COVID-19 vaccination,[27] about 10.5% had received the first dose,[28] and Ebonyi state had about the least coverage rate in Nigeria.[29] As of 11th August, 2022, about 25.2% of eligible Nigerians had received the second dose (fully vaccinated)[30] and about 10.6% had received the first dose (partially vaccinated)[31] and as of 12th August, 2022, Ebonyi state had the second least coverage rate in Nigeria.[32] Moreover, these coverage rates were among the current eligible population of 18 years and above and, the rates among the population at risk, which is what is considered with regards to herd immunity, would be a fraction of the above.

Although the incidence of COVID-19 in Nigeria has been relatively lower compared to many other countries, high acceptance of COVID-19 vaccination among Nigerians is important in order to prevent any possible upsurge of the disease especially due to new strains of the virus. Resurgence of COVID-19 infections and COVID-19 related deaths are common especially among populations with low COVID-19 vaccination coverage.[9–11]

Although the issue of stock-out of COVID-19 vaccines and vaccination syringes cannot be ignored in Nigeria and other African countries,[26] the slow pace of coverage may be partly due to non-acceptance/hesitancy among the populace and health workers as we have observed anecdotally in Ebonyi state. However, to our knowledge, the extent of COVID-19 vaccination acceptance and the determinants among community members and health workers, as well as the degree to which the very low COVID-19 vaccination coverage is explained by non-

acceptance as against non-availability/non-access, have not been rigorously investigated especially in Nigeria and particularly in Ebonyi state. Such investigation has become more imperative since the introduction and scale up of COVID-19 vaccination across Nigeria. The understanding of context-specific determinants of vaccination acceptance is a necessary strategy in addressing the problem of non-acceptance of new vaccines such as the current COVID-19 vaccines.[33]

COVID-19 vaccination intentions among populations were assessed at the early phase of the pandemic by studies across the world[12–14,34–63] and in Nigeria (mostly based on social media platforms and among health workers)[64–70] during the development/clinical trial stage of COVID-19 vaccines. Few studies were done at the early stage of the introduction and deployment of COVID-19 vaccination.[71,72] However, these studies were done when COVID-19 vaccination had not been introduced for public use or was just being introduced. Thus, the perceptions of vaccination-related attributes such as importance, safety or side-effects, and effectiveness were perhaps largely distal. Moreover, the findings of those studies might markedly vary from that of studies conducted in situations where COVID-19 vaccination is readily/relatively available/accessible and there are close/real experiences/perceptions of vaccination activities and vaccination-related adverse events. Also, since the implementation of COVID-19 vaccination in Nigeria, the amplification of reports of serious side-effects and deaths following vaccination is common in the social and conventional media and on the grapevine.

Moreover, decline in the intention to receive COVID-19 vaccination after the vaccine became available has been reported across countries.[73] Anecdotal evidence shows that the initial waves of fear of COVID-19 among the people, including health workers, has markedly waned overtime especially in Ebonyi state and Nigeria as a whole where the pandemic has been much less severe compared to some other climes. As a result, it is not surprising that COVID-19

vaccination uptake is reportedly very low and more importantly, the drive to scale up the availability and uptake of COVID-19 vaccination may be up against an unexpected bottle-neck if there is hesitancy or no intention to receive the vaccination among the people.

Only few studies have assessed the uptake of actual COVID-19 vaccination among the general adult population[55,74,75] and among health workers[76–79] but most were among sub-populations and when the vaccination was still relatively less available and accessible.

This study aims to evaluate and explore COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) and the determinants among community members and health workers in Ebonyi state, Nigeria, in order to generate evidence to inform policy interventions and strategies on optimal COVID-19 vaccination acceptance and coverage.

Study objectives

The primary objectives are to evaluate and explore the following among community members and health workers in Ebonyi state, Nigeria:

1. The intention to receive COVID-19 vaccination and the determinants

2. Timeliness of the intention to receive COVID-19 vaccination and the determinants

3. The uptake of COVID-19 vaccination and the determinants

4. The hesitancy to COVID-19 vaccination and the determinants

5. The predictive power of acceptance factor compared with availability/access factor regarding the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

The secondary objectives are to evaluate and explore the following among community members and health workers in Ebonyi state, Nigeria:

1. The COVID-19 experiences and perceptions and their determinants

2. The COVID-19 vaccination expectations and perceptions and their determinants

3. The COVID-19 vaccination process experiences and perceptions (availability/access factor) and their determinants

4. The knowledge, attitude, and practices about COVID-19 and their determinants

5. The sources of information about COVID-19 and their determinants

6. The perceptions about COVID-19, COVID-19 vaccine/vaccination, and COVID-19 vaccination process

Study hypotheses

The primary hypotheses include:

1. Strong COVID-19 experience and perception increases COVID-19 vaccination acceptance (increases the intention to receive, timeliness of the intention to receive, and uptake and reduces hesitancy) compared with not strong COVID-19 experience and perception

2. Increase in COVID-19 experiences and perceptions score increases COVID-19 vaccination acceptance

3. Good COVID-19 vaccination expectation and perception increases COVID-19 vaccination acceptance compared with poor COVID-19 vaccination expectation and perception

4. Increase in COVID-19 vaccination expectations and perceptions score increases COVID-19 vaccination acceptance

5. Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)) is significantly associated with COVID-19 vaccination acceptance

6. Positive COVID-19 vaccination process experience and perception (positive availability/access factor) increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with negative COVID-19 vaccination process experience and perception (negative availability/access factor)

7. Increase in COVID-19 vaccination process experiences and perceptions score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

8. Acceptance-availability/access factor is significantly associated with the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

9. Increase in acceptance factor score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with increase in availability/access factor score

10. The positive categories of COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions respectively increase COVID-19 vaccination acceptance compared with the negative categories (as depicted in table 1)

The secondary hypotheses include:

11. Knowledge, attitude, and practices about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19

vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions

12. Sources of information about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; and knowledge, attitude, and practices about COVID-19

13. Sociodemographic characteristics are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

14. Professional or work-related attributes of health workers are significantly associated with: COVID-19 vaccination acceptance, COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

The hypothesized relationships between the independent factors and the outcome measures are shown in the study's conceptual framework in figure 1. The conceptual framework was designed based on the study hypotheses which were informed by published data on COVID-19 and COVID-19 vaccination and the "3Cs" Vaccine Hesitancy Model by The SAGE Working Group on Vaccine Hesitancy.[18]

In the conceptual framework (figure 1), strong COVID-19 experience and perception (compared with not strong experience and perception), increase in COVID-19 experiences and

perceptions score, and the positive categories of COVID-19 experiences and perceptions (compared with the negative categories) are expected to be associated with decrease in complacency about COVID-19 vaccination which will result in increase in the intention to receive, timeliness of the intention to receive, and uptake and decrease in hesitancy to COVID-19 vaccination (increase in COVID-19 vaccination acceptance). Likewise, good COVID-19 vaccination expectation and perception (compared with poor expectation and perception), increase in COVID-19 vaccination expectations and perceptions score, and the positive categories of COVID-19 vaccination expectations and perceptions (compared with the negative categories) are expected to be associated with increase in confidence in COVID-19 vaccination which will lead to increase in COVID-19 vaccination acceptance.

Positive COVID-19 vaccination process experience and perception (compared with negative experience and perception), increase in COVID-19 vaccination process experiences and perceptions score, and the positive categories of COVID-19 vaccination process experiences and perceptions (compared with the negative categories) are expected to be associated with increase in convenience in COVID-19 vaccination and then increase in the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination. Acceptance factor is expected to be associated with increase in COVID-19 vaccination acceptance compared with availability/access factor.

As depicted in the conceptual framework (figure 1), knowledge, attitude, and practice about COVID-19; sources of information about COVID-19; sociodemographic characteristics; and professional or work-related attributes are expected to be associated with decrease in complacency, increase in confidence, and increase in convenience in COVID-19 vaccination and then increase in COVID-19 vaccination acceptance. These background characteristics are also expected to be associated with COVID-19 experiences and perceptions, COVID-19

vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions (figure 1).

Methods and analyses

Design

The study is an analytical cross-sectional survey with a concurrent-independent mixed data collection and data analysis and interpretation method. In this design, the quantitative and qualitative aspects of the study will be implemented simultaneously and independently of each other.[80] The study protocol development was guided by the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 checklist and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) 2007 checklist for cross-sectional studies.

Study area

The study is planned to be implemented between March and April, 2022, in Ebonyi state which is located in south-eastern geopolitical zone of Nigeria (figure 2) with land area of 5,953 sq. km. The population of the state was projected to be 3,313,229 in 2021 based on the 2006 national census figure and a growth rate of 2.8% and christianity is the most practiced religion. Ebonyi state has 13 Local Government Areas (LGAs) including the state capital (Abakaliki LGA) and 171 political wards.[81] Each LGA is made up of political wards and autonomous communities. Each autonomous community is made up of larger villages called autonomous villages which consist of smaller villages or settlements. Each village/settlement has a head or traditional leader. Most parts of Ebonyi state are rural and there are only six towns (urban or semi-urban areas), five of which are LGAs capitals with the adjoining areas.[82]

The federal ministry of health (FMOH) and its agencies provide the overarching guidance and policy framework for public and private health service delivery in all states in Nigeria including Ebonyi state. The FMOH provides health services in the state through tertiary health facilities while the state ministry of health (SMOH) provides health service through secondary health facilities (general hospitals). The SMOH and the state primary health care development agency (SPHCDA) provide health care in the local governments through primary health care (PHC) facilities. There is at least one PHC centre in each political ward. The national primary health care development agency (NPHCDA) provides policy guidance and coordination for immunisation/vaccination services in all states in Nigeria including Ebonyi state. The NPHCDA provides vaccines and related products while the SMOH and SPHCDA coordinates the implementation of immunisation/vaccination service delivery in the state (and LGAs) through the tertiary, secondary, and primary health care (PHC) facilities.

Participants

The participants include clusters, the community members within clusters, and health workers in Ebonyi state. A cluster in this study is a geographical community (village(s)/settlement(s)) which is the immediate catchment area of a PHC centre. Eligible clusters for inclusion in the study are those with at least 200 households or a population of 1000 people, whose PHC centres are providing basic maternal and child health care services including routine childhood immunisation, that can be easily accessed with a car, and where the cluster heads give verbal consent/permission. In each of the selected clusters, community members aged 15 years and above who give verbal consent/assent will be eligible to participate in a population-based household survey. Health workers (both clinical and non-clinical staff) in public and private health care sectors, including the patent medicine vendors (PMVs), who work or live in Ebonyi state and give verbal consent will be eligible to participate in a health worker survey. Community members aged 15 years and above who have resided in the community for at least

one year and who give verbal consent/assent will be eligible to participate in community-based focus group discussions (FGDs) while health workers (both clinical and non-clinical staff) who work or live in Ebonyi state, have at least one year of working experience, and give verbal consent will be eligible to participate in health worker-based FGDs.

Independent factors and outcome measures

Independent factors, categories, scoring, and grading

The independent factors among community members and health workers (see table 1) are almost the same with few differences which include: occupation, monthly income, and residence among the community members; and professional or work category/cadre, years of working experience, and level of work among the health workers.

The independent factors are listed under seven headings labelled A–I: COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions (availability/access factor); Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception); Acceptance-availability/access factor; Knowledge, attitude, and practice about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; and Professional or work-related attributes. These three factors – COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions – will be respectively measured using eight, five, and five questionnaire items each having five categories grouped into positive and negative and scored from 0–4 as depicted in table 1.

The scoring will create three new continuous variables including COVID-19 experiences and perceptions score (ranging from 0–32 for each participant); COVID-19 vaccination expectations and perceptions score (ranging from 0–20); and COVID-19 vaccination process

Table 1: Independent factors and their categories and category scores and grading among community members and health workers

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
A	COVID-19 experiences and perceptions					
1.	How fearful are you about getting COVID-19?	Very fearful (4)	A little fearful (3)	Not sure (2)	Not fearful (1)	Not fearful at all (0)
2.	How possible is it for you to get COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
3.	How possible is it for you to get severe COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
4.	Have you ever had COVID-19?	Yes, surely (4)	Yes, think so (3)	Not sure (2)	No, think so (1)	No, surely (0)
5.	Have you ever had severe COVID-19?	Yes, very serious (4)	Yes, a bit serious (3)	Not sure (2)	No, not serious (1)	No, not serious at all (0)
6.	Do you know any person who have had COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
7.	Do you know any person who have had severe COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
8.	Do you know any person who have died from COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
	Total	(32^{H})	–	–	–	(0^{L})
9.	COVID-19 experiences and perceptions score					
10.	Extent of COVID-19 experience and perception (COVID-19 risk perception)[A]	Strong experience and perception (high risk perception)	–	–	–	Not strong experience and perception (low risk perception)
B	COVID-19 vaccination expectations and perceptions					
11.	How important is it for you to receive COVID-19 vaccination?	Very important (4)	Important (3)	Not sure (2)	Not important (1)	Not important at all (0)
12.	How fearful are you about having severe side-effect from COVID-19 vaccination?	Not fearful at all (4)	Not fearful (3)	Not sure (2)	A little fearful (1)	Very fearful (0)
13.	What protection against COVID-19 will you get from receiving COVID-19 vaccination?	Full protection (4)	Partial protection (3)	Not sure (2)	No protection (1)	No protection at all (0)
14.	How do you trust the health workers who give COVID-19 vaccination?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
15.	How do you trust the government who made COVID-19 vaccination available?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
	Total	(20^{HH})	–	–	–	(0^{LL})
16.	COVID-19 vaccination expectations and perceptions score					
17.	COVID-19 vaccination expectation and perception level (COVID-19 vaccination benefit perception) [B]	Good expectation and perception (high benefit perception)	–	–	–	Poor expectation and perception (low benefit perception)
C	COVID-19 vaccination process experiences and perceptions (availability/access factor)					
18.	Ever heard about COVID-19 vaccination?	Many times (4)	Once/few times (3)	Not sure (2)	No time (1)	No time at all (0)
19.	Know a COVID-19 vaccination place?	A very close place (4)	A close place (3)	A far place (2)	A very far place (1)	No place (0)
20.	Frequency of COVID-19 vaccination at the vaccination place?	Daily, down to twice a week (4)	Once a weekly (3)	Once in two-four weeks (2)	No fixed time (1)	Do not know (0)
21.	Queue at the vaccination place?	No queue (4)	Short queue (3)	Do not know (2)	Long queue (1)	Very long queue (0)
22.	How caring are the health workers at the vaccination place?	Very caring (4)	Caring (3)	Not sure (2)	Not caring (1)	Not caring at all (0)
	Total	(20^{HHH})				(0^{LLL})
23.	COVID-19 vaccination process experiences & perceptions score (availability/access factor score)					
24.	COVID-19 vaccination process experience and perception level (availability/access factor level)[C]	Positive experience & perception (availability & access factor)	–	–	–	Negative experience & perception (availability & access factor)
D	Acceptance factor level	Defined as COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level. Categories: High disease risk-high remedy benefit perception or high-high DR-RB perception, high-low DR-RB perception, low-high DR-RB perception, and low-low DR-RB perception				
25.	Acceptance factor score	Defined as COVID-19 risk perception score plus COVID-19 vaccination benefit perceptions score or DR-RB perception score				
26.	Acceptance-availability/access factor level	High-high-positive, High-high-negative, High-low-positive, High-low-negative, low-high-positive, low-high-negative, low-low-positive, low-low-negative				
27.						

Table 1: Continued

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
F	Knowledge, Attitude, and Practice					
28.	Knowledge score					
29.	Level of knowledge of COVID-19 [D]	Good knowledge	–	–	–	Poor knowledge
30.	Attitude score					
31.	Level of attitude towards COVID-19 & COVID-19 vaccination[E]	Good attitude	–	–	–	Poor attitude
32.	Practice score					
33.	Level of practices about COVID-19[F]	Good practice	–	–	–	Poor practice
G	Source of information about COVID-19	Interpersonal (Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums); Traditional media (Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS (WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages)				
34.	Main source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
35.	Most trusted source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
H	Sociodemographic characteristics					
36.	Gender	Male, Female				
37.	Age					
38.	Marital status	Married, Divorced, Separated, Widowed, Never married (single)				
39.	Educational level	No formal education, Some primary, Completed primary, Some secondary, Completed secondary, Tertiary (diploma, first degree, masters/PHD/other equivalent)				
40.	Occupation*	Farmer, Trader, Other-self-employment, Private paid work, Government paid work, Housewife, Student, Apprentice, Youth service (Corper), None				
41.	Residence*	Rural, Semi-urban/Urban				
42.	Usual monthly income (NGN) & income score	Income categories: "no income" up to "more than 300,000" with interval of 20,000, giving 18 categories. "no income" is scored "one" & the score increases by "one" for each higher category up to the highest score of 17				
I	Professional or work-related attributes^					
43.	Professional cadre or work category	non-Clinical staff, Clinical staff (PMV, health attendant, JCHEW, CHEW, CHO, nurse/midwife, medical laboratory scientist, medical laboratory technologist, pharmacist, pharmacy technician, house officer, medical officer, medical doctor in specialist training, specialist medical doctor)				
44.	Years of working experience					
45	Primary place of work	Public and private				
46.	Level of primary place of work	Primary health care level (facility), Secondary health care level (facility), and Tertiary health care level (facility)				

[H]Highest attainable COVID-19 experiences and perceptions score for each participant ([L]Lowest attainable score). [A]COVID-19 experiences and perceptions score of >=50% of the highest attainable score of 32 is strong experience and perception, <50% is not strong experience and perception. [HH]Highest attainable COVID-19 vaccination expectations and perceptions score for each participant ([LL]Lowest attainable score). [B]COVID-19 vaccination expectations and perceptions score of >=50% of the highest attainable score of 20 is good expectation and perception, <50% is poor expectation and perception. [HHH]Highest attainable COVID-19 vaccination process experiences and perceptions score ([LLL]Lowest attainable score). [C]COVID-19 vaccination process experiences and perceptions score of >=50% of the highest attainable score of 20 is positive experience and perception, <50% is negative experience and perception. [D]Knowledge score of >=75% of the highest attainable score of 44 is good knowledge, <75% is poor knowledge (lowest attainable score is 0) (44 knowledge items scored "1" for each correct response and "0" for each incorrect response). [E]Attitude score of >=75% of the highest attainable score of 80 is good attitude, <75% is poor attitude (lowest attainable score is 16) (each of 16 attitude items respectively scored from "1" to "5" or "5" to "1" as appropriate for "strongly disagree", "disagree", "not sure", "agree", & "strongly agree"). [F]Practice score of >=75% of the highest attainable score of 24 is good practice, <75% is poor practice (lowest attainable score is 0) (24 practice items scored "1" for each correct response and "0" for each incorrect response). *Among only community members. ^Among only health workers. PMV=Patent Medicine Vendor. JCHEW=Junior Community Health Extension Worker. CHEW=Community Health Extension Worker. CHO=Community Health Officer.

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332 experiences and perceptions score (ranging from 0–20). These continuous variables will then
333 be graded on a two-level scale such that scores >=50% of the total versus <50% will
334 respectively be considered to be: strong versus not strong COVID-19 experience and
335 perception; good versus poor COVID-19 vaccination expectation and perception; and positive
336 versus negative COVID-19 vaccination process experience and perception.

Acceptance factor will be created as the combination of COVID-19 experiences and perceptions plus COVID-19 vaccination expectations and perceptions and defined as COVID-19 risk-COVID-19 vaccination benefit perception (disease risk-remedy benefit perception (DR-RB/DRRB perception)). Acceptance factor will be in contrast to availability/access factor (COVID-19 vaccination process experience and perception). Acceptance-availability/access factor will be created as the combination of acceptance and availability/access factors. Acceptance factor score (ranging from 0–52 for each participant as the sum of disease-risk perception score (0–32) and remedy-benefit perception score (0–20)) and availability/access factor score (ranging from 0–20) will be converted to percentages of the maximum attainable score for each participant so that the power of acceptance factor and availability/access factor in predicting COVID-19 vaccination acceptance can be compared by comparing how unit increase in the percentage scores (percentage point increase) affect COVID-19 vaccination acceptance. The predictive power of disease-risk perception and remedy-benefit perception will also be compared using similar technique.

Basic knowledge, attitude, and practices about COVID-19 will be assessed, scored, and categorised as stated in the legend of table 1.

Outcome measures

The outcome measures are as defined in table 2. The primary outcomes among community members and health workers include the intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination. Hesitancy was conceptualized as: non-receipt of a vaccination that is really available and accessible and perceived to be available and accessible because one did not want to receive it and either intends to receive it at a later time (delay) or intends not to receive it at a later time (refusal).

Table 2: Outcome measures and their definitions		
SN	**Primary Outcomes**	**Definitions**
	Among community members	
1.	The intention to receive COVID-19 vaccination	The proportion of community members aged 15 years and above, who have not received COVID-19 vaccination, who intend (or plan) to receive COVID-19 vaccination that is available for them to receive. The component outcomes are those who will surely go and receive and those who think they will go and receive the vaccination. This outcome is in contrast to those who do not intend (or plan) to receive COVID-19 vaccination that is available for them to receive – consisting of those who are not sure, those who think they will not go and receive, and those who will surely not go and receive the vaccination.
2.	Timeliness of the intention to receive COVID-19 vaccination	The time (in days) that community members aged 15 years and above, who intend (or plan) to receive COVID-19 vaccination, intend (or plan) to take before they go and receive the vaccination. The component outcomes are the intended time to vaccination among those who will surely go and receive and those who think they will go and receive the vaccination.
3.	The uptake of COVID-19 vaccination	The proportion of community members aged 18 years and above who have received COVID-19 vaccination
4.	The hesitancy to COVID-19 vaccination (delay or refusal to receive)	The proportion of community members aged 18 years and above who have not received COVID-19 vaccination due to reasons that include only non-acceptance factor rather than only real/perceived non-availability/non-access factor or both non-acceptance and real/perceived non-availability/non-access factors. Non-acceptance factor is defined as consisting of one or more of: perceptions that the vaccination is not important, vaccine is not safe, vaccine is not effective, vaccine is new and/or waiting for others to take it first, and hearing of many bad stories about the vaccine. Real/perceived non-availability/non-access factor is defined as consisting of one or more of: ignorance of vaccination availability, ignorance of place and/or time of vaccination, long distance to vaccination site, being too busy, being ill and did not go for vaccination, being ill and went for vaccination but was not given, long waiting time, vaccine stock-out, absence of vaccinator, closure of health facility. The non-acceptance and real/perceived non-availability/non-access factors will be measured as the reasons given by respondents regarding why they have not received COVID-19 vaccination. Delay in receiving COVID-19 vaccination is the intention to receive the vaccination among those that are hesitant. Refusal to receive COVID-19 vaccination is the intention not to receive the vaccination among those that are hesitant.
5.	The intention for the children to receive COVID-19 vaccination	The proportion of community members aged 15 years and above who intend (or plan) for their children to receive COVID-19 vaccination if it is available for them to receive. The component outcomes are those who will surely take their children to receive and those who think they will take their children to receive the vaccination. This outcome is in contrast to those who do not intend (or plan) for their children to receive COVID-19 vaccination – consisting of those who are not sure, those who think they will not take their children to receive, and those who will surely not take their children to receive the vaccination
6.	Timeliness of the intention for the children to receive COVID-19 vaccination	The time (in days) that community members aged 15 years and above, who intend (or plan) for their children to receive COVID-19 vaccination, intend (or plan) to take before they take their children to receive the vaccination. The component outcomes are the intended time to vaccination for their children among those who will surely take their children to receive and those who think they will take their children to receive the vaccination
	Among health workers	
7.	The intention to receive COVID-19 vaccination	As for community members above
8.	Timeliness of the intention to receive COVID-19 vaccination	As for community members above
9.	The uptake of COVID-19 vaccination	As for community members above
10.	The hesitancy to COVID-19 vaccination	As for community members above
SN	**Secondary Outcomes**	**Definitions**
	Among community members	
1.	COVID-19 experiences and perceptions	COVID-19 experiences and perceptions score among community members aged 15 years and above
2.		The proportion of community members aged 15 years and above who have strong COVID-19 experience and perception (in contrast to those who have less strong experience and perception)
3.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 experiences and perceptions (in contrast to those who have the negative categories)
4.	COVID-19 vaccination expectations and perceptions	COVID-19 vaccination expectations and perceptions score among community members aged 15 years and above
5.		The proportion of community members aged 15 years and above who have good COVID-19 vaccination expectation and perception (in contrast to those who have poor expectation and perception)
6.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination expectations and perceptions (in contrast to those who have the negative categories)
7.	COVID-19 vaccination process experiences and perceptions	COVID-19 vaccination process experiences and perceptions score among community members aged 15 years and above
8.		The proportion of community members aged 15 years and above who have positive COVID-19 vaccination process experience and perception (in contrast to those who have negative experience and perception)
9.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination process experiences and perceptions (in contrast to those who have the negative categories)

Table 2: Continued		
SN	**Secondary Outcomes**	**Definitions**
10.	The knowledge of COVID-19	Knowledge score among community members aged 15 years and above
11.		The proportion of community members aged 15 years and above who have good knowledge of COVID-19 (in contrast to those who have poor knowledge)
12.	The attitude towards COVID-19 and COVID-19 vaccination	Attitude score among community members aged 15 years and above
13.		The proportion of community members aged 15 years and above who have good attitude towards COVID-19 and COVID-19 vaccination (in contrast to those who have poor attitude)
14.	The practices about COVID-19	Practice score among community members aged 15 years and above
15.		The proportion of community members aged 15 years and above who have good practice about COVID-19 (in contrast to those who have poor practice)
16.	The main source of information about COVID-19*	The proportion of community members aged 15 years and above whose main source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS.
17.	The most trusted source of information about COVID-19*	The proportion of community members aged 15 years and above whose most trusted source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS
	Among health workers	
18.	COVID-19 experiences and perceptions	As for community members above
19.	COVID-19 vaccination expectations and perceptions	As for community members above
20.	COVID-19 vaccination process experiences and perceptions	As for community members above
21.	The knowledge of COVID-19	As for community members above
22.	The attitude towards COVID-19 and COVID-19 vaccination	As for community members above
23.	The practices about COVID-19	As for community members above
24.	The main source of information about COVID-19	As for community members above
25.	The most trusted source of information about COVID-19	As for community members above

*Interpersonal source includes Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums; Traditional media source includes Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS source includes WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages.

Hesitancy to COVID-19 vaccination was measured among the unvaccinated based on the concepts of "non-acceptance factor" and real or perceived "non-availability (non-access) factor" and delay vs refusal was measured based on intention vs non-intention to receive among the unvaccinated (table 2).

The secondary outcomes include COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, COVID-19 vaccination process experiences and perceptions, knowledge of COVID-19, attitude towards COVID-19 and COVID-19 vaccination, practices about COVID-19, and main source and most trusted source of information about COVID-19 (table 2).

Measurement of independent factors and study outcomes

Quantitative data will be measured through population-based household survey using structured community members questionnaire (supplementary file 1) and health workers survey using structured health workers questionnaire (supplementary file 2). The community members questionnaire and the health workers questionnaire are virtually the same except for the absence of identification section and the professional/work-related attributes in the sociodemographic section of the health worker questionnaire. The questionnaire was designed with the guide of data published by other studies,[12,34,42,47] the Report of the SAGE Working Group on Vaccine Hesitancy,[18] the WHO vaccination coverage questionnaire,[83] and basic facts about COVID-19 on WHO website.[84] The electronic versions of both questionnaires were programmed using the KoBoToolbox software and were pre-tested in non-participating clusters.

The community members questionnaire will be interviewer administered. The interviewers will administer the electronic questionnaire with KoBoCollect installed in their android phones or tablet devices. The interviewers will receive two days training on how to administer the electronic questionnaire. The training will include a detailed review and explanation of the questionnaire items, how to obtain consent from respondents, interview techniques, the translation of key words in the questionnaire to local language, household revisiting techniques, and how to collect data and upload completed forms with KoBoCollect.

During the household survey, all the households will be enumerated and household members aged 15 years and above in households where verbal consent is given by the heads of households will be enlisted and assigned unique numbers on a separate paper form before administering the anonymised electronic questionnaire. To enhance coverage and response, local residents who have good knowledge of the cluster environment will preferably be the

interviewers so that they can visit households when household members are expected to be around and revisit up to three times as necessary. The community members questionnaire has seven sections: Identification (including cluster number, household number, participant number); Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19 (supplementary file 1).

The health worker questionnaire will be both self-administered and interviewer-administered. The web link for the electronic questionnaire will be distributed to health workers via social media platform such as WhatsApp. However, interviewers will administer the health workers questionnaire via KoBoCollect installed in android devices to health workers who do not have online contact and those living in remote areas with poor internet access. The health workers questionnaire has six sections: Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19 (supplementary file 2).

Qualitative data will be measured through focus group discussions (FGDs) with community members and health workers. A total of 20 FGDs with community members will be carried out across 10 clusters with two FGDs (one male-FGD and one female-FGD) per cluster. A total of 14 FGDs with health workers will be conducted, five with non-clinical staff and nine with clinical staff (five at PHC facilities and four at secondary/tertiary health facilities). The investigators will conduct the FGDs using FGD guide (supplementary file 3) prepared in English and pre-tested in non-participating clusters and among some health workers who will later be exempted from the study. The FGD guides (supplementary file 3) contain step-by-step instructions and both open-ended and more targeted questions designed to explore the

participants' perceptions about COVID-19, COVID-19 vaccine/vaccination, COVID-19 vaccination process, and the determinants of COVID-19 vaccination acceptance.

Before commencement of each FGD, the investigators will collect background data of participants including age, sex, marital status, level of education, occupation or cadre, and years of working experience as appropriate. The community members FGDs will be conducted in local language and the health workers FGDs in English. Each FGD will consist of 7–8 participants (comprising a moderator, a note taker, and the respondents) and will last for about 45 minutes. The FGDs will be audio-recorded, the health workers FGDs will be transcribed and community members FGDs will be translated and transcribed verbatim into English.

Data management and quality control

The skip logic and validation criteria in KoBoToolbox software was utilized when programming the electronic questionnaire to enhance the quality of data collection. To minimise the potential bias in assessing the association between COVID-19 and COVID-19 vaccination related experiences and perceptions and uptake of COVID-19 vaccination, the questionnaire items on these factors are subdivided into two subgroups: "have not received COVID-19 vaccination" and "have received COVID-19 vaccination" and the items in each subgroup are framed differently, respectively in present tense versus in past tense. For example, those whose response to a preceding question indicate that they have not received COVID-19 vaccination will subsequently respond to the questions: "How fearful are you that you may have very serious side-effect if you receive COVID-19 vaccination?" "How fearful are you about getting COVID-19?" etc. In contrast, those who have received COVID-19 vaccination will subsequently respond to the questions: "Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination: How fearful were you

that you might have very serious side-effect if you received COVID-19 vaccination?" "How fearful were you about getting COVID-19?"

To enhance the validity of the questionnaires, after the first drafts, there were several rounds of systematic review-discussion-correction-redrafting by the research team. During this iterative process, attention was paid to relevance of the questionnaire items to the study objectives and the logical flow and order, wording, framing, clarity and appropriateness of the questions. The validation process continued until the final version of the questionnaires which were then pre-tested. During the pre-test, respondents' understanding and interpretation of the items and the options, their response time to individual items and time taken to complete a questionnaire were assessed and the completed questionnaires were reviewed for any problems. Minor adjustments were made thereafter.

The household interviewers will upload only completed anonymised questionnaires to the online survey records at the end of each day's survey and the transmitted questionnaires will be reviewed for missing, incoherent, and illogical data. Any identified error will immediately be communicated to the respective interviewers for correction by cross-checking with the respective respondents. The investigators will supervise the household survey interviewers and will revisit at least 20 eligible households per cluster with a specialised form of the survey questionnaire to double check on responses and coverage.

Multiple submissions of the self-administered electronic questionnaire from a health worker on the same device and browser will be prevented by deploying the questionnaire through the online-only (once per respondent) option in KoBoToolbox. However, in any case where a health worker who has completed the questionnaire agrees to give the android phone to any co-worker – who do not have android phone or online address but is willing to participate in the survey – to respond to the questionnaire, a web link for online-only (single submission) will be

sent to such health worker. The data utility in Stata will be used to check for duplicated submissions (observations) and if found, only one will be kept, the duplicates will be deleted from the dataset. Participation of study participants in the FGDs before the questionnaire surveys will be prevented. During the translation and transcribing of the community members FGDs, exact and meaning-based translation will be used. The FGD transcripts will be compared with the original recording to check for 'accuracy' before conducting analyses.

Sample size

Sample size is estimated using Stata/SE version 15·1 (Stata Corp, College Station, TX, USA). For the community members survey, assuming a conservative estimate of 50% for the primary outcome (the proportion of community members who have not received COVID-19 vaccination who intend (or plan) to receive COVID-19 vaccination that is available for them to receive) among the community members who have not strong COVID-19 experience and perception and 56% among those who have strong COVID-19 experience and perception, 80% power at 2.5% probability of type one error (to correct for multiple comparisons),[85] 2630 is the minimum total sample size required to detect the 6%-point difference in this primary outcome between both comparison groups. Allowance for 70% response rate will increase the sample size to 3758. To account for cluster sampling, 3758 is multiplied by a conservative estimate of design effect of 4 to give a final minimum total sample size of 15032. As the clusters that will be selected to participate in the study are those with minimum population size of 1000 per cluster, and with 540 (54%) of the population expectedly falling withing the age group of 15 years and above,[86] the study requires 28 clusters (15032/540) for the community members survey.

Using similar parameters, the health workers survey requires a minimum total sample size of 940 to detect a 10%-point difference in this primary outcome between both comparison groups

(50% versus 60%). Because of the nature of the survey, such as the use of social media platforms for distribution of the (self-administered) questionnaire, the length of the questionnaire, and the sampling technique (convenience and snowball), allowance for 50% acceptance rate to account for both non-response and incomplete response will increase the minimum total sample size for the health worker survey to 1880. Also, due to the nature of the survey, the I880 is perhaps more of the number of health workers that will be targeted for distribution of the questionnaire rather than for selection to participate in the survey.

Sampling technique (Recruitment)

Community members will be selected by stratified cluster sampling technique. The sampling frame will be the list of clusters obtained from the Ebonyi state ministry of health. The eligible clusters will be stratified into two: rural and urban/semi-urban. A random sample of 21 clusters will be selected from the rural stratum and a random sample of 7 clusters will be selected from the urban/semi-urban stratum using the "sample" command in Stata. This will give a 3:1 rural to urban ratio. If verbal consent/permission is not given by any of the selected cluster(s) head(s) before commencement of household survey, replacement cluster(s) will be selected from the remaining list of eligible clusters using the same technique. The study profile is shown in figure 3. In each of the selected clusters, all the households will be enumerated and all individuals aged 15 year and above in each household will be selected for the community members survey. About five to six eligible male and female community members, both those who have received and those who have not received COVID-19 vaccination, in 10 clusters will be selected purposively for FGDs.

Health workers will be selected by convenience and snowballing techniques. To increase acceptance rate, the research team will first make a physical and or phone contact with as many health workers as possible to invite them to participate in the survey and seek their consent and

permission for the web link for the self-administered electronic questionnaire to be sent to them via online platforms. For those who give consent and permission, the address or phone number of their preferred online platform will be recorded and the web link for the questionnaire will be sent to their private online pages. They will be implored to forward the web link to other health workers that they know within the study area after they have completed the questionnaires. The research team will send the web link for the questionnaire to the online contacts (such as WhatsApp phone numbers) of as many eligible health workers as possible, including both private and group pages. Interviewers will also use convenience sampling in administering the health workers questionnaire (via KoBoCollect installed in android devices) to those who do not have online contact and those living in remote areas with poor internet connectivity. About five to six eligible health workers, both those who have received and those who have not receive COVID-19 vaccination, will be selected purposively for FGDs.

Data analyses

Data will be analysed using Stata/SE version 15.1 (Stata Corp, College Station, TX, USA). Analyses of the community members data will be based on population-averaged models that account for clustering. Point estimates of the outcome measures will be computed for each comparison group as defined in the study hypotheses. Each hypothesis with dichotomous or categorical independent factor will be tested by computing prevalence difference (with 97.5% CI and p-values) in binary outcome measure using binomial identity, and mean difference (with 97.5% CI and p-values) in continuous outcome measure using gaussian identity, generalized estimating equations (GEE) with an exchangeable correlation matrix and robust standard errors. Each hypothesis with continuous independent factor will be tested by computing coefficient (with 97.5% CI and p-values) in binary and continuous outcome measures, respectively using the binomial identity and gaussian identity GEE models.

For each independent factor (in a hypothesis) being tested, adjusted analysis will be done by in-putting into the GEE model the other independent factors as appropriate. For clarity, the potential independent factors to control for are presented in table 3. Both unadjusted and adjusted results will be reported. If the binomial identity GEE model fails to run or convergence is not achieved, gaussian identity GEE model, or generalized least square (GLS) random-effects linear regression model (with robust standard errors), or maximum likelihood (ML) random-effects linear regression model will be used instead.[87]

The same analytic technique will be used for the analyses of the health workers data except that generalized linear model (GLM) with robust standard errors will be used in place of GEE model because of the absence of cluster design in the health worker survey.

Summary statistics will be used to assess COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy); COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19 among community members and health workers.

The qualitative data (focus group discussion transcripts) will be analysed thematically based on pre-determined themes in the study's conceptual framework. The qualitative data will be analysed, interpreted, and presented independently of the quantitative data.

Ethics and dissemination

Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital Abakaliki (14/12/2021-17/02/2022). The investigators will obtain verbal consent/permission from the heads of the selected clusters.

Table 3: Independent factors to in-put into multivariate models in adjusted analyses		
	Independent factors under test	**Independent factors to control for (as appropriate)**
	Primary hypotheses	
1.	Extent of COVID-19 experience and perception	COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19 (Main source and Most trusted source of information about COVID-19); Sociodemographic characteristics (Gender, Age, Marital status, Educational level, Occupation*, Residence*, Monthly income/income score*); Professional or work-related attributes^ (Work category (clinical and non-clinical), Years of working experience, Primary place of work (public and private), Level of primary place of work (primary, secondary, and tertiary))
2.	COVID-19 experiences and perceptions score	COVID-19 vaccination expectations and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
3.	COVID-19 vaccination expectation and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
4.	COVID-19 vaccination expectations and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
5.	Acceptance factor level (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level)	Availability/access factor level (COVID-19 vaccination process experience and perception level); Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
6.	COVID-19 vaccination process experience and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
7.	COVID-19 vaccination process experiences and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination expectations and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
8.	Acceptance-availability/access factor level	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
9.	Acceptance factor score and availability/access factor score	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
10.	COVID-19 experiences & perceptions[A], COVID-19 vaccination expectations & perceptions[B], COVID-19 vaccination process experiences & perceptions[C]	COVID-19 experiences & perceptions[A], COVID-19 vaccination expectations & perceptions[B], COVID-19 vaccination process experiences & perceptions[C] (as appropriate); Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
	Secondary hypotheses	
1.	Knowledge of COVID-19	Attitude towards COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
2.	Attitude towards COVID-19	Knowledge of COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
3.	Practices about COVID-19	Knowledge of COVID-19; Attitude towards COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
4.	Main source of information about COVID-19	Most trusted source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
5.	Most trusted source of information about COVID-19	Main source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
6.	A sociodemographic characteristic	Other sociodemographic characteristics; Source of information about COVID-19; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
7.	A professional or work-related attribute^	Other professional or work-related attributes^; Source of information about COVID-19; Sociodemographic characteristics; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level

*Among only community members. ^Among only health workers. [A]Fear of getting COVID-19, possible to get (severe) COVID-19, ever had COVID-19, and knowledge of any person who have had COVID-19. [B]Importance of COVID-19 vaccination, fear of having severe side-effect from COVID-19 vaccination, protection from receiving COVID-19 vaccination, trust for the health workers who give COVID-19 vaccination, trust for the government who made COVID-19 vaccination available [C]Ever heard COVID-19 vaccination was available for receipt and knowledge of a COVID-19 vaccination place.

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During the household survey the interviewers will obtain verbal consent from the household members aged 18 years and above and assent from household members aged less than 18 rears (after obtaining consent from the heads of households). The health workers will be informed that only those that give consent should take the online survey. The moderators of the focus group discussions (FGDs) will obtain verbal consent from the respondents before each FGD.

The purpose the study, the kind of participation, likely duration of participation, voluntary nature of participation, absence of potential harm, potential benefit, and confidential nature of the study will be communicated to participants as required. The online record of the anonymised quantitative data will be passworded and the audio recordings and the electronic verbatim transcript of the FGDs will be stored in a passworded computer to prevent unauthorised access.

Study findings will be reported at local, national, and international levels in high impact peer-reviewed journals and conferences as appropriate.

Patients and public involvement

Patients or the public were not involved in the design and reporting or dissemination plans and will not be involved in the conduct of our research.

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Contributors UIO conceived and designed the study, designed the data collection tools and programmed the software, and wrote the protocol and the manuscript. OI, RLE, CIA, OUO, VUU, ASA, COI, OON, OOU, and IMO contributed to the development of the study design, data collection tools, and original protocol. GEN and UIAN contributed to the development of the study design, data collection tools, and final version of the protocol. All authors contributed to the revision of the manuscript and read, edited, and approved the final manuscript.

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Competing interests No competing interest is declared.

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Figure legend

Figure 1: Study conceptual framework

Figure 2: Map showing the study area (Ebonyi state) in the south-east geopolitical zone of Nigeria

Figure 3: Summary of study profile

Supplemental files

Supplementary file 1: COVID-19 Vaccination Questionnaire_Community Members

Supplementary file 2: COVID-19 Vaccination Questionnaire_Health Workers

Supplementary file 3: FGD Guide_Community Members and Health Workers

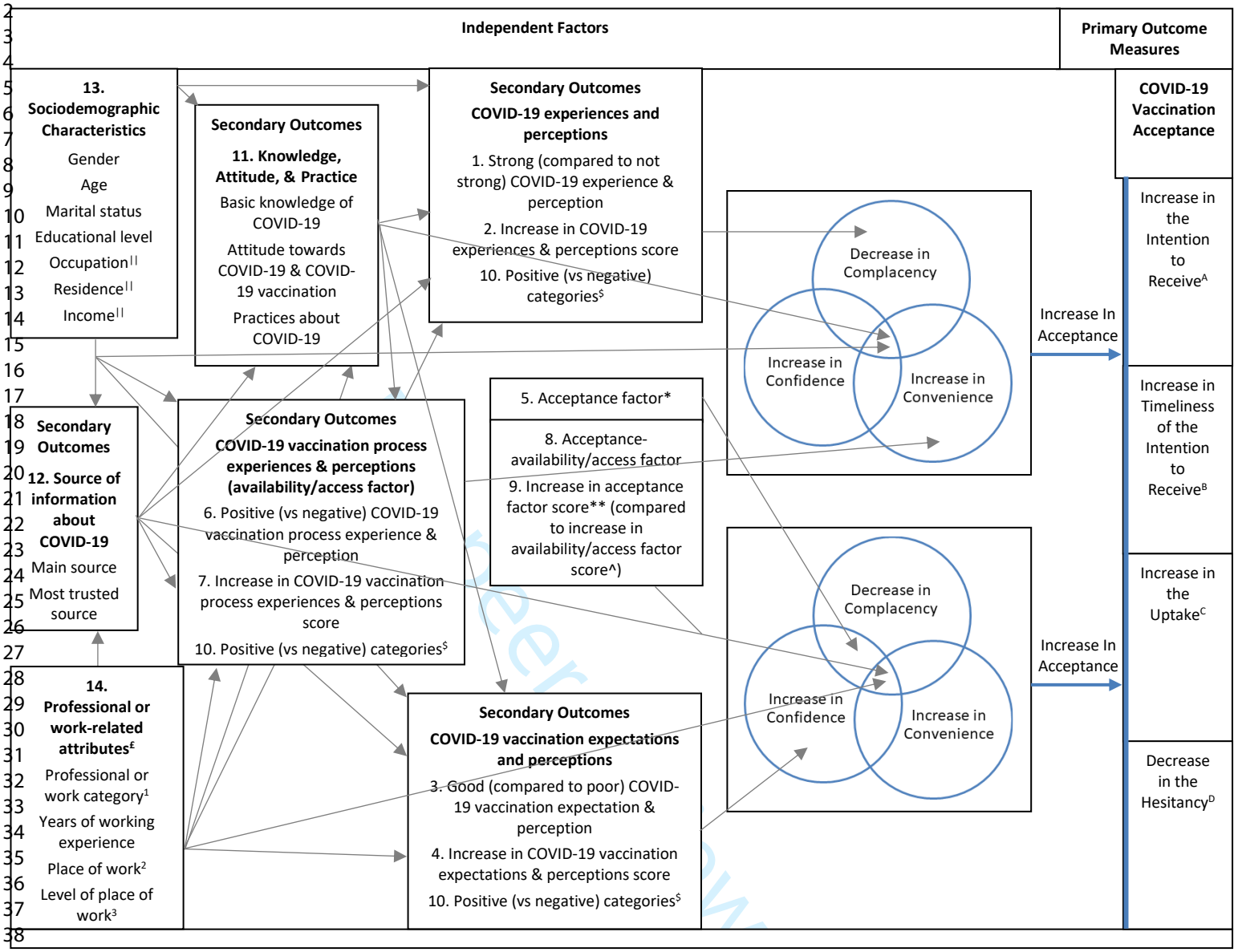

Figure 1: Study conceptual framework

[A]Measured as the proportion of participants who intended to receive covid-19 vaccination. [B]Measured as the time (in days) the participants, who intended to receive covid-19 vaccination, intended to take before they go and receive the COVID-19 vaccination (increase in timeliness means decrease in the intended days to vaccination). [C]Measured as the proportion of participants who had received covid-19 vaccination (including those who had completed the doses and those who had not). [D]Measured as the proportion of participants who had not received covid-19 vaccination due only to non-acceptance factor (perceptions that the vaccination was not important, vaccine was not safe, vaccine was not effective etc) rather than real or perceived non-availability (non-access) factor (ignorance of vaccination availability, long distance to place of vaccination, vaccine stock-out etc) or both. [$]As depicted in table 1. *COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)). **Increase in COVID-19 risk-COVID-19 vaccination benefit perceptions score or DR-RB perception score. ^Increase in COVID-19 vaccination process experience & perception score. ||Among only community members. [£]Among only health workers. [1]Clinical and non-clinical. [2]Public and private. [3]Primary, secondary, and tertiary.

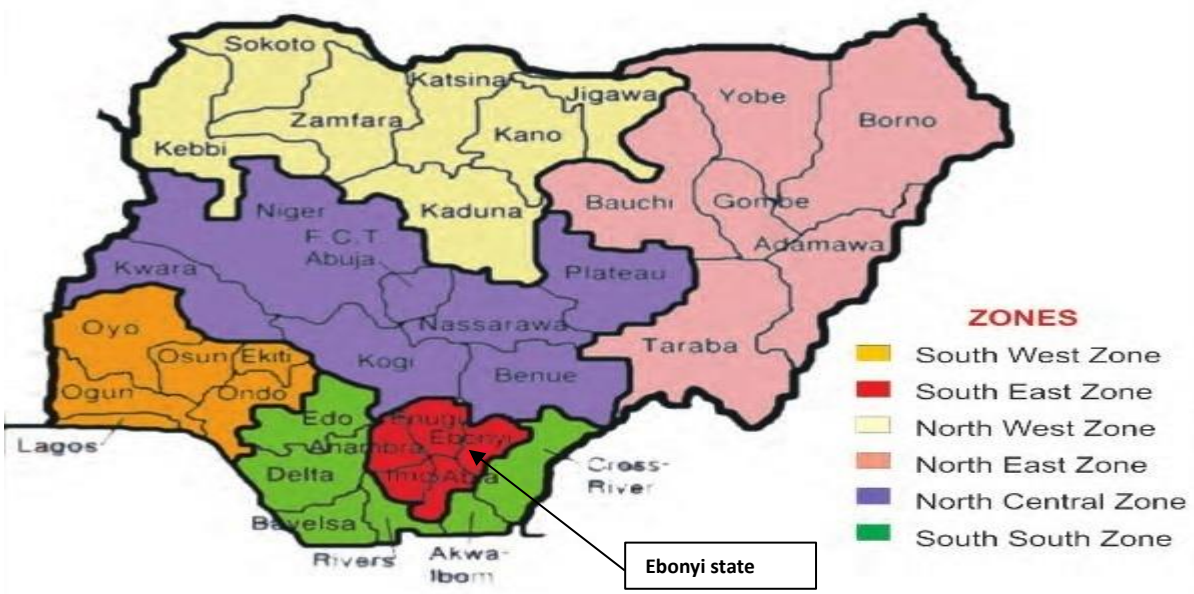

Figure 2: Map showing the study area (Ebonyi state) in the south-east geopolitical zone of Nigeria
(Source: National malaria strategic plan 2014–2020)

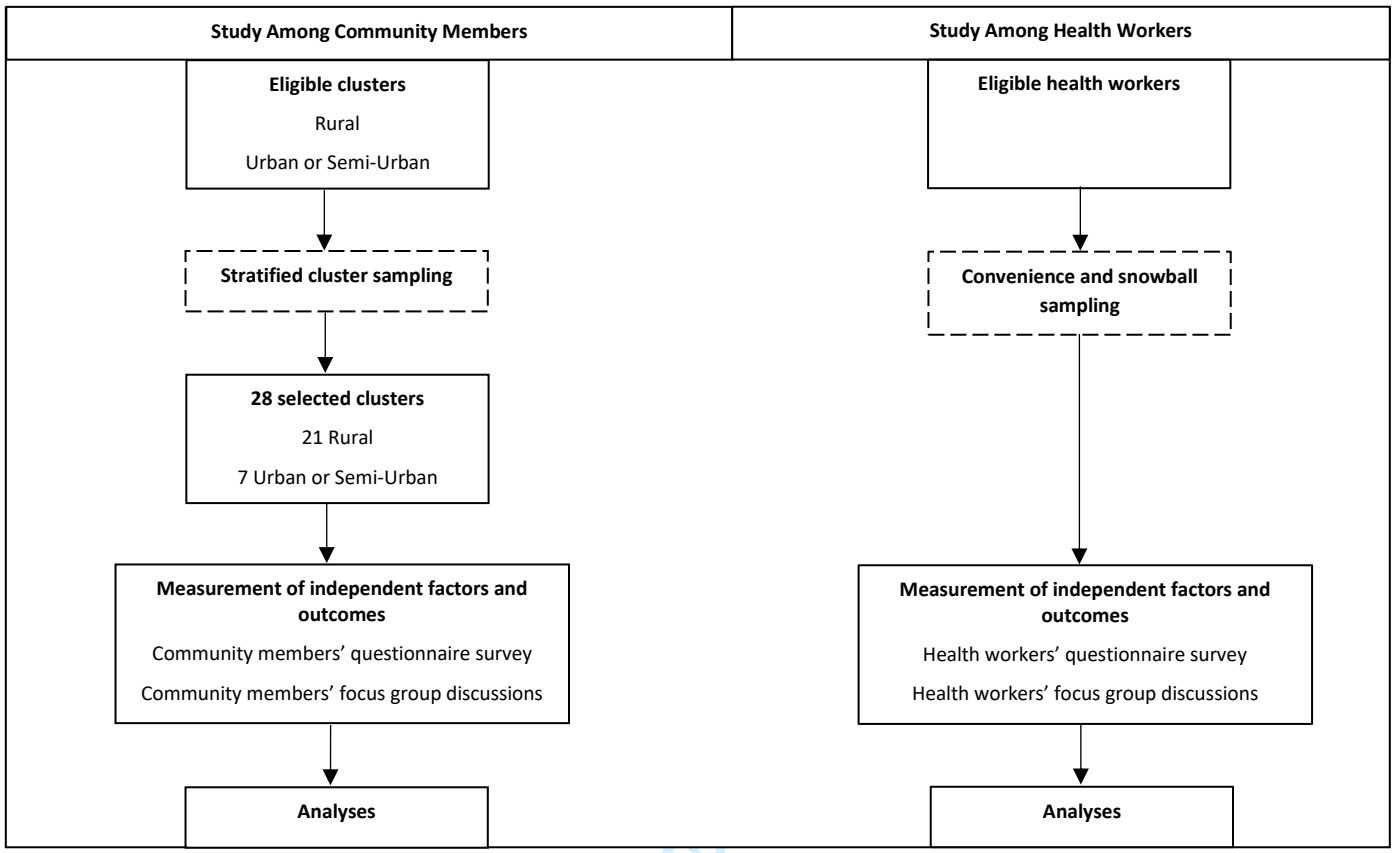

Figure 3: Summary of study profile

COVID-19 AND COVID-19 VACCINATION QUESTIONNAIRE FOR COMMUNITY MEMBERS

NOTE: Only Household Members Aged 15 years and Above Who Give Verbal Consent (or Assent) are Eligible to Participate in this Survey.

Identification – Section 1

1. Cluster ID Number: _____

2. Household ID Number (last 3 digits of household number): _____

3. Participant (Respondent) ID Number: _____

4. GPS

5. Date of interview (Year/Month/Day)

Sociodemographic Characteristics – Section 2

6. What is your Gender?
    1. Male
    2. Female

7. Age in years: How old were you during your last birthday? Number: _____

8. What is your Marital Status? **Probe:**
    1. Married
    2. Separated/Divorced
    3. Widowed
    4. Never married (Single)

9. What is your Educational Level? **Probe:**
    1. No formal education
    2. Some primary
    3. Completed primary
    4. Some secondary
    5. Completed secondary
    6. NCE/Diploma (ND, OND) (Tertiary)
    7. HND/First Degree (Tertiary)
    8. Masters/PHD/Other Equivalent (Tertiary)

10. What is your Main Occupation? **NOTE: Record the most suitable option:**

1. Farmer
2. Trader
3. Other-self-employment
4. Private paid work
5. Government paid work
6. Housewife
7. Student
8. Apprentice
9. Youth service (Corper)
10. None

11. What is your Usual Monthly Income in NGN from all sources including remittances and "pocket money" if any? **Probe:**

1. No income
2. 20,000 and less
3. 21,000–40,000
4. 41,000–60,000
5. 61,000–80,000
6. 81,000–100,000
7. 101,000–120,000
8. 121,000–140,000
9. 141,000–160,000
10. 161,000–180,000
11. 181,000–200,000
12. 201,000–220,000
13. 221,000–240,000
14. 241,000–260,000
15. 261,000–280,000
16. 281,000–300,000
17. More than 300,000

COVID-19 Vaccination Acceptance – Section 3

12. Have you received COVID-19 vaccination?

1. Yes
2. No

NOTE: No. 13–27 is for those who have received COVID-19 vaccination:

13. Which of the COVID-19 vaccination doses have you received? **Probe:**

1. First dose only
2. Second dose only
3. Second dose plus Booster

14. **If no. 13 above is 1:** Why have you not received the second dose of COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. No vaccine when you went (stock-out)
2. No vaccinator when you went (health facility not Closed)

3. Health facility was closed when you went
4. Place of vaccination was too far
5. You were too busy
6. You were ill and did not go for the remaining dose
7. You were ill, went but was not given the remaining dose
8. You had serious side effects from the first dose
9. The time for the second dose has not reached
10. Other (specify below)

15. **If no. 14 above includes 10:** Other reason, please specify. Phrase:_____

16. **If no. 13 above is 2:** Why have you not received a booster dose of COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You are not aware of booster dose
2. You do not need booster dose (it is not important)
3. No vaccine when you went (stock-out)
4. No vaccinator when you went (health facility not Closed)
5. Health facility was closed when you went
6. Place of vaccination was too far
7. You were too busy
8. You were ill and did not go for the booster dose
9. You were ill, went but was not given the booster dose
10. You had serious side effects from the second dose
11. The time for a booster dose has not reached
12. Other (specify below)

17. **If no. 16 above includes 12:** Other reason, please specify. Phrase:_____

18. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How often did you hear that COVID-19 vaccination was available for you to go and receive? **Probe:**

1. You heard about it many times before the day you received it
2. You heard about it few times (or once) before the day you received it
3. Not sure about it
4. You did not hear about it before the day you received it
5. You did not hear about it at all before the day you received it

19. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any place or health facility where they gave COVID-19 vaccination? **Probe:**

1. Yes, a place that was very close
2. Yes, a place that was close
3. Yes, a place that was far
4. Yes, a place that was very far
5. No, you did not know any place before the day you received COVID-19 vaccination

20. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How frequently were they giving COVID-19 vaccination at that place you mentioned above? **Probe:**

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. You did not know how frequently they were giving COVID-19 vaccination before the day you received it

21. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How was the queue (waiting time) at the place of vaccination that you mentioned above?

1. There was usually no queue (very short waiting time)
2. There was usually short queue (short waiting time)
3. You did not know what the queue (waiting time) was
4. There was usually long queue (long waiting time)
5. There was usually very long queue (very long waiting time)

22. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How caring (or kind/friendly) were the health workers at the place of vaccination that you mentioned above? **Probe:**

1. They were very caring
2. They were caring
3. Not sure whether they were caring or not
4. They were not caring
5. They were not caring at all

23. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How important did you think it was for you to receive COVID-19 vaccination? **Probe:**

1. It was very important
2. It was important

3. Not sure whether it was important or not
4. It was not important
5. It was not important at all

24. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How fearful were you that you might have severe or very serious side-effect if you received COVID-19 vaccination? **Probe:**

1. You were not fearful at all
2. You were not fearful
3. Not sure about it
4. You were a little fearful
5. You were very fearful

25. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** What protection did you think COVID-19 vaccination would give you if you received it? **Probe:**

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. You were not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

26. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How did you trust the health workers who gave COVID-19 vaccination?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

27. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How did you trust the federal and state governments who made the COVID-19 vaccination available for people to receive? **Probe:**

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

NOTE: No. 28–43 is for those who have not received COVID-19 vaccination:

28. Have you ever heard that COVID-19 vaccination is available for you to go and receive? **Probe:**

1. Yes, you heard about it many times
2. Yes, you heard about it few times (or once)
3. Not sure
4. No, you have not heard about it
5. No, you have not heard about it at all

29. Do you know any place or health facility where they give COVID-19 vaccination? **Probe:**

1. Yes, a place that is very close
2. Yes, a place that is close
3. Yes, a place that is far
4. Yes, a place that is very far
5. No, you do not know any place

30. **If no. 29 above is 1 or 2 or 3 or 4:** How frequently do they give COVID-19 vaccination at that place you mentioned above? **Probe:**

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. Do not know

31. **If no. 29 above is 1 or 2 or 3 or 4:** How is the queue (waiting time) at the place of vaccination that you mentioned above? **Probe:**

1. There is usually no queue (very short waiting time)
2. There is usually short queue (short waiting time)
3. Do not know
4. There is usually long queue (long waiting time)
5. There is usually very long queue (very long waiting time)

32. **If no. 29 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) are the health workers at the place of vaccination that you mentioned above? **Probe:**

1. They are very caring
2. They are caring
3. You are not sure about it
4. They are not caring
5. They are not caring at all

33. **If no. 12 above is 2 & no. 7 above is >=18:** Why have you not received COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (you think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or you want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. You have been too busy
9. You have been ill and did not go for vaccination
10. You have been ill, went but was not given vaccination
11. Long waiting time (long queue)
12. No vaccine (stock-out) when you went
13. No vaccinator (health facility not closed) when you went
14. Health facility was closed when you went
15. You are not aware of it
16. Other (specify below)

34. **If no. 33 above includes 16:** Other reason, please specify. Phrase: _____

35. How important is it for you to receive COVID-19 vaccination? **Probe:**

1. Very important for me to receive it
2. Important for me to receive it
3. Not sure about it
4. Not important for me to receive it
5. Not important at all for me to receive it

36. How fearful are you that you may have severe or very serious side-effect if you receive COVID-19 vaccination? **Probe:**

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

37. What protection will COVID-19 vaccination give you if you receive it? **Probe:**

1. Full or complete protection from COVID-19

2. Partial or incomplete protection from COVID-19
3. Not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

38. How do you trust the health workers who give COVID-19 vaccination? **Probe:**

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

39. How do you trust the federal and state governments who made the COVID-19 vaccination available for people to receive? **Probe:**

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

40. Do you intend (or plan) to receive COVID-19 vaccination that is available for you to receive? **Probe:**

1. Yes, you will surely go and receive the vaccination
2. Yes, you think you will go and receive the vaccination
3. Not sure about it
4. No, you think you will not go and receive the vaccination
5. No, you will surely not go and receive the vaccination

NOTE: If 3 or 4 or 5: Skip to no. 35

41. **If no. 40 above is 1 or 2:** How long will it take before you go and receive the COVID-19 vaccination? Number (in days):_____ **NOTE: Record Response in DAYS (Convert Weeks, Months, and Years to DAYS). NOTE: Record "2000" for "do not know"**

42. **If no. 40 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) to receive COVID-19 vaccination or are not sure about it? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective

4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or I want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. Other reason (specify below)

43. **If no. 42 above includes 8:** Other reason, please specify. Phrase: _____

NOTE: No. 44–51 is for all

44. Do you have a child or children? 1=Yes 2=No. **If 2: Skip to 52**

45. How important is it for your child or children to receive COVID-19 vaccination if it is available for them to receive? **Probe:**

1. Very important for them to receive it
2. Important for them to receive it
3. Not sure about it
4. Not important for them to receive it
5. Not important at all for them to receive it

46. How fearful are you that your child/children may have severe or very serious side-effect if they receive COVID-19 vaccination that is available for them to receive? **Probe:**

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

47. What protection will COVID-19 vaccination give your child or children if they receive the one that is available for them to receive? **Probe:**

1. It will give them full or complete protection from COVID-19
2. It will give them partial or incomplete protection from COVID-19
3. Not sure about it
4. It will give them no protection from COVID-19
5. It will give them no protection at all from COVID-19

48. Do you intend (or plan) for your child or children to receive COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY]?

1. Yes, you will surely take your child or children to receive the vaccination

2. Yes, you think you will take your child or children to receive the vaccination
3. Not sure about it
4. No, you think you will not take your child or children to receive the vaccination
5. No, you will surely not take your child or children to receive the vaccination

NOTE: If 3 or 4 or 5: Skip to 50

49. **If no. 48 above is 1 or 2:** How long will it take before you take your child or children to receive the COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY]? Number (in days): _____ **NOTE: Record Response in DAYS (Convert Weeks, Months, and Years to DAYS)**

50. **If no. 48 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) for your child or children to receive the COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY] or are not sure about it? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. The child/children do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or You want others to take it first
6. Other reason (specify below)

51. **If no. 49 above includes 6:** Other reason, please specify. Phrase:_____

COVID-19 Experiences and Perceptions – Section 4

NOTE: No. 52–63 is for those who have received COVID-19 vaccination:

52. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How fearful were you about getting COVID-19? **Probe:**

1. You were very fearful
2. You were a little fearful
3. Not sure about it
4. You were not fearful
5. You were not fearful at all

53. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Was it possible for someone like you to get COVID-19? **Probe:**

1. It was highly possible

2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

54. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Was it possible for someone like you to get severe or very serious COVID-19? **Probe:**

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

55. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you ever have COVID-19 before you received the vaccination? **Probe:**

1. Yes, you were sure
2. Yes, you thought so
3. Not sure about it
4. No, you thought so
5. No, you were sure

56. **If no. 55 above is 1 or 2: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you ever have severe or very serious COVID-19 before you received the vaccination? **Probe:**

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious
5. No, it was not serious at all

57. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any person who had COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

58. **If no. 57 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any person who had severe or very serious COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

59. **If no. 57 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the COVID-19 vaccination:** Did you know any person who died from COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

60. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** What were your sources of information about COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Family members/Relatives/Friends
2. Health care providers/Health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media
8. Internet sites — Internet, social media, & SMS
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc)
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

61. **If no. 60 above includes 12:** Please specify the other source. Word or Phrase: _____

62. **If more than one sources given in no. 60 above:** Which of the sources was your main source? **NOTE: Probe: Select the one mentioned:** 1–12 above

63. **If more than one sources given in no. 60 above:** Which of the sources did you trust most? **NOTE:**

Probe: Select the one mentioned: 1–12 above

NOTE: No. 64–75 is for those who have not received COVID-19 vaccination:

64. How fearful are you about getting COVID-19? **Probe:**

1. Very fearful
2. A little fearful
3. Not sure about it
4. Not fearful
5. Not fearful at all

65. Is it possible for someone like you to get COVID-19? **Probe:**

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

66. Is it possible for someone like you to get severe or very serious COVID-19? **Probe:**

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

67. Have you ever had COVID-19? **Probe:**

1. Yes, you are sure
2. Yes, you think so
3. Not sure about it
4. No, you think so
5. No, you are sure

68. **If no 67 above is 1 or 2:** Have you ever had severe or very serious COVID-19? **Probe:**

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious
5. No, it was not serious at all

69. Do you know any person who have had COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

70. **If no. 69 above is 1 or 2 or 3 or 4:** Do you know any person who have had severe or very serious COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

71. **If no. 69 above is 1 or 2 or 3 or 4:** Do you know any person who have died from COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

72. What are your sources of information about COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Family members/Relatives/Friends
2. Health care providers/Health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media — Internet, social media, & SMS
8. Internet sites
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc)
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

73. **If no. 72 above includes 12:** Please specify the other source. Word or Phrase: _____

74. **If more than one sources given in no. 72 above:** Which of the sources is your main source? **NOTE:**

Probe: Select the one mentioned: 1–12 above

75. **If more than one sources given in no. 72 above:** Which of the sources do you trust most? **NOTE:**

Probe: Select the one mentioned: 1–12 above

Basic Knowledge of COVID-19 – Section 5

76. What is COVID-19? **Probe:**

1. A new disease (caused by a new micro-organism)
2. An old disease (caused by an old micro-organism)
99. Do not know

77. How do people get COVID-19? **Probe:**

1. By staying close to infected persons when they cough or sneezes
2. From bat
3. From rat
4. From spiritual attack
5. Other (specify below)
99. Do not know

78. **If no. 77 above is 5:** Please specify how people get COVID-19. Word or Phrase: _____

79. When somebody gets COVID-19, how long does it usually take before the person starts to show symptoms? **Probe:**

1. 2–14 days (within 2 weeks)
2. 2–4 weeks
3. >4 weeks
99. Do not know

80. What are the symptoms of COVID-19 (symptoms that someone with COVID-19 can have)? **NOTE:**

Multiple responses: Probe for respondent to select all that apply:

1. Fever
2. Cough
3. Tiredness
4. Body aches and pains
5. Sore throat
6. Difficulty breathing or shortness of breath
7. Chest pain

8. Headache
9. Loss of taste or smell
10. Diarrhoea
11. Nausea or vomiting
12. other (specify below)
99. Do not know

81. **If no. 80 above includes 12:** Please specify the other symptom. Word or Phrase:_____

82. Can people also have COVID-19 without showing any symptoms?

1. Yes
2. No
99. Do Not Know

83. Who are more at risk of having severe COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Children
2. Younger adults
3. Elderly people
4. Slim people
5. Obese people
6. People with chronic illness
7. People who smoke
8. Pregnant women
99. Do not know

84. Is there a laboratory test to diagnose COVID-19?

1. Yes
2. No
99. Do not know**. If 2 OR 99: Skip to 87**

85. **If no. 84 above is 1:** Where is laboratory test to diagnose COVID-19 done in Ebonyi state? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. AEFUTHA
2. General hospitals
3. PHC centres
4. Missionary hospitals
5. Private hospitals
6. Private laboratory

7. Other (specify below)

99. Do not know

86. **If no. 85 above includes 7:** Please specify the other place lab test for COVID-19 is done in Ebonyi state. Word or Phrase:_____

87. Are there treatments for COVID-19?

1. Yes
2. No
99. Do Not Know

88. Are there vaccines for COVID-19?

1. Yes
2. No
99. Do Not Know

89. **If no. 88 above is 1:** Do you know any place where one can go and receive COVID-19 vaccination in Ebonyi state?

1. Yes
2. No

90. What are the ways to avoid/prevent getting COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of face mask in public places (especially indoor public places)
4. Frequent hands washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching of face (eyes, nose, & mouth) when one is in public places
7. COVID-19 vaccination
8. Taking chloroquine
9. Use of herbs or roots (“Agbo”)
10. Use of ginger or garlic
11. Taking hot drinks or “ogogoro”
12. Other (specify below)
99. Do Not Know

91. **If no. 90 above includes 12:** Please specify other way to avoid getting COVID-19. Word or Phrase: _____

Attitude Towards COVID-19 and COVID-19 Vaccination – Section 6

NOTE: Tell the respondents you will make statements and for each statement, they should: Strongly Disagree, Disagree, Say if they are Not Sure/Do Not Know, Agree, or Strongly Agree.

92. COVID-19 is real. **Probe:**

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

93. COVID-19 a serious illness that can kill.

94. Everybody is susceptible to COVID-19 infection (it is possible for anybody to get COVID-19).

95. The risk of getting COVID-19 can be reduced by avoiding crowd (large group of people).

96. The risk of getting COVID-19 can be reduced by maintaining at least 1–2 metre distance away from people coughing or sneezing

97. The risk of getting COVID-19 can be reduced if everybody covers the mouth and nose (with handkerchief or bent elbow) when coughing or sneezing

98. The risk of getting COVID-19 can be reduced by wearing face mask when going out to public places (especially indoor public places).

99. The risk of getting COVID-19 can be reduced by washing hands with soap and water frequently (e.g before touching the face, before eating).

100. The risk of getting COVID-19 can be reduced by cleaning hands with alcoholic sanitisers frequently.

101. Chloroquine is an effective treatment (prevention) for COVID-19.

102. Herbs and roots (“Agbo”) are effective treatments (prevention) for COVID-19.

103. Ginger and garlic are effective treatments (prevention) for COVID-19.

104. Hot drinks or “ogogoro” are effective treatments (prevention) for COVID-19

105. COVID-19 vaccines are safe for people to receive

106. The risk of COVID-19 can be reduced by receiving COVID-19 vaccination

107. Everybody should receive COVID-19 vaccination that is recommended by the government

Practices about COVID-19 – Section 7

108. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Avoid or Prevent transmission of COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was ever practiced

109. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Avoid or Prevent transmission of COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was practiced in the last two weeks

110. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Treat or Prevent COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)

3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was ever practiced

111. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Treat or Prevent COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)
3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was practiced in the last two weeks

COVID-19 AND COVID-19 VACCINATION QUESTIONNAIRE FOR HEALTH WORKERS

NOTE: All health workers (both clinical and non-clinical) working or living in Eboni state who give consent are eligible to participate in this survey.

Sociodemographic Characteristics

1. What is your Gender?
    1. Male
    2. Female

2. Age in years: How old were you during your last birthday? Number: _____

3. What is your Marital Status?
    1. Married
    2. Separated/Divorced
    3. Widowed
    4. Never married (Single)

4. What is your Educational Level?
    1. No formal education
    2. Some primary
    3. Completed primary
    4. Some secondary
    5. Completed secondary
    6. NCE/Diploma (ND, OND) (Tertiary)
    7. HND/First Degree (Tertiary)
    8. Masters/PHD/Other Equivalent (Tertiary)

5. What is your Category or Cadre?
    1. non-Clinical staff
    2. PMV
    3. Health attendant
    4. JCHEW
    5. CHEW
    6. CHO
    7. Nurse/Midwife
    8. Medical laboratory technologist

9. Medical laboratory scientist
10. Pharmacy technician
11. Pharmacist
12. House officer
13. Medical officer
14. Medical doctor in specialist training (Resident doctor)
15. Specialist medical doctor (Fellow)
16. Other (specify below)

6. **If no. 5 above is 16:** Please specify your Category or Cadre. Word or Phrase:_____

7. How many years of working experience do you have? **NOTE: Use "0" for less than one year**. Number: _____

8. Where is your current primary place of work?

1. PMV
2. PHC centre
3. Private laboratory
4. Private pharmacy
5. Private hospital/clinic
6. Missionary hospital
7. General hospital
8. NOFIC
9. AEFUTHA
10. Other (specify below)

9. **If no. 8 above is 10:** Please specify your current primary place of work. Word or Phrase:_____

COVID-19 Vaccination Acceptance

10. Have you received COVID-19 vaccination?

1. Yes
2. No

NOTE: No. 11–25 is for those who have received COVID-19 vaccination:

11. Which of the COVID-19 vaccination doses have you received?

1. First dose only
2. Second dose only
3. Second dose plus Booster

12. **If no. 11 above is 1:** Why have you not received the second dose of COVID-19 vaccination?

NOTE: select all that apply:

1. No vaccine when you went (stock-out)
2. No vaccinator when you went (health facility not Closed)
3. Health facility was closed when you went
4. Place of vaccination was too far
5. You were too busy
6. You were ill and did not go for the remaining dose
7. You were ill, went but was not given the remaining dose
8. You had serious side effects from the first dose
9. The time for the second dose has not reached
10. Other (specify below)

13. **If no. 12 above includes 10:** Other reason, please specify. Phrase:_____

14. **If no. 11 above is 2:** Why have you not received a booster dose of COVID-19 vaccination?

NOTE: select all that apply:

1. You are not aware of booster dose
2. You do not need booster dose (it is not important)
3. No vaccine when you went (stock-out)
4. No vaccinator when you went (health facility not Closed)
5. Health facility was closed when you went
6. Place of vaccination was too far
7. You were too busy
8. You were ill and did not go for the booster dose
9. You were ill, went but was not given the booster dose
10. You had serious side effects from the second dose
11. The time for a booster dose has not reached
12. Other (specify below)

15. **If no. 14 above includes 12:** Other reason, please specify. Phrase:_____

NOTE: No. 16–25 is about your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:

16. How often did you hear that COVID-19 vaccination was available for you to go and receive?

1. You heard about it many times before the day you received it
2. You heard about it few times (or once) before the day you received it
3. Not sure

4. You did not hear about it before the day you received it
5. You did not hear about it at all before the day you received it

17. Did you know any place or health facility where they gave COVID-19 vaccination?

1. Yes, a place that was very close
2. Yes, a place that was close
3. Yes, a place that was far
4. Yes, a place that was too far
5. No, you did not know any place before the day you received COVID-19 vaccination

18. **If no. 17 above is 1 or 2 or 3 or 4:** How frequently were they giving COVID-19 vaccination at that place you mentioned above?

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. You did not know how frequently they were giving COVID-19 vaccination before the day you received it

19. **If no. 17 above is 1 or 2 or 3 or 4:** How was the queue (waiting time) at the place of vaccination that you mentioned above?

1. There was usually no queue (very short waiting time)
2. There was usually short queue (short waiting time)
3. You did not know what the queue (waiting time) was
4. There was usually long queue (long waiting time)
5. There was usually very long queue (very long waiting time)

20. **If no. 17 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) were the health workers at the place of vaccination that you mentioned above?

1. They were very caring
2. They were caring
3. Not sure whether they were caring or not
4. They were not caring
5. They were not caring at all

21. How important did you think it was for you to receive COVID-19 vaccination?

1. It was very important
2. It was important

3. Not sure whether it was important or not
4. It was not important
5. It was not important at all

22. How fearful were you that you might have severe or very serious side-effect if you received COVID-19 vaccination?

1. You were not fearful at all
2. You were not fearful
3. Not sure about it
4. You were a little fearful
5. You were very fearful

23. What protection did you think COVID-19 vaccination would give you if you received it?

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. You were not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

24. How did you trust the health workers who gave COVID-19 vaccination?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

25. How did you trust the federal and state governments who made the COVID-19 vaccination available for people to receive?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

NOTE: No. 26–41 is for those who have not received COVID-19 vaccination:

26. Have you ever heard that COVID-19 vaccination is available for you to go and receive?

1. Yes, you heard about it many times
2. Yes, you heard about it few times (or once)

3. Not sure
4. No, you have not heard about it
5. No, you have not heard about it at all

27. Do you know any place or health facility where they give COVID-19 vaccination?

1. Yes, a place that is very close
2. Yes, a place that is close
3. Yes, a place that is far
4. Yes, a place that is very far
5. No, you do not know any place

28. **If no. 27 above is 1 or 2 or 3 or 4:** How frequently do they give COVID-19 vaccination at that place you mentioned above?

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. Do not know

29. **If no. 27 above is 1 or 2 or 3 or 4:** How is the queue (waiting time) at the place of vaccination that you mentioned above?

1. There is usually no queue (very short waiting time)
2. There is usually short queue (short waiting time)
3. Do not know
4. There is usually long queue (long waiting time)
5. There is usually very long queue (very long waiting time)

30. **If no. 27 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) are the health workers at the place of vaccination that you mentioned above?

1. They are very caring
2. They are caring
3. You are not sure about it
4. They are not caring
5. They are not caring at all

31. **If no. 10 above is 2 & no. 2 above is >=18:** Why have you not received COVID-19 vaccination? **NOTE: Select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (you think it is harmful)

3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or you want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. You have been too busy
9. You have been ill and did not go for vaccination
10. You have been ill, went but was not given vaccination
11. Long waiting time (long queue)
12. No vaccine (stock-out) when you went
13. No vaccinator (health facility not Closed) when you went
14. Health facility was closed when you went
15. You are not aware of it
16. Other (specify below)

32. **If no. 31 above includes 16:** Other reason, please specify. Phrase: _____

33. How important is it for you to receive COVID-19 vaccination?

1. Very important for me to receive it
2. Important for me to receive it
3. Not sure about it
4. Not important for me to receive it
5. Not important at all for me to receive it

34. How fearful are you that you may have severe or very serious side-effect if you receive COVID-19 vaccination?

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

35. What protection will COVID-19 vaccination give you if you receive it?

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. Not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

36. How do you trust the health workers who give COVID-19 vaccination?

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

37. How do you trust the federal and state governments who made the COVID-19 vaccination available for people to receive?

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

38. Do you intend (or plan) to receive COVID-19 vaccination that is available for you to receive?

1. Yes, you will surely go and receive the vaccination
2. Yes, you think you will go and receive the vaccination
3. Not sure about it
4. No, you think you will not go and receive the vaccination
5. No, you will surely not go and receive the vaccination

NOTE: If 3 or 4 or 5: Skip to no. 40

39. **If no. 38 above is 1 or 2:** How many DAYS or WEEKS or MONTHS or YEARS will it take before you go and receive the COVID-19 vaccination? Number plus Word: _____

40. **If no. 38 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) to receive COVID-19 vaccination? **NOTE: Select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or I want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. Other reason (specify below)

41. **If no. 40 above includes 8:** Other reason, please specify. Phrase: _____

COVID-19 Experiences and Perceptions

NOTE: No. 42–53 is for those who have received COVID-19 vaccination:

NOTE: No. 42–53 is about your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:

42. How fearful were you about getting COVID-19?

1. You were very fearful
2. You were a little fearful
3. Not sure about it
4. You were not fearful
5. You were not fearful at all

43. Was it possible for someone like you to get COVID-19?

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

44. Was it possible for someone like you to get severe or very serious COVID-19?

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

45. Did you ever have COVID-19 before you received the vaccination?

1. Yes, you were sure
2. Yes, you thought so
3. Not sure about it
4. No, you thought so
5. No, you were sure

46. **If no. 45 above is 1 or 2:** Did you ever have severe or very serious COVID-19 before you received the vaccination?

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious

5. No, it was not serious at all

47. Did you know any person who had COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

48. **If no. 47 above is 1 or 2 or 3 or 4:** Did you know any person who had severe or very serious COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

49. **If no. 47 above is 1 or 2 or 3 or 4:** Did you know any person who died from COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

50. What were your sources of information about COVID-19? **NOTE: Select all that apply:**

1. Family members/Relatives/Friends
2. Other health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media
8. Internet sites
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc) — Internet, social media, & SMS
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

51. **If no. 50 above includes 12:** Please specify the other source. Word or Phrase: _____

52. **If more than one sources given in no. 50 above:** Which of the sources was your main source?

53. **If more than one sources given in no. 50 above:** Which of the sources did you trust most?

NOTE: No. 54–65 is for those who have not received COVID-19 vaccination:

54. How fearful are you about getting COVID-19?

1. Very fearful
2. A little fearful
3. Not sure about it
4. Not fearful
5. Not fearful at all

55. Is it possible for someone like you to get COVID-19?

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

56. Is it possible for someone like you to get severe or very serious COVID-19?

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

57. Have you ever had COVID-19?

1. Yes, you are sure
2. Yes, you think so
3. Not sure about it
4. No, you think so
5. No, you are sure

58. **If no. 57 above is 1 or 2:** Have you ever had severe or very serious COVID-19?

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it

4. No, it was not serious
5. No, it was not serious at all

59. Do you know any person who have had COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

60. **If no. 59 above is 1 or 2 or 3 or 4:** Do you know any person who have had severe or very serious COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

61. **If no 59 above is 1 or 2 or 3 or 4:** Do you know any persons who have died from COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

62. What are your sources of information about COVID-19? **NOTE: Select all that apply:**

1. Family members/Relatives/Friends
2. Other health workers — Interpersonal
3. Television
4. Radio
5. Prints (Newspaper/Magazine) — Traditional media
6. WhatsApp
7. Facebook
8. Internet sites — Internet and social media
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc) — Internet, social media, & SMS
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

63. **If no. 62 above includes 12:** Please specify the other source. Word or Phrase: _____

64. **If more than one sources given in no. 62 above:** Which of the sources is your main source?

65. **If more than one sources given in no. 62 above:** Which of the sources do you trust most?

Basic Knowledge of COVID-19

66. What is COVID-19?

1. A new type of coronavirus disease
2. An old type of coronavirus disease
99. Do not know

67. How do people get COVID-19?

1. By staying close to infected persons when they cough or sneezes
2. From bat
3. From rat
4. From spiritual attack
5. Other (specify below)
99. Do not know

68. **If no. 67 above is 5:** Please specify how people get COVID-19. Word or Phrase: _____

69. When somebody gets COVID-19, how long does it usually take before the person starts to show symptoms?

1. 2–14 days (within 2 weeks)
2. 2–4 weeks
3. >4 weeks
99. Do not know

70. What are the symptoms of COVID-19? **NOTE: Select all that apply:**

1. Fever
2. Cough
3. Tiredness
4. Body aches and pains
5. Sore throat
6. Difficulty breathing or shortness of breath
7. Chest pain
8. Headache

9. Loss of taste or smell
10. Diarrhoea
11. Nausea or vomiting
12. other (specify below)
99. Do not know

71. **If no. 70 above includes 12:** Please specify the other symptom. Word or Phrase:_____

72. Can people also have COVID-19 without showing any symptoms?

1. Yes
2. No
99. Do Not Know

73. Who are more at risk of having severe COVID-19? **NOTE: Select all that apply:**

1. Children
2. Younger adults
3. Elderly people
4. Slim people
5. Obese people
6. People with chronic illness
7. People who smoke
8. Pregnant women
99. Do not know

74. Is there a laboratory test to diagnose COVID-19?

1. Yes
2. No
99. Do not know**. If 2 OR 99: Skip to 77**

75. Where is laboratory test to diagnose COVID-19 done in Ebonyi state? **NOTE: Select all that apply:**

1. AEFUTHA
2. General hospitals
3. PHC centres
4. Missionary hospitals
5. Private hospitals
6. Private laboratory
7. Other (specify below)
99. Do not know

76. **If no. 75 above includes 7:** Please specify the other place lab test for COVID-19 is done in Ebonyi state. Word or Phrase:_____

77. Are there treatments for COVID-19?

1. Yes
2. No
99. Do Not Know

78. Are there vaccines for COVID-19?

1. Yes
2. No
99. Do Not Know

79. **If no. 78 above is 1:** Do you know any place where one can go and receive COVID-19 vaccination in Ebonyi state?

1. Yes
2. No

80. What are the ways to avoid/prevent getting COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of face mask in public places (especially indoor public places)
4. Frequent hands washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching of face (eyes, nose, & mouth) when one is in public places
7. COVID-19 vaccination
8. Taking chloroquine
9. Use of herbs or roots (“Agbo”)
10. Use of ginger or garlic
11. Taking hot drinks or “ogogoro”
12. Other (specify below)
99. Do Not Know

81. **If no. 80 above includes 12:** Please specify other way. Word or Phrase: _____

Attitude Towards COVID-19 and COVID-19 Vaccination

NOTE: For each of the statements below, take one option whether you: Strongly Disagree, Disagree, Not Sure/Do Not Know, Agree, or Strongly Agree.

82. COVID-19 is real.

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

83. COVID-19 a serious illness that can kill.

84. Everybody is susceptible to COVID-19 infection (Anybody can get COVID-19).

85. The risk of getting COVID-19 can be reduced by avoiding crowd (large group of people).

86. The risk of getting COVID-19 can be reduced by maintaining at least 1–2 metre distance away from people coughing or sneezing

87.The risk of getting COVID-19 can be reduced if everybody covers the mouth and nose (with handkerchief or bent elbow) when coughing or sneezing

88. The risk of getting COVID-19 can be reduced by wearing face mask when going out to public places (especially indoor public places).

89. The risk of getting COVID-19 can be reduced by washing hands with soap and water frequently (e.g before touching the face, before eating).

90. The risk of getting COVID-19 can be reduced by cleaning hands with alcoholic sanitisers frequently.

91. Chloroquine is an effective treatment (prevention) for COVID-19.

92. Herbs and roots (“Agbo”) are effective treatments (prevention) for COVID-19.

93. Ginger and garlic are effective treatments (prevention) for COVID-19.

94. Hot drinks or “ogogoro” are effective treatments (prevention) for COVID-19

95. COVID-19 vaccines are safe for people to receive

96. The risk of COVID-19 can be reduced by receiving COVID-19 vaccination

97. Everybody should receive COVID-19 vaccination that is recommended by the government

Practices about COVID-19

98. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Avoid or Prevent transmission of COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was ever practiced

99. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Avoid or Prevent transmission of COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was practiced in the last two weeks

100. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Treat or Prevent COVID-19? **NOTE: Select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)
3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was ever practiced

101. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Treat or Prevent COVID-19? **NOTE: Select all that apply:**

1. Taking chloroquine
2. Using herbs or roots ("Agbo")
3. Using ginger or garlic
4. Using hot drinks or "ogogoro"
5. None of the above was practiced in the last two weeks

FGD Guide for FGD with Community Members

Q1. What is COVID-19?

Prompts:

1. Is COVID-19 real or not?
2. Is COVID-19 a new disease or an old disease?
3. Is COVID-19 a serious disease that can kill?

Probe: their views on cause, transmission, symptoms, diagnosis, treatment, and prevention of COVID-19

Prompt: Are there vaccines for COVID-19?

Q2. What are your views about COVID-19 vaccine/vaccination and the vaccination process?

Probe: safety, effectiveness, universal COVID-19 vaccination, and vaccination process

Q3. Some people have received COVID-19 vaccination but others have not received. What are the things that make people to receive or not to received COVID-19 vaccination?

Prompt: Why have some people not received COVID-19 vaccination?

Why have some people not received COVID-19 vaccination that *is available close to them?*

Q4. Among the people that currently have not received COVID-19 vaccination, some intend or plan to receive it but others do not intend or plan to receive it.

What are the things that make people to plan to receive or to plan not to received COVID-19 vaccination?

Prompt: Why do some people say they will not receive COVID-19 vaccination?

Q5. Among the people that say they will receive COVID-19 vaccination, some say they will go and receive it after some days, some say after some weeks, some say after some months, others say after some years.

What are the things that determines how long it takes before people go and receive COVID-19 vaccination?

Prompt: What will make some people go and receive the COVID-19 vaccination earlier and others to go later?

Q6. What do you think should be done so that people who have not received COVID-19 vaccination will go and receive or start planning to receive it?

Prompt: How can people be made to accept COVID-19 vaccination? Probe: Role of government, health workers etc.

Thank you very much for your time and views.

FGD Guide for FGD with Health Workers

Q1. What is COVID-19?

Prompts:

1. Is COVID-19 real or not?
2. Is COVID-19 a new disease or an old disease?
3. Is COVID-19 a serious disease that can kill?

Probe: their views on cause, transmission, symptoms, diagnosis, treatment, and prevention of COVID-19

Prompt: Are there vaccines for COVID-19?

Q2. What are your views about COVID-19 vaccine/vaccination and the vaccination process?

Probe: safety, effectiveness, universal COVID-19 vaccination, and vaccination process

Q3. Some health workers have received COVID-19 vaccination but others have not received. What are the things that make health workers to receive or not to received COVID-19 vaccination?

Prompt: Why have some health workers not received COVID-19 vaccination?

Why have some health workers not received COVID-19 vaccination that is *available close to them?*

Q4. Among the health workers that currently have not received COVID-19 vaccination, some intend or plan to receive it but others do not intend or plan to receive it.

What are the things that make health workers to plan to receive or to plan not to received COVID-19 vaccination?

Prompt: Why do some health workers say they will not receive COVID-19 vaccination?

Q5. Among the health workers that say they will receive COVID-19 vaccination, some say they will go and receive it after some days, some say after some weeks, some say after some months, others say after some years.

What are the things that determines how long it takes before health workers go and receive COVID-19 vaccination?

Prompt: What will make some health workers go and receive the COVID-19 vaccination earlier and others to go later?

Q6. What do you think should be done so that health workers who have not received COVID-19 vaccination will go and receive or start planning to receive it?

Prompt: How can health workers be made to accept COVID-19 vaccination? Probe: Role of government, other health workers etc.

Thank you very much for your time and views.

BMJ Open

COVID-19 vaccination acceptance among community members and health workers in Ebonyi state, Nigeria: study protocol for a concurrent-independent mixed method analyses of intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination and the determinants

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Abstract

Introduction The coronavirus disease 2019 (COVID-19) pandemic has gravely affected the lives and economies of the global population including Nigeria. The attainment of herd immunity through mass COVID-19 vaccination is the foremost control strategy, however, the deployments of COVID-19 vaccinations are facing challenges of non-acceptance. Despite the efforts of the Nigerian government and COVAX facility in making COVID-19 vaccination more available/accessible, the vaccination rate remains unexpectedly very low in Nigeria/Ebonyi state. It is thus important to investigate the acceptability of COVID-19 vaccination to elucidate the explanations for the very low coverage rate. This study aims to evaluate/explore COVID-19 vaccination acceptance and the determinants among community members and health workers in Ebonyi state, Nigeria.

Methods and analyses The study is an analytical cross-sectional survey with a concurrent-independent mixed method design. Quantitative data will be collected from all consenting/assenting community members aged 15 years and above, in 28 randomly selected geographical clusters, through structured interviewer-administered questionnaire household survey using KoBoCollect installed in android devices. Quantitative data will be collected from all consenting health workers, selected via convenience and snowball techniques, through structured self-administered questionnaire survey distributed via WhatsApp and interviewer-administered survey using KoBoCollect installed in android devices. Qualitative data will be collected from purposively selected community members and health workers through focus group discussions. Quantitative analyses will involve descriptive statistics, generalized estimating equations (for community members data), and generalized linear model (for health workers data). Qualitative analyses will employ the thematic approach.

Ethics and dissemination Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital Abakaliki (14/12/2021-17/02/2022) and verbal consent will be obtained from participants. Study findings will be reported at local, national, and international levels as appropriate.

Trial registration number ISRCTN16735844

Strengths and limitations of this study

- Our study will be the first geographical-community based study, using mixed method approach, to investigate COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) in the context where there is very low vaccination rate despite relative vaccine availability and public access to vaccination.
- The study will be implemented after prospective registration with ISRCTN and based on available/accessible or disseminated protocol.
- The study is prone to reporting bias due to the questionnaire-based data collection method. The convenience and snowballing sampling will make the health worker survey prone to selection bias.

Introduction

Coronavirus disease 2019 (COVID-19), a severe acute respiratory syndrome disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged by the end of 2019 and became a pandemic. By 7th August, 2022, the COVID-19 pandemic had affected more than 581 million persons and had resulted in the death of over 6.4 million persons globally with more than 9.2 million cases and over 174000 deaths in Africa.[1] By 10th August, 2022, the total number of recorded confirmed cases of COVID-19 and COVID-19 related deaths were respectively 262402 and 3147 in Nigeria and 2064 and 32 in Ebonyi state.[2] The pandemic has overstretched the capacity of many countries' health care delivery and disrupted the global economy due to lockdown measures.[3–7]

Amongst the available control measures, perhaps the most cost-effective and sustainable control strategy is mass COVID-19 vaccination (with safe and effective vaccines). COVID-19 vaccination reduces the incidence, severity, and death from COVID-19,[8–11] and is perhaps the foremost means of achieving herd immunity especially when all population groups including adults and children are vaccinated[9–14] because both adults and children are susceptible to COVID-19 infection.[15–17] However, the deployments of COVID-19 vaccinations are facing some challenges such as non-acceptance and misinformation propagated by anti-vaccine campaigners. Refusal and/or delay in accepting vaccinations (vaccine hesitancy) has become a major public health challenge over the past decade[18,19] and was noted as one of the top ten threats to global health in 2019.[20] Moreover, the unprecedented disruptive impact of the pandemic with the associated conspiracy theories being propagated in conventional and social media and the unprecedented rapid development and introduction of COVID-19 vaccines have generated an atmosphere of uncertainty and confusion which have further limited the acceptance of COVID-19 vaccination.[21–23]

COVID-19 vaccination started in March, 2021 in Nigeria under the COVAX initiative.[24,25] Although the Nigerian government, with the support of the COVAX facility, is scaling up the availability/access to COVID-19 vaccination, the coverage rate is still very low in Nigeria, including Ebonyi state and Nigeria was not among the only five countries in Africa expected to meet the target of about 40% COVID-19 vaccination coverage by end of 2021.[26] As of 26th January, 2022 (before this study was implemented), only about 4.6% of eligible Nigerians had received the second dose of COVID-19 vaccination,[27] about 10.5% had received the first dose,[28] and Ebonyi state had about the least coverage rate in Nigeria.[29] As of 11th August, 2022, about 25.2% of eligible Nigerians had received the second dose (fully vaccinated)[30] and about 10.6% had received the first dose (partially vaccinated)[31] and as of 12th August, 2022, Ebonyi state had the second least coverage rate in Nigeria.[32] Moreover, these coverage rates were among the current eligible population of 18 years and above and, the rates among the population at risk, which is what is considered with regards to herd immunity, would be a fraction of the above.

Although the incidence of COVID-19 in Nigeria has been relatively lower compared to many other countries, high acceptance of COVID-19 vaccination among Nigerians is important in order to prevent any possible upsurge of the disease especially due to new strains of the virus. Resurgence of COVID-19 infections and COVID-19 related deaths are common especially among populations with low COVID-19 vaccination coverage.[9–11]

Although the issue of stock-out of COVID-19 vaccines and vaccination syringes cannot be ignored in Nigeria and other African countries,[26] the slow pace of coverage may be partly due to non-acceptance/hesitancy among the populace and health workers as we have observed anecdotally in Ebonyi state. However, to our knowledge, the extent of COVID-19 vaccination acceptance and the determinants among community members and health workers, as well as the degree to which the very low COVID-19 vaccination coverage is explained by non-

acceptance as against non-availability/non-access, have not been rigorously investigated especially in Nigeria and particularly in Ebonyi state. Such investigation has become more imperative since the introduction and scale up of COVID-19 vaccination across Nigeria. The understanding of context-specific determinants of vaccination acceptance is a necessary strategy in addressing the problem of non-acceptance of new vaccines such as the current COVID-19 vaccines.[33]

COVID-19 vaccination intentions among populations were assessed at the early phase of the pandemic by studies across the world[12–14,34–63] and in Nigeria (mostly based on social media platforms and among health workers)[64–70] during the development/clinical trial stage of COVID-19 vaccines. Few studies were done at the early stage of the introduction and deployment of COVID-19 vaccination.[71,72] However, these studies were done when COVID-19 vaccination had not been introduced for public use or was just being introduced. Thus, the perceptions of vaccination-related attributes such as importance, safety or side-effects, and effectiveness were perhaps largely distal. Moreover, the findings of those studies might markedly vary from that of studies conducted in situations where COVID-19 vaccination is readily/relatively available/accessible and there are close/real experiences/perceptions of vaccination activities and vaccination-related adverse events. Also, since the implementation of COVID-19 vaccination in Nigeria, the amplification of reports of serious side-effects and deaths following vaccination is common in the social and conventional media and on the grapevine.

Moreover, decline in the intention to receive COVID-19 vaccination after the vaccine became available has been reported across countries.[73] Anecdotal evidence shows that the initial waves of fear of COVID-19 among the people, including health workers, has markedly waned overtime especially in Ebonyi state and Nigeria as a whole where the pandemic has been much less severe compared to some other climes. As a result, it is not surprising that COVID-19

vaccination uptake is reportedly very low and more importantly, the drive to scale up the availability and uptake of COVID-19 vaccination may be up against an unexpected bottle-neck if there is hesitancy or no intention to receive the vaccination among the people.

Only few studies have assessed the uptake of actual COVID-19 vaccination among the general adult population[55,74,75] and among health workers[76–79] but most were among sub-populations and when the vaccination was still relatively less available and accessible.

This study aims to evaluate and explore COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy) and the determinants among community members and health workers in Ebonyi state, Nigeria, in order to generate evidence to inform policy interventions and strategies on optimal COVID-19 vaccination acceptance and coverage.

Study objectives

The primary objectives are to evaluate and explore the following among community members and health workers in Ebonyi state, Nigeria:

1. The intention to receive COVID-19 vaccination and the determinants

2. Timeliness of the intention to receive COVID-19 vaccination and the determinants

3. The uptake of COVID-19 vaccination and the determinants

4. The hesitancy to COVID-19 vaccination and the determinants

5. The predictive power of acceptance factor compared with availability/access factor regarding the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

The secondary objectives are to evaluate and explore the following among community members and health workers in Ebonyi state, Nigeria:

1. The COVID-19 experiences and perceptions and their determinants

2. The COVID-19 vaccination expectations and perceptions and their determinants

3. The COVID-19 vaccination process experiences and perceptions (availability/access factor) and their determinants

4. The knowledge, attitude, and practices about COVID-19 and their determinants

5. The sources of information about COVID-19 and their determinants

6. The perceptions about COVID-19, COVID-19 vaccine/vaccination, and COVID-19 vaccination process

Study hypotheses

The primary hypotheses include:

1. Strong COVID-19 experience and perception increases COVID-19 vaccination acceptance (increases the intention to receive, timeliness of the intention to receive, and uptake and reduces hesitancy) compared with not strong COVID-19 experience and perception

2. Increase in COVID-19 experiences and perceptions score increases COVID-19 vaccination acceptance

3. Good COVID-19 vaccination expectation and perception increases COVID-19 vaccination acceptance compared with poor COVID-19 vaccination expectation and perception

4. Increase in COVID-19 vaccination expectations and perceptions score increases COVID-19 vaccination acceptance

5. Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)) is significantly associated with COVID-19 vaccination acceptance

6. Positive COVID-19 vaccination process experience and perception (positive availability/access factor) increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with negative COVID-19 vaccination process experience and perception (negative availability/access factor)

7. Increase in COVID-19 vaccination process experiences and perceptions score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

8. Acceptance-availability/access factor is significantly associated with the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination

9. Increase in acceptance factor score increases the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination compared with increase in availability/access factor score

10. The positive categories of COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions respectively increase COVID-19 vaccination acceptance compared with the negative categories (as depicted in table 1)

The secondary hypotheses include:

11. Knowledge, attitude, and practices about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19

vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions

12. Sources of information about COVID-19 are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; and knowledge, attitude, and practices about COVID-19

13. Sociodemographic characteristics are significantly associated with: COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

14. Professional or work-related attributes of health workers are significantly associated with: COVID-19 vaccination acceptance, COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19

The hypothesized relationships between the independent factors and the outcome measures are shown in the study's conceptual framework in figure 1. The conceptual framework was designed based on the study hypotheses which were informed by published data on COVID-19 and COVID-19 vaccination and the "3Cs" Vaccine Hesitancy Model by The SAGE Working Group on Vaccine Hesitancy.[18]

In the conceptual framework (figure 1), strong COVID-19 experience and perception (compared with not strong experience and perception), increase in COVID-19 experiences and

perceptions score, and the positive categories of COVID-19 experiences and perceptions (compared with the negative categories) are expected to be associated with decrease in complacency about COVID-19 vaccination which will result in increase in the intention to receive, timeliness of the intention to receive, and uptake and decrease in hesitancy to COVID-19 vaccination (increase in COVID-19 vaccination acceptance). Likewise, good COVID-19 vaccination expectation and perception (compared with poor expectation and perception), increase in COVID-19 vaccination expectations and perceptions score, and the positive categories of COVID-19 vaccination expectations and perceptions (compared with the negative categories) are expected to be associated with increase in confidence in COVID-19 vaccination which will lead to increase in COVID-19 vaccination acceptance.

Positive COVID-19 vaccination process experience and perception (compared with negative experience and perception), increase in COVID-19 vaccination process experiences and perceptions score, and the positive categories of COVID-19 vaccination process experiences and perceptions (compared with the negative categories) are expected to be associated with increase in convenience in COVID-19 vaccination and then increase in the intention to receive, timeliness of the intention to receive, and uptake of COVID-19 vaccination. Acceptance factor is expected to be associated with increase in COVID-19 vaccination acceptance compared with availability/access factor.

As depicted in the conceptual framework (figure 1), knowledge, attitude, and practice about COVID-19; sources of information about COVID-19; sociodemographic characteristics; and professional or work-related attributes are expected to be associated with decrease in complacency, increase in confidence, and increase in convenience in COVID-19 vaccination and then increase in COVID-19 vaccination acceptance. These background characteristics are also expected to be associated with COVID-19 experiences and perceptions, COVID-19

vaccination expectations and perceptions, and COVID-19 vaccination process experiences and perceptions (figure 1).

Methods and analyses

Design

The study is an analytical cross-sectional survey with a concurrent-independent mixed data collection and data analysis and interpretation method. In this design, the quantitative and qualitative aspects of the study will be implemented simultaneously and independently of each other.[80] The study protocol development was guided by the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 checklist and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) 2007 checklist for cross-sectional studies.

Study area

The study is planned to be implemented between March and April, 2022, in Ebonyi state which is located in south-eastern geopolitical zone of Nigeria with land area of 5,953 sq. km. The population of the state was projected to be 3,313,229 in 2021 based on the 2006 national census figure and a growth rate of 2.8% and christianity is the most practiced religion. Ebonyi state has 13 Local Government Areas (LGAs) including the state capital (Abakaliki LGA) and 171 political wards.[81] Each LGA is made up of political wards and autonomous communities. Each autonomous community is made up of larger villages called autonomous villages which consist of smaller villages or settlements. Each village/settlement has a head or traditional leader. Most parts of Ebonyi state are rural and there are only six towns (urban or semi-urban areas), five of which are LGAs capitals with the adjoining areas.[82]

The federal ministry of health (FMOH) and its agencies provide the overarching guidance and policy framework for public and private health service delivery in all states in Nigeria including Ebonyi state. The FMOH provides health services in the state through tertiary health facilities while the state ministry of health (SMOH) provides health service through secondary health facilities (general hospitals). The SMOH and the state primary health care development agency (SPHCDA) provide health care in the local governments through primary health care (PHC) facilities. There is at least one PHC centre in each political ward. The national primary health care development agency (NPHCDA) provides policy guidance and coordination for immunisation/vaccination services in all states in Nigeria including Ebonyi state. The NPHCDA provides vaccines and related products while the SMOH and SPHCDA coordinates the implementation of immunisation/vaccination service delivery in the state (and LGAs) through the tertiary, secondary, and primary health care (PHC) facilities.

Participants

The participants include clusters, the community members within clusters, and health workers in Ebonyi state. A cluster in this study is a geographical community (village(s)/settlement(s)) which is the immediate catchment area of a PHC centre. Eligible clusters for inclusion in the study are those with at least 200 households or a population of 1000 people, whose PHC centres are providing basic maternal and child health care services including routine childhood immunisation, that can be easily accessed with a car, and where the cluster heads give verbal consent/permission. In each of the selected clusters, community members aged 15 years and above who give verbal consent/assent will be eligible to participate in a population-based household survey. Health workers (both clinical and non-clinical staff) in public and private health care sectors, including the patent medicine vendors (PMVs), who work or live in Ebonyi state and give verbal consent will be eligible to participate in a health worker survey. Community members aged 15 years and above who have resided in the community for at least

one year and who give verbal consent/assent will be eligible to participate in community-based focus group discussions (FGDs) while health workers (both clinical and non-clinical staff) who work or live in Ebonyi state, have at least one year of working experience, and give verbal consent will be eligible to participate in health worker-based FGDs.

Independent factors and outcome measures

Independent factors, categories, scoring, and grading

The independent factors among community members and health workers (see table 1) are almost the same with few differences which include: occupation, monthly income, and residence among the community members; and professional or work category/cadre, years of working experience, and level of work among the health workers.

The independent factors are listed under seven headings labelled A–I: COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions (availability/access factor); Acceptance factor (COVID-19 risk-COVID-19 vaccination benefit perception); Acceptance-availability/access factor; Knowledge, attitude, and practice about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; and Professional or work-related attributes. These three factors – COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; and COVID-19 vaccination process experiences and perceptions – will be respectively measured using eight, five, and five questionnaire items each having five categories grouped into positive and negative and scored from 0–4 as depicted in table 1.

The scoring will create three new continuous variables including COVID-19 experiences and perceptions score (ranging from 0–32 for each participant); COVID-19 vaccination expectations and perceptions score (ranging from 0–20); and COVID-19 vaccination process

Table 1: Independent factors and their categories and category scores and grading among community members and health workers

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
A	COVID-19 experiences and perceptions					
1.	How fearful are you about getting COVID-19?	Very fearful (4)	A little fearful (3)	Not sure (2)	Not fearful (1)	Not fearful at all (0)
2.	How possible is it for you to get COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
3.	How possible is it for you to get severe COVID-19?	Highly possible (4)	A bit possible (3)	Not sure (2)	Not possible (1)	Not possible at all (0)
4.	Have you ever had COVID-19?	Yes, surely (4)	Yes, think so (3)	Not sure (2)	No, think so (1)	No, surely (0)
5.	Have you ever had severe COVID-19?	Yes, very serious (4)	Yes, a bit serious (3)	Not sure (2)	No, not serious (1)	No, not serious at all (0)
6.	Do you know any person who have had COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
7.	Do you know any person who have had severe COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
8.	Do you know any person who have died from COVID-19?	A very close person (4)	A close person (3)	A distant person (2)	A very distant person (1)	No person (0)
	Total	(32^{H})	–	–	–	(0^{L})
9.	COVID-19 experiences and perceptions score					
10.	Extent of COVID-19 experience and perception (COVID-19 risk perception)[A]	Strong experience and perception (high risk perception)	–	–	–	Not strong experience and perception (low risk perception)
B	COVID-19 vaccination expectations and perceptions					
11.	How important is it for you to receive COVID-19 vaccination?	Very important (4)	Important (3)	Not sure (2)	Not important (1)	Not important at all (0)
12.	How fearful are you about having severe side-effect from COVID-19 vaccination?	Not fearful at all (4)	Not fearful (3)	Not sure (2)	A little fearful (1)	Very fearful (0)
13.	What protection against COVID-19 will you get from receiving COVID-19 vaccination?	Full protection (4)	Partial protection (3)	Not sure (2)	No protection (1)	No protection at all (0)
14.	How do you trust the health workers who give COVID-19 vaccination?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
15.	How do you trust the government who made COVID-19 vaccination available?	Trust them very much (4)	Trust them (3)	Not sure (2)	Do not trust them (1)	Do not trust them at all (0)
	Total	(20^{HH})	–	–	–	(0^{LL})
16.	COVID-19 vaccination expectations and perceptions score					
17.	COVID-19 vaccination expectation and perception level (COVID-19 vaccination benefit perception) [B]	Good expectation and perception (high benefit perception)	–	–	–	Poor expectation and perception (low benefit perception)
C	COVID-19 vaccination process experiences and perceptions (availability/access factor)					
18.	Ever heard about COVID-19 vaccination?	Many times (4)	Once/few times (3)	Not sure (2)	No time (1)	No time at all (0)
19.	Know a COVID-19 vaccination place?	A very close place (4)	A close place (3)	A far place (2)	A very far place (1)	No place (0)
20.	Frequency of COVID-19 vaccination at the vaccination place?	Daily, down to twice a week (4)	Once a weekly (3)	Once in two-four weeks (2)	No fixed time (1)	Do not know (0)
21.	Queue at the vaccination place?	No queue (4)	Short queue (3)	Do not know (2)	Long queue (1)	Very long queue (0)
22.	How caring are the health workers at the vaccination place?	Very caring (4)	Caring (3)	Not sure (2)	Not caring (1)	Not caring at all (0)
	Total	(20^{HHH})				(0^{LLL})
23.	COVID-19 vaccination process experiences & perceptions score (availability/access factor score)					
24.	COVID-19 vaccination process experience and perception level (availability/access factor level)[C]	Positive experience & perception (availability & access factor)	–	–	–	Negative experience & perception (availability & access factor)
D	Acceptance factor level	Defined as COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level. Categories: High disease risk-high remedy benefit perception or high-high DR-RB perception, high-low DR-RB perception, low-high DR-RB perception, and low-low DR-RB perception				
25.	Acceptance factor score	Defined as COVID-19 risk perception score plus COVID-19 vaccination benefit perceptions score or DR-RB perception score				
26.	Acceptance-availability/access factor level	High-high-positive, High-high-negative, High-low-positive, High-low-negative, low-high-positive, low-high-negative, low-low-positive, low-low-negative				
27.						

Table 1: Continued

	Independent factors	Categories (Scores)				
		Positive category		Negative category		
F	Knowledge, Attitude, and Practice					
28.	Knowledge score					
29.	Level of knowledge of COVID-19 [D]	Good knowledge	–	–	–	Poor knowledge
30.	Attitude score					
31.	Level of attitude towards COVID-19 & COVID-19 vaccination[E]	Good attitude	–	–	–	Poor attitude
32.	Practice score					
33.	Level of practices about COVID-19[F]	Good practice	–	–	–	Poor practice
G	Source of information about COVID-19	Interpersonal (Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums); Traditional media (Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS (WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages)				
34.	Main source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
35.	Most trusted source of information	Interpersonal; Traditional media; Internet, social media, & SMS				
H	Sociodemographic characteristics					
36.	Gender	Male, Female				
37.	Age					
38.	Marital status	Married, Divorced, Separated, Widowed, Never married (single)				
39.	Educational level	No formal education, Some primary, Completed primary, Some secondary, Completed secondary, Tertiary (diploma, first degree, masters/PHD/other equivalent)				
40.	Occupation*	Farmer, Trader, Other-self-employment, Private paid work, Government paid work, Housewife, Student, Apprentice, Youth service (Corper), None				
41.	Residence*	Rural, Semi-urban/Urban				
42.	Usual monthly income (NGN) & income score	Income categories: "no income" up to "more than 300,000" with interval of 20,000, giving 18 categories. "no income" is scored "one" & the score increases by "one" for each higher category up to the highest score of 17				
	Professional or work-related attributes^					
43.	Professional cadre or work category	non-Clinical staff, Clinical staff (PMV, health attendant, JCHEW, CHEW, CHO, nurse/midwife, medical laboratory scientist, medical laboratory technologist, pharmacist, pharmacy technician, house officer, medical officer, medical doctor in specialist training, specialist medical doctor)				
44.	Years of working experience					
45	Primary place of work	Public and private				
46.	Level of primary place of work	Primary health care level (facility), Secondary health care level (facility), and Tertiary health care level (facility)				

[H]Highest attainable COVID-19 experiences and perceptions score for each participant ([L]Lowest attainable score). [A]COVID-19 experiences and perceptions score of >=50% of the highest attainable score of 32 is strong experience and perception, <50% is not strong experience and perception. [HH]Highest attainable COVID-19 vaccination expectations and perceptions score for each participant ([LL]Lowest attainable score). [B]COVID-19 vaccination expectations and perceptions score of >=50% of the highest attainable score of 20 is good expectation and perception, <50% is poor expectation and perception. [HHH]Highest attainable COVID-19 vaccination process experiences and perceptions score ([LLL]Lowest attainable score). [C]COVID-19 vaccination process experiences and perceptions score of >=50% of the highest attainable score of 20 is positive experience and perception, <50% is negative experience and perception. [D]Knowledge score of >=75% of the highest attainable score of 44 is good knowledge, <75% is poor knowledge (lowest attainable score is 0) (44 knowledge items scored "1" for each correct response and "0" for each incorrect response). [E]Attitude score of >=75% of the highest attainable score of 80 is good attitude, <75% is poor attitude (lowest attainable score is 16) (each of 16 attitude items respectively scored from "1" to "5" or "5" to "1" as appropriate for "strongly disagree", "disagree", "not sure", "agree", & "strongly agree"). [F]Practice score of >=75% of the highest attainable score of 24 is good practice, <75% is poor practice (lowest attainable score is 0) (24 practice items scored "1" for each correct response and "0" for each incorrect response). *Among only community members. ^Among only health workers. PMV=Patent Medicine Vendor. JCHEW=Junior Community Health Extension Worker. CHEW=Community Health Extension Worker. CHO=Community Health Officer.

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332 experiences and perceptions score (ranging from 0–20). These continuous variables will then
333 be graded on a two-level scale such that scores >=50% of the total versus <50% will
334 respectively be considered to be: strong versus not strong COVID-19 experience and
335 perception; good versus poor COVID-19 vaccination expectation and perception; and positive
336 versus negative COVID-19 vaccination process experience and perception.

Acceptance factor will be created as the combination of COVID-19 experiences and perceptions plus COVID-19 vaccination expectations and perceptions and defined as COVID-19 risk-COVID-19 vaccination benefit perception (disease risk-remedy benefit perception (DR-RB/DRRB perception)). Acceptance factor will be in contrast to availability/access factor (COVID-19 vaccination process experience and perception). Acceptance-availability/access factor will be created as the combination of acceptance and availability/access factors. Acceptance factor score (ranging from 0–52 for each participant as the sum of disease-risk perception score (0–32) and remedy-benefit perception score (0–20)) and availability/access factor score (ranging from 0–20) will be converted to percentages of the maximum attainable score for each participant so that the power of acceptance factor and availability/access factor in predicting COVID-19 vaccination acceptance can be compared by comparing how unit increase in the percentage scores (percentage point increase) affect COVID-19 vaccination acceptance. The predictive power of disease-risk perception and remedy-benefit perception will also be compared using similar technique.

Basic knowledge, attitude, and practices about COVID-19 will be assessed, scored, and categorised as stated in the legend of table 1.

Outcome measures

The outcome measures are as defined in table 2. The primary outcomes among community members and health workers include the intention to receive, timeliness of the intention to receive, uptake, and hesitancy to COVID-19 vaccination. Hesitancy was conceptualized as: non-receipt of a vaccination that is really available and accessible and perceived to be available and accessible because one did not want to receive it and either intends to receive it at a later time (delay) or intends not to receive it at a later time (refusal).

Table 2: Outcome measures and their definitions		
SN	**Primary Outcomes**	**Definitions**
	Among community members	
1.	The intention to receive COVID-19 vaccination	The proportion of community members aged 15 years and above, who have not received COVID-19 vaccination, who intend (or plan) to receive COVID-19 vaccination that is available for them to receive. The component outcomes are those who will surely go and receive and those who think they will go and receive the vaccination. This outcome is in contrast to those who do not intend (or plan) to receive COVID-19 vaccination that is available for them to receive – consisting of those who are not sure, those who think they will not go and receive, and those who will surely not go and receive the vaccination.
2.	Timeliness of the intention to receive COVID-19 vaccination	The time (in days) that community members aged 15 years and above, who intend (or plan) to receive COVID-19 vaccination, intend (or plan) to take before they go and receive the vaccination. The component outcomes are the intended time to vaccination among those who will surely go and receive and those who think they will go and receive the vaccination.
3.	The uptake of COVID-19 vaccination	The proportion of community members aged 18 years and above who have received COVID-19 vaccination
4.	The hesitancy to COVID-19 vaccination (delay or refusal to receive)	The proportion of community members aged 18 years and above who have not received COVID-19 vaccination due to reasons that include only non-acceptance factor rather than only real/perceived non-availability/non-access factor or both non-acceptance and real/perceived non-availability/non-access factors. Non-acceptance factor is defined as consisting of one or more of: perceptions that the vaccination is not important, vaccine is not safe, vaccine is not effective, vaccine is new and/or waiting for others to take it first, and hearing of many bad stories about the vaccine. Real/perceived non-availability/non-access factor is defined as consisting of one or more of: ignorance of vaccination availability, ignorance of place and/or time of vaccination, long distance to vaccination site, being too busy, being ill and did not go for vaccination, being ill and went for vaccination but was not given, long waiting time, vaccine stock-out, absence of vaccinator, closure of health facility. The non-acceptance and real/perceived non-availability/non-access factors will be measured as the reasons given by respondents regarding why they have not received COVID-19 vaccination. Delay in receiving COVID-19 vaccination is the intention to receive the vaccination among those that are hesitant. Refusal to receive COVID-19 vaccination is the intention not to receive the vaccination among those that are hesitant.
5.	The intention for the children to receive COVID-19 vaccination	The proportion of community members aged 15 years and above who intend (or plan) for their children to receive COVID-19 vaccination if it is available for them to receive. The component outcomes are those who will surely take their children to receive and those who think they will take their children to receive the vaccination. This outcome is in contrast to those who do not intend (or plan) for their children to receive COVID-19 vaccination – consisting of those who are not sure, those who think they will not take their children to receive, and those who will surely not take their children to receive the vaccination
6.	Timeliness of the intention for the children to receive COVID-19 vaccination	The time (in days) that community members aged 15 years and above, who intend (or plan) for their children to receive COVID-19 vaccination, intend (or plan) to take before they take their children to receive the vaccination. The component outcomes are the intended time to vaccination for their children among those who will surely take their children to receive and those who think they will take their children to receive the vaccination
	Among health workers	
7.	The intention to receive COVID-19 vaccination	As for community members above
8.	Timeliness of the intention to receive COVID-19 vaccination	As for community members above
9.	The uptake of COVID-19 vaccination	As for community members above
10.	The hesitancy to COVID-19 vaccination	As for community members above
SN	**Secondary Outcomes**	**Definitions**
	Among community members	
1.	COVID-19 experiences and perceptions	COVID-19 experiences and perceptions score among community members aged 15 years and above
2.		The proportion of community members aged 15 years and above who have strong COVID-19 experience and perception (in contrast to those who have less strong experience and perception)
3.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 experiences and perceptions (in contrast to those who have the negative categories)
4.	COVID-19 vaccination expectations and perceptions	COVID-19 vaccination expectations and perceptions score among community members aged 15 years and above
5.		The proportion of community members aged 15 years and above who have good COVID-19 vaccination expectation and perception (in contrast to those who have poor expectation and perception)
6.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination expectations and perceptions (in contrast to those who have the negative categories)
7.	COVID-19 vaccination process experiences and perceptions	COVID-19 vaccination process experiences and perceptions score among community members aged 15 years and above
8.		The proportion of community members aged 15 years and above who have positive COVID-19 vaccination process experience and perception (in contrast to those who have negative experience and perception)
9.		The proportion of community members aged 15 years and above who have the positive categories of COVID-19 vaccination process experiences and perceptions (in contrast to those who have the negative categories)

Table 2: Continued		
SN	**Secondary Outcomes**	**Definitions**
10.	The knowledge of COVID-19	Knowledge score among community members aged 15 years and above
11.		The proportion of community members aged 15 years and above who have good knowledge of COVID-19 (in contrast to those who have poor knowledge)
12.	The attitude towards COVID-19 and COVID-19 vaccination	Attitude score among community members aged 15 years and above
13.		The proportion of community members aged 15 years and above who have good attitude towards COVID-19 and COVID-19 vaccination (in contrast to those who have poor attitude)
14.	The practices about COVID-19	Practice score among community members aged 15 years and above
15.		The proportion of community members aged 15 years and above who have good practice about COVID-19 (in contrast to those who have poor practice)
16.	The main source of information about COVID-19*	The proportion of community members aged 15 years and above whose main source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS.
17.	The most trusted source of information about COVID-19*	The proportion of community members aged 15 years and above whose most trusted source of information about COVID-19 is interpersonal; traditional media; or Internet, social media, & SMS
	Among health workers	
18.	COVID-19 experiences and perceptions	As for community members above
19.	COVID-19 vaccination expectations and perceptions	As for community members above
20.	COVID-19 vaccination process experiences and perceptions	As for community members above
21.	The knowledge of COVID-19	As for community members above
22.	The attitude towards COVID-19 and COVID-19 vaccination	As for community members above
23.	The practices about COVID-19	As for community members above
24.	The main source of information about COVID-19	As for community members above
25.	The most trusted source of information about COVID-19	As for community members above

*Interpersonal source includes Family members/Relatives/Friends, Other health workers, Place of work, Place of worship/Religious forums; Traditional media source includes Television, Radio, Prints (Newspaper/Magazine)); Internet, social media, & SMS source includes WhatsApp, Facebook, Internet sites, Bulk SMS/Text messages.

Hesitancy to COVID-19 vaccination was measured among the unvaccinated based on the concepts of "non-acceptance factor" and real or perceived "non-availability (non-access) factor" and delay vs refusal was measured based on intention vs non-intention to receive among the unvaccinated (table 2).

The secondary outcomes include COVID-19 experiences and perceptions, COVID-19 vaccination expectations and perceptions, COVID-19 vaccination process experiences and perceptions, knowledge of COVID-19, attitude towards COVID-19 and COVID-19 vaccination, practices about COVID-19, and main source and most trusted source of information about COVID-19 (table 2).

Measurement of independent factors and study outcomes

Quantitative data will be measured through population-based household survey using structured community members questionnaire (supplementary file 1) and health workers survey using structured health workers questionnaire (supplementary file 2). The community members questionnaire and the health workers questionnaire are virtually the same except for the absence of identification section and the professional/work-related attributes in the sociodemographic section of the health worker questionnaire. The questionnaire was designed with the guide of data published by other studies,[12,34,42,47] the Report of the SAGE Working Group on Vaccine Hesitancy,[18] the WHO vaccination coverage questionnaire,[83] and basic facts about COVID-19 on WHO website.[84] The electronic versions of both questionnaires were programmed using the KoBoToolbox software and were pre-tested in non-participating clusters.

The community members questionnaire will be interviewer administered. The interviewers will administer the electronic questionnaire with KoBoCollect installed in their android phones or tablet devices. The interviewers will receive two days training on how to administer the electronic questionnaire. The training will include a detailed review and explanation of the questionnaire items, how to obtain consent from respondents, interview techniques, the translation of key words in the questionnaire to local language, household revisiting techniques, and how to collect data and upload completed forms with KoBoCollect.

During the household survey, all the households will be enumerated and household members aged 15 years and above in households where verbal consent is given by the heads of households will be enlisted and assigned unique numbers on a separate paper form before administering the anonymised electronic questionnaire. To enhance coverage and response, local residents who have good knowledge of the cluster environment will preferably be the

interviewers so that they can visit households when household members are expected to be around and revisit up to three times as necessary. The community members questionnaire has seven sections: Identification (including cluster number, household number, participant number); Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19 (supplementary file 1).

The health worker questionnaire will be both self-administered and interviewer-administered. The web link for the electronic questionnaire will be distributed to health workers via social media platform such as WhatsApp. However, interviewers will administer the health workers questionnaire via KoBoCollect installed in android devices to health workers who do not have online contact and those living in remote areas with poor internet access. The health workers questionnaire has six sections: Sociodemographic characteristics; COVID-19 vaccination acceptance; COVID-19 experiences and perceptions; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; and Practices about COVID-19 (supplementary file 2).

Qualitative data will be measured through focus group discussions (FGDs) with community members and health workers. A total of 20 FGDs with community members will be carried out across 10 clusters with two FGDs (one male-FGD and one female-FGD) per cluster. A total of 14 FGDs with health workers will be conducted, five with non-clinical staff and nine with clinical staff (five at PHC facilities and four at secondary/tertiary health facilities). The investigators will conduct the FGDs using FGD guide (supplementary file 3) prepared in English and pre-tested in non-participating clusters and among some health workers who will later be exempted from the study. The FGD guides (supplementary file 3) contain step-by-step instructions and both open-ended and more targeted questions designed to explore the

participants' perceptions about COVID-19, COVID-19 vaccine/vaccination, COVID-19 vaccination process, and the determinants of COVID-19 vaccination acceptance.

Before commencement of each FGD, the investigators will collect background data of participants including age, sex, marital status, level of education, occupation or cadre, and years of working experience as appropriate. The community members FGDs will be conducted in local language and the health workers FGDs in English. Each FGD will consist of 7–8 participants (comprising a moderator, a note taker, and the respondents) and will last for about 45 minutes. The FGDs will be audio-recorded, the health workers FGDs will be transcribed and community members FGDs will be translated and transcribed verbatim into English.

Data management and quality control

The skip logic and validation criteria in KoBoToolbox software was utilized when programming the electronic questionnaire to enhance the quality of data collection. To minimise the potential bias in assessing the association between COVID-19 and COVID-19 vaccination related experiences and perceptions and uptake of COVID-19 vaccination, the questionnaire items on these factors are subdivided into two subgroups: "have not received COVID-19 vaccination" and "have received COVID-19 vaccination" and the items in each subgroup are framed differently, respectively in present tense versus in past tense. For example, those whose response to a preceding question indicate that they have not received COVID-19 vaccination will subsequently respond to the questions: "How fearful are you that you may have very serious side-effect if you receive COVID-19 vaccination?" "How fearful are you about getting COVID-19?" etc. In contrast, those who have received COVID-19 vaccination will subsequently respond to the questions: "Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination: How fearful were you

that you might have very serious side-effect if you received COVID-19 vaccination?" "How fearful were you about getting COVID-19?"

To enhance the validity of the questionnaires, after the first drafts, there were several rounds of systematic review-discussion-correction-redrafting by the research team. During this iterative process, attention was paid to relevance of the questionnaire items to the study objectives and the logical flow and order, wording, framing, clarity and appropriateness of the questions. The validation process continued until the final version of the questionnaires which were then pre-tested. During the pre-test, respondents' understanding and interpretation of the items and the options, their response time to individual items and time taken to complete a questionnaire were assessed and the completed questionnaires were reviewed for any problems. Minor adjustments were made thereafter.

The household interviewers will upload only completed anonymised questionnaires to the online survey records at the end of each day's survey and the transmitted questionnaires will be reviewed for missing, incoherent, and illogical data. Any identified error will immediately be communicated to the respective interviewers for correction by cross-checking with the respective respondents. The investigators will supervise the household survey interviewers and will revisit at least 20 eligible households per cluster with a specialised form of the survey questionnaire to double check on responses and coverage.

Multiple submissions of the self-administered electronic questionnaire from a health worker on the same device and browser will be prevented by deploying the questionnaire through the online-only (once per respondent) option in KoBoToolbox. However, in any case where a health worker who has completed the questionnaire agrees to give the android phone to any co-worker – who do not have android phone or online address but is willing to participate in the survey – to respond to the questionnaire, a web link for online-only (single submission) will be

sent to such health worker. The data utility in Stata will be used to check for duplicated submissions (observations) and if found, only one will be kept, the duplicates will be deleted from the dataset. Participation of study participants in the FGDs before the questionnaire surveys will be prevented. During the translation and transcribing of the community members FGDs, exact and meaning-based translation will be used. The FGD transcripts will be compared with the original recording to check for 'accuracy' before conducting analyses.

Sample size

Sample size is estimated using Stata/SE version 15·1 (Stata Corp, College Station, TX, USA). For the community members survey, assuming a conservative estimate of 50% for the primary outcome (the proportion of community members who have not received COVID-19 vaccination who intend (or plan) to receive COVID-19 vaccination that is available for them to receive) among the community members who have not strong COVID-19 experience and perception and 56% among those who have strong COVID-19 experience and perception, 80% power at 2.5% probability of type one error (to correct for multiple comparisons),[85] 2630 is the minimum total sample size required to detect the 6%-point difference in this primary outcome between both comparison groups. Allowance for 70% response rate will increase the sample size to 3758. To account for cluster sampling, 3758 is multiplied by a conservative estimate of design effect of 4 to give a final minimum total sample size of 15032. As the clusters that will be selected to participate in the study are those with minimum population size of 1000 per cluster, and with 540 (54%) of the population expectedly falling withing the age group of 15 years and above,[86] the study requires 28 clusters (15032/540) for the community members survey.

Using similar parameters, the health workers survey requires a minimum total sample size of 940 to detect a 10%-point difference in this primary outcome between both comparison groups

(50% versus 60%). Because of the nature of the survey, such as the use of social media platforms for distribution of the (self-administered) questionnaire, the length of the questionnaire, and the sampling technique (convenience and snowball), allowance for 50% acceptance rate to account for both non-response and incomplete response will increase the minimum total sample size for the health worker survey to 1880. Also, due to the nature of the survey, the I880 is perhaps more of the number of health workers that will be targeted for distribution of the questionnaire rather than for selection to participate in the survey.

Sampling technique (Recruitment)

Community members will be selected by stratified cluster sampling technique. The sampling frame will be the list of clusters obtained from the Ebonyi state ministry of health. The eligible clusters will be stratified into two: rural and urban/semi-urban. A random sample of 21 clusters will be selected from the rural stratum and a random sample of 7 clusters will be selected from the urban/semi-urban stratum using the "sample" command in Stata. This will give a 3:1 rural to urban ratio. If verbal consent/permission is not given by any of the selected cluster(s) head(s) before commencement of household survey, replacement cluster(s) will be selected from the remaining list of eligible clusters using the same technique. The study profile is shown in figure 2. In each of the selected clusters, all the households will be enumerated and all individuals aged 15 year and above in each household will be selected for the community members survey. About five to six eligible male and female community members, both those who have received and those who have not received COVID-19 vaccination, in 10 clusters will be selected purposively for FGDs.

Health workers will be selected by convenience and snowballing techniques. To increase acceptance rate, the research team will first make a physical and or phone contact with as many health workers as possible to invite them to participate in the survey and seek their consent and

permission for the web link for the self-administered electronic questionnaire to be sent to them via online platforms. For those who give consent and permission, the address or phone number of their preferred online platform will be recorded and the web link for the questionnaire will be sent to their private online pages. They will be implored to forward the web link to other health workers that they know within the study area after they have completed the questionnaires. The research team will send the web link for the questionnaire to the online contacts (such as WhatsApp phone numbers) of as many eligible health workers as possible, including both private and group pages. Interviewers will also use convenience sampling in administering the health workers questionnaire (via KoBoCollect installed in android devices) to those who do not have online contact and those living in remote areas with poor internet connectivity. About five to six eligible health workers, both those who have received and those who have not receive COVID-19 vaccination, will be selected purposively for FGDs.

Data analyses

Data will be analysed using Stata/SE version 15.1 (Stata Corp, College Station, TX, USA). Analyses of the community members data will be based on population-averaged models that account for clustering. Point estimates of the outcome measures will be computed for each comparison group as defined in the study hypotheses. Each hypothesis with dichotomous or categorical independent factor will be tested by computing prevalence difference (with 97.5% CI and p-values) in binary outcome measure using binomial identity, and mean difference (with 97.5% CI and p-values) in continuous outcome measure using gaussian identity, generalized estimating equations (GEE) with an exchangeable correlation matrix and robust standard errors. Each hypothesis with continuous independent factor will be tested by computing coefficient (with 97.5% CI and p-values) in binary and continuous outcome measures, respectively using the binomial identity and gaussian identity GEE models.

For each independent factor (in a hypothesis) being tested, adjusted analysis will be done by in-putting into the GEE model the other independent factors as appropriate. For clarity, the potential independent factors to control for are presented in table 3. Both unadjusted and adjusted results will be reported. If the binomial identity GEE model fails to run or convergence is not achieved, gaussian identity GEE model, or generalized least square (GLS) random-effects linear regression model (with robust standard errors), or maximum likelihood (ML) random-effects linear regression model will be used instead.[87]

The same analytic technique will be used for the analyses of the health workers data except that generalized linear model (GLM) with robust standard errors will be used in place of GEE model because of the absence of cluster design in the health worker survey.

Summary statistics will be used to assess COVID-19 vaccination acceptance (the intention to receive, timeliness of the intention to receive, uptake, and hesitancy); COVID-19 experiences and perceptions; COVID-19 vaccination expectations and perceptions; COVID-19 vaccination process experiences and perceptions; knowledge, attitude, and practices about COVID-19; and sources of information about COVID-19 among community members and health workers.

The qualitative data (focus group discussion transcripts) will be analysed thematically based on pre-determined themes in the study's conceptual framework. The qualitative data will be analysed, interpreted, and presented independently of the quantitative data.

Ethics and dissemination

Ethical approval for this study was obtained from the Ebonyi State Health Research and Ethics Committee (EBSHREC/15/01/2022-02/01/2023) and Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital Abakaliki (14/12/2021-17/02/2022). The investigators will obtain verbal consent/permission from the heads of the selected clusters.

Table 3: Independent factors to in-put into multivariate models in adjusted analyses		
	Independent factors under test	**Independent factors to control for (as appropriate)**
	Primary hypotheses	
1.	Extent of COVID-19 experience and perception	COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19 (Main source and Most trusted source of information about COVID-19); Sociodemographic characteristics (Gender, Age, Marital status, Educational level, Occupation*, Residence*, Monthly income/income score*); Professional or work-related attributes^ (Work category (clinical and non-clinical), Years of working experience, Primary place of work (public and private), Level of primary place of work (primary, secondary, and tertiary))
2.	COVID-19 experiences and perceptions score	COVID-19 vaccination expectations and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
3.	COVID-19 vaccination expectation and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination process experience and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
4.	COVID-19 vaccination expectations and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination process experiences and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
5.	Acceptance factor level (COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception level)	Availability/access factor level (COVID-19 vaccination process experience and perception level); Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
6.	COVID-19 vaccination process experience and perception level	Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
7.	COVID-19 vaccination process experiences and perceptions score	COVID-19 experiences and perceptions score; COVID-19 vaccination expectations and perceptions score; Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
8.	Acceptance-availability/access factor level	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
9.	Acceptance factor score and availability/access factor score	Basic knowledge of COVID-19; Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
10.	COVID-19 experiences & perceptions[A], COVID-19 vaccination expectations & perceptions[B], COVID-19 vaccination process experiences & perceptions[C]	COVID-19 experiences & perceptions[A], COVID-19 vaccination expectations & perceptions[B], COVID-19 vaccination process experiences & perceptions[C] (as appropriate); Basic knowledge of COVID-19, Attitude towards COVID-19 and COVID-19 vaccination; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^
	Secondary hypotheses	
1.	Knowledge of COVID-19	Attitude towards COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
2.	Attitude towards COVID-19	Knowledge of COVID-19; Practices about COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
3.	Practices about COVID-19	Knowledge of COVID-19; Attitude towards COVID-19; Source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
4.	Main source of information about COVID-19	Most trusted source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
5.	Most trusted source of information about COVID-19	Main source of information about COVID-19; Sociodemographic characteristics; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
6.	A sociodemographic characteristic	Other sociodemographic characteristics; Source of information about COVID-19; Work-related attributes^; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level
7.	A professional or work-related attribute^	Other professional or work-related attributes^; Source of information about COVID-19; Sociodemographic characteristics; Extent of COVID-19 experience and perception; COVID-19 vaccination expectation and perception level; COVID-19 vaccination process experience and perception level

*Among only community members. ^Among only health workers. [A]Fear of getting COVID-19, possible to get (severe) COVID-19, ever had COVID-19, and knowledge of any person who have had COVID-19. [B]Importance of COVID-19 vaccination, fear of having severe side-effect from COVID-19 vaccination, protection from receiving COVID-19 vaccination, trust for the health workers who give COVID-19 vaccination, trust for the government who made COVID-19 vaccination available [C]Ever heard COVID-19 vaccination was available for receipt and knowledge of a COVID-19 vaccination place.

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During the household survey the interviewers will obtain verbal consent from the household members aged 18 years and above and assent from household members aged less than 18 rears (after obtaining consent from the heads of households). The health workers will be informed that only those that give consent should take the online survey. The moderators of the focus group discussions (FGDs) will obtain verbal consent from the respondents before each FGD.

The purpose the study, the kind of participation, likely duration of participation, voluntary nature of participation, absence of potential harm, potential benefit, and confidential nature of the study will be communicated to participants as required. The online record of the anonymised quantitative data will be passworded and the audio recordings and the electronic verbatim transcript of the FGDs will be stored in a passworded computer to prevent unauthorised access.

Study findings will be reported at local, national, and international levels in high impact peer-reviewed journals and conferences as appropriate.

Patients and public involvement

Patients or the public were not involved in the design and reporting or dissemination plans and will not be involved in the conduct of our research.

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Figure legend

Figure 1: Study conceptual framework

Figure 2: Summary of study profile

Supplemental files

Supplementary file 1: COVID-19 Vaccination Questionnaire_Community Members

Supplementary file 2: COVID-19 Vaccination Questionnaire_Health Workers

Supplementary file 3: FGD Guide_Community Members and Health Workers

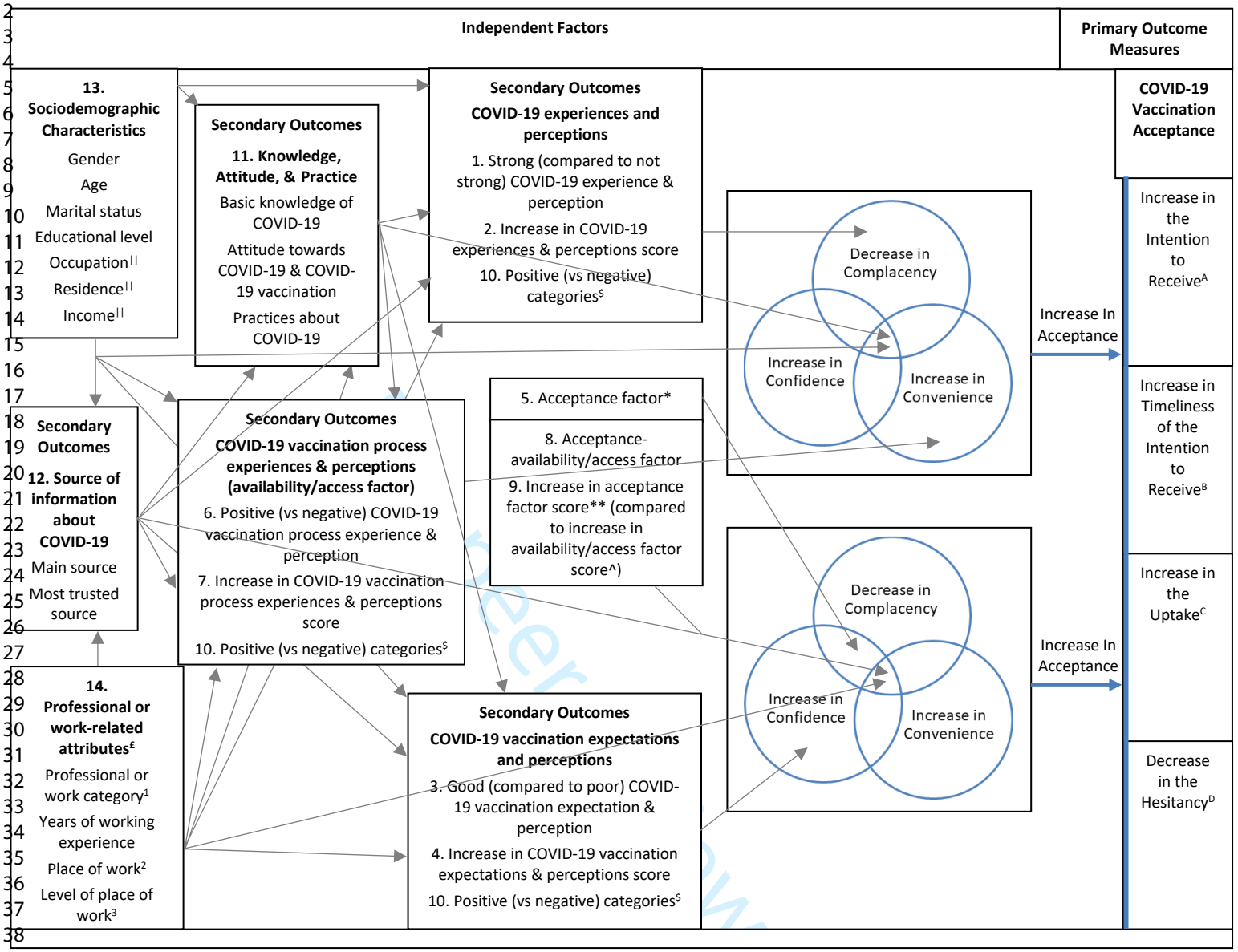

Figure 1: Study conceptual framework

[A]Measured as the proportion of participants who intended to receive covid-19 vaccination. [B]Measured as the time (in days) the participants, who intended to receive covid-19 vaccination, intended to take before they go and receive the COVID-19 vaccination (increase in timeliness means decrease in the intended days to vaccination). [C]Measured as the proportion of participants who had received covid-19 vaccination (including those who had completed the doses and those who had not). [D]Measured as the proportion of participants who had not received covid-19 vaccination due only to non-acceptance factor (perceptions that the vaccination was not important, vaccine was not safe, vaccine was not effective etc) rather than real or perceived non-availability (non-access) factor (ignorance of vaccination availability, long distance to place of vaccination, vaccine stock-out etc) or both. $As depicted in table 1. *COVID-19 risk-COVID-19 vaccination benefit perception or disease risk-remedy benefit perception (DR-RB or DRRB perception)). **Increase in COVID-19 risk-COVID-19 vaccination benefit perceptions score or DR-RB perception score. ^Increase in COVID-19 vaccination process experience & perception score. ||Among only community members. £Among only health workers. [1]Clinical and non-clinical. [2]Public and private. [3]Primary, secondary, and tertiary.

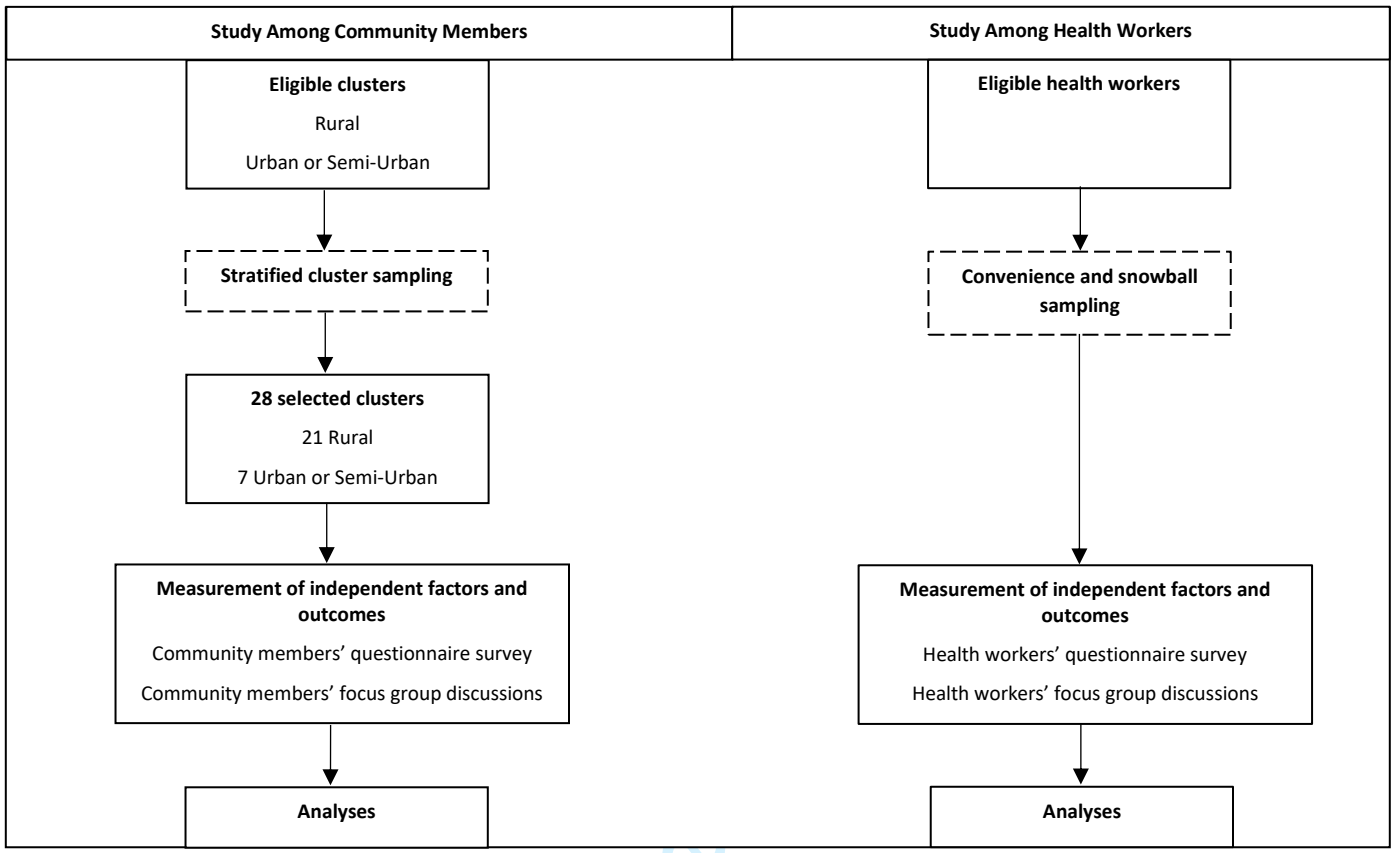

Figure 2: Summary of study profile

COVID-19 AND COVID-19 VACCINATION QUESTIONNAIRE FOR COMMUNITY MEMBERS

NOTE: Only Household Members Aged 15 years and Above Who Give Verbal Consent (or Assent) are Eligible to Participate in this Survey.

Identification – Section 1

1. Cluster ID Number: _____

2. Household ID Number (last 3 digits of household number): _____

3. Participant (Respondent) ID Number: _____

4. GPS

5. Date of interview (Year/Month/Day)

Sociodemographic Characteristics – Section 2

6. What is your Gender?
    1. Male
    2. Female

7. Age in years: How old were you during your last birthday? Number: _____

8. What is your Marital Status? **Probe:**
    1. Married
    2. Separated/Divorced
    3. Widowed
    4. Never married (Single)

9. What is your Educational Level? **Probe:**
    1. No formal education
    2. Some primary
    3. Completed primary
    4. Some secondary
    5. Completed secondary
    6. NCE/Diploma (ND, OND) (Tertiary)
    7. HND/First Degree (Tertiary)
    8. Masters/PHD/Other Equivalent (Tertiary)

10. What is your Main Occupation? **NOTE: Record the most suitable option:**

1. Farmer
2. Trader
3. Other-self-employment
4. Private paid work
5. Government paid work
6. Housewife
7. Student
8. Apprentice
9. Youth service (Corper)
10. None

11. What is your Usual Monthly Income in NGN from all sources including remittances and "pocket money" if any? **Probe:**

1. No income
2. 20,000 and less
3. 21,000–40,000
4. 41,000–60,000
5. 61,000–80,000
6. 81,000–100,000
7. 101,000–120,000
8. 121,000–140,000
9. 141,000–160,000
10. 161,000–180,000
11. 181,000–200,000
12. 201,000–220,000
13. 221,000–240,000
14. 241,000–260,000
15. 261,000–280,000
16. 281,000–300,000
17. More than 300,000

COVID-19 Vaccination Acceptance – Section 3

12. Have you received COVID-19 vaccination?

1. Yes
2. No

NOTE: No. 13–27 is for those who have received COVID-19 vaccination:

13. Which of the COVID-19 vaccination doses have you received? **Probe:**

1. First dose only
2. Second dose only
3. Second dose plus Booster

14. **If no. 13 above is 1:** Why have you not received the second dose of COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. No vaccine when you went (stock-out)
2. No vaccinator when you went (health facility not Closed)

3. Health facility was closed when you went
4. Place of vaccination was too far
5. You were too busy
6. You were ill and did not go for the remaining dose
7. You were ill, went but was not given the remaining dose
8. You had serious side effects from the first dose
9. The time for the second dose has not reached
10. Other (specify below)

15. **If no. 14 above includes 10:** Other reason, please specify. Phrase:_____

16. **If no. 13 above is 2:** Why have you not received a booster dose of COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You are not aware of booster dose
2. You do not need booster dose (it is not important)
3. No vaccine when you went (stock-out)
4. No vaccinator when you went (health facility not Closed)
5. Health facility was closed when you went
6. Place of vaccination was too far
7. You were too busy
8. You were ill and did not go for the booster dose
9. You were ill, went but was not given the booster dose
10. You had serious side effects from the second dose
11. The time for a booster dose has not reached
12. Other (specify below)

17. **If no. 16 above includes 12:** Other reason, please specify. Phrase:_____

18. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How often did you hear that COVID-19 vaccination was available for you to go and receive? **Probe:**

1. You heard about it many times before the day you received it
2. You heard about it few times (or once) before the day you received it
3. Not sure about it
4. You did not hear about it before the day you received it
5. You did not hear about it at all before the day you received it

19. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any place or health facility where they gave COVID-19 vaccination? **Probe:**

1. Yes, a place that was very close
2. Yes, a place that was close
3. Yes, a place that was far
4. Yes, a place that was very far
5. No, you did not know any place before the day you received COVID-19 vaccination

20. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How frequently were they giving COVID-19 vaccination at that place you mentioned above? **Probe:**

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. You did not know how frequently they were giving COVID-19 vaccination before the day you received it

21. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How was the queue (waiting time) at the place of vaccination that you mentioned above?

1. There was usually no queue (very short waiting time)
2. There was usually short queue (short waiting time)
3. You did not know what the queue (waiting time) was
4. There was usually long queue (long waiting time)
5. There was usually very long queue (very long waiting time)

22. **If no. 19 above is 1 or 2 or 3 or 4: Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How caring (or kind/friendly) were the health workers at the place of vaccination that you mentioned above? **Probe:**

1. They were very caring
2. They were caring
3. Not sure whether they were caring or not
4. They were not caring
5. They were not caring at all

23. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How important did you think it was for you to receive COVID-19 vaccination? **Probe:**

1. It was very important
2. It was important

3. Not sure whether it was important or not
4. It was not important
5. It was not important at all

24. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How fearful were you that you might have severe or very serious side-effect if you received COVID-19 vaccination? **Probe:**

1. You were not fearful at all
2. You were not fearful
3. Not sure about it
4. You were a little fearful
5. You were very fearful

25. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** What protection did you think COVID-19 vaccination would give you if you received it? **Probe:**

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. You were not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

26. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How did you trust the health workers who gave COVID-19 vaccination?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

27. **Regarding your expectations and perceptions before the day you received the first dose of COVID-19 vaccination:** How did you trust the federal and state governments who made the COVID-19 vaccination available for people to receive? **Probe:**

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

NOTE: No. 28–43 is for those who have not received COVID-19 vaccination:

28. Have you ever heard that COVID-19 vaccination is available for you to go and receive? **Probe:**

1. Yes, you heard about it many times
2. Yes, you heard about it few times (or once)
3. Not sure
4. No, you have not heard about it
5. No, you have not heard about it at all

29. Do you know any place or health facility where they give COVID-19 vaccination? **Probe:**

1. Yes, a place that is very close
2. Yes, a place that is close
3. Yes, a place that is far
4. Yes, a place that is very far
5. No, you do not know any place

30. **If no. 29 above is 1 or 2 or 3 or 4:** How frequently do they give COVID-19 vaccination at that place you mentioned above? **Probe:**

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. Do not know

31. **If no. 29 above is 1 or 2 or 3 or 4:** How is the queue (waiting time) at the place of vaccination that you mentioned above? **Probe:**

1. There is usually no queue (very short waiting time)
2. There is usually short queue (short waiting time)
3. Do not know
4. There is usually long queue (long waiting time)
5. There is usually very long queue (very long waiting time)

32. **If no. 29 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) are the health workers at the place of vaccination that you mentioned above? **Probe:**

1. They are very caring
2. They are caring
3. You are not sure about it
4. They are not caring
5. They are not caring at all

33. **If no. 12 above is 2 & no. 7 above is >=18:** Why have you not received COVID-19 vaccination? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (you think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or you want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. You have been too busy
9. You have been ill and did not go for vaccination
10. You have been ill, went but was not given vaccination
11. Long waiting time (long queue)
12. No vaccine (stock-out) when you went
13. No vaccinator (health facility not closed) when you went
14. Health facility was closed when you went
15. You are not aware of it
16. Other (specify below)

34. **If no. 33 above includes 16:** Other reason, please specify. Phrase: _____

35. How important is it for you to receive COVID-19 vaccination? **Probe:**

1. Very important for me to receive it
2. Important for me to receive it
3. Not sure about it
4. Not important for me to receive it
5. Not important at all for me to receive it

36. How fearful are you that you may have severe or very serious side-effect if you receive COVID-19 vaccination? **Probe:**

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

37. What protection will COVID-19 vaccination give you if you receive it? **Probe:**

1. Full or complete protection from COVID-19

2. Partial or incomplete protection from COVID-19
3. Not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

38. How do you trust the health workers who give COVID-19 vaccination? **Probe:**

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

39. How do you trust the federal and state governments who made the COVID-19 vaccination available for people to receive? **Probe:**

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

40. Do you intend (or plan) to receive COVID-19 vaccination that is available for you to receive? **Probe:**

1. Yes, you will surely go and receive the vaccination
2. Yes, you think you will go and receive the vaccination
3. Not sure about it
4. No, you think you will not go and receive the vaccination
5. No, you will surely not go and receive the vaccination

NOTE: If 3 or 4 or 5: Skip to no. 35

41. **If no. 40 above is 1 or 2:** How long will it take before you go and receive the COVID-19 vaccination? Number (in days):_____ **NOTE: Record Response in DAYS (Convert Weeks, Months, and Years to DAYS). NOTE: Record "2000" for "do not know"**

42. **If no. 40 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) to receive COVID-19 vaccination or are not sure about it? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective

4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or I want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. Other reason (specify below)

43. **If no. 42 above includes 8:** Other reason, please specify. Phrase: _____

NOTE: No. 44–51 is for all

44. Do you have a child or children? 1=Yes 2=No. **If 2: Skip to 52**

45. How important is it for your child or children to receive COVID-19 vaccination if it is available for them to receive? **Probe:**

1. Very important for them to receive it
2. Important for them to receive it
3. Not sure about it
4. Not important for them to receive it
5. Not important at all for them to receive it

46. How fearful are you that your child/children may have severe or very serious side-effect if they receive COVID-19 vaccination that is available for them to receive? **Probe:**

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

47. What protection will COVID-19 vaccination give your child or children if they receive the one that is available for them to receive? **Probe:**

1. It will give them full or complete protection from COVID-19
2. It will give them partial or incomplete protection from COVID-19
3. Not sure about it
4. It will give them no protection from COVID-19
5. It will give them no protection at all from COVID-19

48. Do you intend (or plan) for your child or children to receive COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY]?

1. Yes, you will surely take your child or children to receive the vaccination

2. Yes, you think you will take your child or children to receive the vaccination
3. Not sure about it
4. No, you think you will not take your child or children to receive the vaccination
5. No, you will surely not take your child or children to receive the vaccination

NOTE: If 3 or 4 or 5: Skip to 50

49. **If no. 48 above is 1 or 2:** How long will it take before you take your child or children to receive the COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY]? Number (in days): _____ **NOTE: Record Response in DAYS (Convert Weeks, Months, and Years to DAYS)**

50. **If no. 48 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) for your child or children to receive the COVID-19 vaccination if it is available for them to receive at [NAME OF CATCHMENT HEALTH FACILITY] or are not sure about it? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. The child/children do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or You want others to take it first
6. Other reason (specify below)

51. **If no. 49 above includes 6:** Other reason, please specify. Phrase:_____

COVID-19 Experiences and Perceptions – Section 4

NOTE: No. 52–63 is for those who have received COVID-19 vaccination:

52. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** How fearful were you about getting COVID-19? **Probe:**

1. You were very fearful
2. You were a little fearful
3. Not sure about it
4. You were not fearful
5. You were not fearful at all

53. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Was it possible for someone like you to get COVID-19? **Probe:**

1. It was highly possible

2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

54. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Was it possible for someone like you to get severe or very serious COVID-19? **Probe:**

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

55. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you ever have COVID-19 before you received the vaccination? **Probe:**

1. Yes, you were sure
2. Yes, you thought so
3. Not sure about it
4. No, you thought so
5. No, you were sure

56. **If no. 55 above is 1 or 2: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you ever have severe or very serious COVID-19 before you received the vaccination? **Probe:**

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious
5. No, it was not serious at all

57. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any person who had COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

58. **If no. 57 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** Did you know any person who had severe or very serious COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

59. **If no. 57 above is 1 or 2 or 3 or 4: Regarding your experiences and perceptions before the day you received the COVID-19 vaccination:** Did you know any person who died from COVID-19 before you received the vaccination? **Probe:**

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

60. **Regarding your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:** What were your sources of information about COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Family members/Relatives/Friends
2. Health care providers/Health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media
8. Internet sites — Internet, social media, & SMS
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc)
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

61. **If no. 60 above includes 12:** Please specify the other source. Word or Phrase: _____

62. **If more than one sources given in no. 60 above:** Which of the sources was your main source? **NOTE: Probe: Select the one mentioned:** 1–12 above

63. **If more than one sources given in no. 60 above:** Which of the sources did you trust most? **NOTE:**

Probe: Select the one mentioned: 1–12 above

NOTE: No. 64–75 is for those who have not received COVID-19 vaccination:

64. How fearful are you about getting COVID-19? **Probe:**

1. Very fearful
2. A little fearful
3. Not sure about it
4. Not fearful
5. Not fearful at all

65. Is it possible for someone like you to get COVID-19? **Probe:**

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

66. Is it possible for someone like you to get severe or very serious COVID-19? **Probe:**

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

67. Have you ever had COVID-19? **Probe:**

1. Yes, you are sure
2. Yes, you think so
3. Not sure about it
4. No, you think so
5. No, you are sure

68. **If no 67 above is 1 or 2:** Have you ever had severe or very serious COVID-19? **Probe:**

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious
5. No, it was not serious at all

69. Do you know any person who have had COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

70. **If no. 69 above is 1 or 2 or 3 or 4:** Do you know any person who have had severe or very serious COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

71. **If no. 69 above is 1 or 2 or 3 or 4:** Do you know any person who have died from COVID-19? **Probe:**

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

72. What are your sources of information about COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Family members/Relatives/Friends
2. Health care providers/Health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media — Internet, social media, & SMS
8. Internet sites
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc)
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

73. **If no. 72 above includes 12:** Please specify the other source. Word or Phrase: _____

74. **If more than one sources given in no. 72 above:** Which of the sources is your main source? **NOTE:**

Probe: Select the one mentioned: 1–12 above

75. **If more than one sources given in no. 72 above:** Which of the sources do you trust most? **NOTE:**

Probe: Select the one mentioned: 1–12 above

Basic Knowledge of COVID-19 – Section 5

76. What is COVID-19? **Probe:**

1. A new disease (caused by a new micro-organism)
2. An old disease (caused by an old micro-organism)
99. Do not know

77. How do people get COVID-19? **Probe:**

1. By staying close to infected persons when they cough or sneezes
2. From bat
3. From rat
4. From spiritual attack
5. Other (specify below)
99. Do not know

78. **If no. 77 above is 5:** Please specify how people get COVID-19. Word or Phrase: _____

79. When somebody gets COVID-19, how long does it usually take before the person starts to show symptoms? **Probe:**

1. 2–14 days (within 2 weeks)
2. 2–4 weeks
3. >4 weeks
99. Do not know

80. What are the symptoms of COVID-19 (symptoms that someone with COVID-19 can have)? **NOTE:**

Multiple responses: Probe for respondent to select all that apply:

1. Fever
2. Cough
3. Tiredness
4. Body aches and pains
5. Sore throat
6. Difficulty breathing or shortness of breath
7. Chest pain

8. Headache
9. Loss of taste or smell
10. Diarrhoea
11. Nausea or vomiting
12. other (specify below)
99. Do not know

81. **If no. 80 above includes 12:** Please specify the other symptom. Word or Phrase:_____

82. Can people also have COVID-19 without showing any symptoms?

1. Yes
2. No
99. Do Not Know

83. Who are more at risk of having severe COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Children
2. Younger adults
3. Elderly people
4. Slim people
5. Obese people
6. People with chronic illness
7. People who smoke
8. Pregnant women
99. Do not know

84. Is there a laboratory test to diagnose COVID-19?

1. Yes
2. No
99. Do not know**. If 2 OR 99: Skip to 87**

85. **If no. 84 above is 1:** Where is laboratory test to diagnose COVID-19 done in Ebonyi state? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. AEFUTHA
2. General hospitals
3. PHC centres
4. Missionary hospitals
5. Private hospitals
6. Private laboratory

7. Other (specify below)

99. Do not know

86. **If no. 85 above includes 7:** Please specify the other place lab test for COVID-19 is done in Ebonyi state. Word or Phrase:_____

87. Are there treatments for COVID-19?

1. Yes
2. No
99. Do Not Know

88. Are there vaccines for COVID-19?

1. Yes
2. No
99. Do Not Know

89. **If no. 88 above is 1:** Do you know any place where one can go and receive COVID-19 vaccination in Ebonyi state?

1. Yes
2. No

90. What are the ways to avoid/prevent getting COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of face mask in public places (especially indoor public places)
4. Frequent hands washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching of face (eyes, nose, & mouth) when one is in public places
7. COVID-19 vaccination
8. Taking chloroquine
9. Use of herbs or roots (“Agbo”)
10. Use of ginger or garlic
11. Taking hot drinks or “ogogoro”
12. Other (specify below)
99. Do Not Know

91. **If no. 90 above includes 12:** Please specify other way to avoid getting COVID-19. Word or Phrase: _____

Attitude Towards COVID-19 and COVID-19 Vaccination – Section 6

NOTE: Tell the respondents you will make statements and for each statement, they should: Strongly Disagree, Disagree, Say if they are Not Sure/Do Not Know, Agree, or Strongly Agree.

92. COVID-19 is real. **Probe:**

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

93. COVID-19 a serious illness that can kill.

94. Everybody is susceptible to COVID-19 infection (it is possible for anybody to get COVID-19).

95. The risk of getting COVID-19 can be reduced by avoiding crowd (large group of people).

96. The risk of getting COVID-19 can be reduced by maintaining at least 1–2 metre distance away from people coughing or sneezing

97. The risk of getting COVID-19 can be reduced if everybody covers the mouth and nose (with handkerchief or bent elbow) when coughing or sneezing

98. The risk of getting COVID-19 can be reduced by wearing face mask when going out to public places (especially indoor public places).

99. The risk of getting COVID-19 can be reduced by washing hands with soap and water frequently (e.g before touching the face, before eating).

100. The risk of getting COVID-19 can be reduced by cleaning hands with alcoholic sanitisers frequently.

101. Chloroquine is an effective treatment (prevention) for COVID-19.

102. Herbs and roots (“Agbo”) are effective treatments (prevention) for COVID-19.

103. Ginger and garlic are effective treatments (prevention) for COVID-19.

104. Hot drinks or “ogogoro” are effective treatments (prevention) for COVID-19

105. COVID-19 vaccines are safe for people to receive

106. The risk of COVID-19 can be reduced by receiving COVID-19 vaccination

107. Everybody should receive COVID-19 vaccination that is recommended by the government

Practices about COVID-19 – Section 7

108. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Avoid or Prevent transmission of COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was ever practiced

109. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Avoid or Prevent transmission of COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was practiced in the last two weeks

110. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Treat or Prevent COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)

3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was ever practiced

111. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Treat or Prevent COVID-19? **NOTE: Multiple responses: Probe for respondent to select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)
3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was practiced in the last two weeks

COVID-19 AND COVID-19 VACCINATION QUESTIONNAIRE FOR HEALTH WORKERS

NOTE: All health workers (both clinical and non-clinical) working or living in Eboni state who give consent are eligible to participate in this survey.

Sociodemographic Characteristics

1. What is your Gender?
    1. Male
    2. Female

2. Age in years: How old were you during your last birthday? Number: _____

3. What is your Marital Status?
    1. Married
    2. Separated/Divorced
    3. Widowed
    4. Never married (Single)

4. What is your Educational Level?
    1. No formal education
    2. Some primary
    3. Completed primary
    4. Some secondary
    5. Completed secondary
    6. NCE/Diploma (ND, OND) (Tertiary)
    7. HND/First Degree (Tertiary)
    8. Masters/PHD/Other Equivalent (Tertiary)

5. What is your Category or Cadre?
    1. non-Clinical staff
    2. PMV
    3. Health attendant
    4. JCHEW
    5. CHEW
    6. CHO
    7. Nurse/Midwife
    8. Medical laboratory technologist

9. Medical laboratory scientist
10. Pharmacy technician
11. Pharmacist
12. House officer
13. Medical officer
14. Medical doctor in specialist training (Resident doctor)
15. Specialist medical doctor (Fellow)
16. Other (specify below)

6. **If no. 5 above is 16:** Please specify your Category or Cadre. Word or Phrase:_____

7. How many years of working experience do you have? **NOTE: Use "0" for less than one year**. Number: _____

8. Where is your current primary place of work?

1. PMV
2. PHC centre
3. Private laboratory
4. Private pharmacy
5. Private hospital/clinic
6. Missionary hospital
7. General hospital
8. NOFIC
9. AEFUTHA
10. Other (specify below)

9. **If no. 8 above is 10:** Please specify your current primary place of work. Word or Phrase:_____

COVID-19 Vaccination Acceptance

10. Have you received COVID-19 vaccination?

1. Yes
2. No

NOTE: No. 11–25 is for those who have received COVID-19 vaccination:

11. Which of the COVID-19 vaccination doses have you received?

1. First dose only
2. Second dose only
3. Second dose plus Booster

12. **If no. 11 above is 1:** Why have you not received the second dose of COVID-19 vaccination?

NOTE: select all that apply:

1. No vaccine when you went (stock-out)
2. No vaccinator when you went (health facility not Closed)
3. Health facility was closed when you went
4. Place of vaccination was too far
5. You were too busy
6. You were ill and did not go for the remaining dose
7. You were ill, went but was not given the remaining dose
8. You had serious side effects from the first dose
9. The time for the second dose has not reached
10. Other (specify below)

13. **If no. 12 above includes 10:** Other reason, please specify. Phrase:_____

14. **If no. 11 above is 2:** Why have you not received a booster dose of COVID-19 vaccination?

NOTE: select all that apply:

1. You are not aware of booster dose
2. You do not need booster dose (it is not important)
3. No vaccine when you went (stock-out)
4. No vaccinator when you went (health facility not Closed)
5. Health facility was closed when you went
6. Place of vaccination was too far
7. You were too busy
8. You were ill and did not go for the booster dose
9. You were ill, went but was not given the booster dose
10. You had serious side effects from the second dose
11. The time for a booster dose has not reached
12. Other (specify below)

15. **If no. 14 above includes 12:** Other reason, please specify. Phrase:_____

NOTE: No. 16–25 is about your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:

16. How often did you hear that COVID-19 vaccination was available for you to go and receive?

1. You heard about it many times before the day you received it
2. You heard about it few times (or once) before the day you received it
3. Not sure

4. You did not hear about it before the day you received it
5. You did not hear about it at all before the day you received it

17. Did you know any place or health facility where they gave COVID-19 vaccination?

1. Yes, a place that was very close
2. Yes, a place that was close
3. Yes, a place that was far
4. Yes, a place that was too far
5. No, you did not know any place before the day you received COVID-19 vaccination

18. **If no. 17 above is 1 or 2 or 3 or 4:** How frequently were they giving COVID-19 vaccination at that place you mentioned above?

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. You did not know how frequently they were giving COVID-19 vaccination before the day you received it

19. **If no. 17 above is 1 or 2 or 3 or 4:** How was the queue (waiting time) at the place of vaccination that you mentioned above?

1. There was usually no queue (very short waiting time)
2. There was usually short queue (short waiting time)
3. You did not know what the queue (waiting time) was
4. There was usually long queue (long waiting time)
5. There was usually very long queue (very long waiting time)

20. **If no. 17 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) were the health workers at the place of vaccination that you mentioned above?

1. They were very caring
2. They were caring
3. Not sure whether they were caring or not
4. They were not caring
5. They were not caring at all

21. How important did you think it was for you to receive COVID-19 vaccination?

1. It was very important
2. It was important

3. Not sure whether it was important or not
4. It was not important
5. It was not important at all

22. How fearful were you that you might have severe or very serious side-effect if you received COVID-19 vaccination?

1. You were not fearful at all
2. You were not fearful
3. Not sure about it
4. You were a little fearful
5. You were very fearful

23. What protection did you think COVID-19 vaccination would give you if you received it?

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. You were not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

24. How did you trust the health workers who gave COVID-19 vaccination?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

25. How did you trust the federal and state governments who made the COVID-19 vaccination available for people to receive?

1. You trusted them very much
2. You trusted them
3. Not sure about it
4. You did not trust them
5. You did not trust them at all

NOTE: No. 26–41 is for those who have not received COVID-19 vaccination:

26. Have you ever heard that COVID-19 vaccination is available for you to go and receive?

1. Yes, you heard about it many times
2. Yes, you heard about it few times (or once)

3. Not sure
4. No, you have not heard about it
5. No, you have not heard about it at all

27. Do you know any place or health facility where they give COVID-19 vaccination?

1. Yes, a place that is very close
2. Yes, a place that is close
3. Yes, a place that is far
4. Yes, a place that is very far
5. No, you do not know any place

28. **If no. 27 above is 1 or 2 or 3 or 4:** How frequently do they give COVID-19 vaccination at that place you mentioned above?

1. Daily or two/three times a week
2. Once a week
3. Once every two weeks/every month
4. No fixed time (not regular)
5. Do not know

29. **If no. 27 above is 1 or 2 or 3 or 4:** How is the queue (waiting time) at the place of vaccination that you mentioned above?

1. There is usually no queue (very short waiting time)
2. There is usually short queue (short waiting time)
3. Do not know
4. There is usually long queue (long waiting time)
5. There is usually very long queue (very long waiting time)

30. **If no. 27 above is 1 or 2 or 3 or 4:** How caring (or kind/friendly) are the health workers at the place of vaccination that you mentioned above?

1. They are very caring
2. They are caring
3. You are not sure about it
4. They are not caring
5. They are not caring at all

31. **If no. 10 above is 2 & no. 2 above is >=18:** Why have you not received COVID-19 vaccination? **NOTE: Select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (you think it is harmful)

3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or you want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. You have been too busy
9. You have been ill and did not go for vaccination
10. You have been ill, went but was not given vaccination
11. Long waiting time (long queue)
12. No vaccine (stock-out) when you went
13. No vaccinator (health facility not Closed) when you went
14. Health facility was closed when you went
15. You are not aware of it
16. Other (specify below)

32. **If no. 31 above includes 16:** Other reason, please specify. Phrase: _____

33. How important is it for you to receive COVID-19 vaccination?

1. Very important for me to receive it
2. Important for me to receive it
3. Not sure about it
4. Not important for me to receive it
5. Not important at all for me to receive it

34. How fearful are you that you may have severe or very serious side-effect if you receive COVID-19 vaccination?

1. Not fearful at all
2. Not fearful
3. Not sure about it
4. A little fearful
5. Very fearful

35. What protection will COVID-19 vaccination give you if you receive it?

1. Full or complete protection from COVID-19
2. Partial or incomplete protection from COVID-19
3. Not sure about it
4. No protection from COVID-19
5. No protection at all from COVID-19

36. How do you trust the health workers who give COVID-19 vaccination?

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

37. How do you trust the federal and state governments who made the COVID-19 vaccination available for people to receive?

1. You trust them very much
2. You trust them
3. Not sure about it
4. You do not trust them
5. You do not trust them at all

38. Do you intend (or plan) to receive COVID-19 vaccination that is available for you to receive?

1. Yes, you will surely go and receive the vaccination
2. Yes, you think you will go and receive the vaccination
3. Not sure about it
4. No, you think you will not go and receive the vaccination
5. No, you will surely not go and receive the vaccination

NOTE: If 3 or 4 or 5: Skip to no. 40

39. **If no. 38 above is 1 or 2:** How many DAYS or WEEKS or MONTHS or YEARS will it take before you go and receive the COVID-19 vaccination? Number plus Word: _____

40. **If no. 38 above is 3 or 4 or 5:** What is/are the reasons why you do not intend (or plan) to receive COVID-19 vaccination? **NOTE: Select all that apply:**

1. You do not need the vaccine (it is not important)
2. You think the vaccine is not safe (I think it is harmful)
3. You think the vaccine is not effective
4. You have been hearing bad stories about the vaccine
5. The vaccine is new and/or I want others to take it first
6. You do not know the place and/or time of vaccination
7. Place of vaccination is too far
8. Other reason (specify below)

41. **If no. 40 above includes 8:** Other reason, please specify. Phrase: _____

COVID-19 Experiences and Perceptions

NOTE: No. 42–53 is for those who have received COVID-19 vaccination:

NOTE: No. 42–53 is about your experiences and perceptions before the day you received the first dose of COVID-19 vaccination:

42. How fearful were you about getting COVID-19?

1. You were very fearful
2. You were a little fearful
3. Not sure about it
4. You were not fearful
5. You were not fearful at all

43. Was it possible for someone like you to get COVID-19?

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

44. Was it possible for someone like you to get severe or very serious COVID-19?

1. It was highly possible
2. It was a bit possible
3. Not sure about it
4. It was not possible
5. It was not possible at all

45. Did you ever have COVID-19 before you received the vaccination?

1. Yes, you were sure
2. Yes, you thought so
3. Not sure about it
4. No, you thought so
5. No, you were sure

46. **If no. 45 above is 1 or 2:** Did you ever have severe or very serious COVID-19 before you received the vaccination?

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it
4. No, it was not serious

5. No, it was not serious at all

47. Did you know any person who had COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

48. **If no. 47 above is 1 or 2 or 3 or 4:** Did you know any person who had severe or very serious COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

49. **If no. 47 above is 1 or 2 or 3 or 4:** Did you know any person who died from COVID-19 before you received the vaccination?

1. Yes, you knew a very close person
2. Yes, you knew a close person
3. Yes, you only knew a distant person
4. Yes, you only knew a very distant person
5. No, you did not know any person

50. What were your sources of information about COVID-19? **NOTE: Select all that apply:**

1. Family members/Relatives/Friends
2. Other health workers — Interpersonal
3. Television
4. Radio — Traditional media
5. Prints (Newspaper/Magazine)
6. WhatsApp
7. Facebook — Internet and social media
8. Internet sites
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc) — Internet, social media, & SMS
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

51. **If no. 50 above includes 12:** Please specify the other source. Word or Phrase: _____

52. **If more than one sources given in no. 50 above:** Which of the sources was your main source?

53. **If more than one sources given in no. 50 above:** Which of the sources did you trust most?

NOTE: No. 54–65 is for those who have not received COVID-19 vaccination:

54. How fearful are you about getting COVID-19?

1. Very fearful
2. A little fearful
3. Not sure about it
4. Not fearful
5. Not fearful at all

55. Is it possible for someone like you to get COVID-19?

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

56. Is it possible for someone like you to get severe or very serious COVID-19?

1. Highly possible
2. A bit possible
3. Not sure about it
4. Not possible
5. Not possible at all

57. Have you ever had COVID-19?

1. Yes, you are sure
2. Yes, you think so
3. Not sure about it
4. No, you think so
5. No, you are sure

58. **If no. 57 above is 1 or 2:** Have you ever had severe or very serious COVID-19?

1. Yes, it was very serious
2. Yes, it was a bit serious
3. Not sure about it

4. No, it was not serious
5. No, it was not serious at all

59. Do you know any person who have had COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

60. **If no. 59 above is 1 or 2 or 3 or 4:** Do you know any person who have had severe or very serious COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

61. **If no 59 above is 1 or 2 or 3 or 4:** Do you know any persons who have died from COVID-19?

1. Yes, you know a very close person
2. Yes, you know a close person
3. Yes, you only know a distant person
4. Yes, you only know a very distant person
5. No, you do not know any person

62. What are your sources of information about COVID-19? **NOTE: Select all that apply:**

1. Family members/Relatives/Friends
2. Other health workers — Interpersonal
3. Television
4. Radio
5. Prints (Newspaper/Magazine) — Traditional media
6. WhatsApp
7. Facebook
8. Internet sites — Internet and social media
9. Bulk SMS/Text messages (e.g from Nigerian CDC, NPHCDA, Bank etc) — Internet, social media, & SMS
10. Workplace (Place of work)
11. Place of worship/Religious forums — Interpersonal
12. Other (specify below)

63. **If no. 62 above includes 12:** Please specify the other source. Word or Phrase: _____

64. **If more than one sources given in no. 62 above:** Which of the sources is your main source?

65. **If more than one sources given in no. 62 above:** Which of the sources do you trust most?

Basic Knowledge of COVID-19

66. What is COVID-19?

1. A new type of coronavirus disease
2. An old type of coronavirus disease
99. Do not know

67. How do people get COVID-19?

1. By staying close to infected persons when they cough or sneezes
2. From bat
3. From rat
4. From spiritual attack
5. Other (specify below)
99. Do not know

68. **If no. 67 above is 5:** Please specify how people get COVID-19. Word or Phrase: _____

69. When somebody gets COVID-19, how long does it usually take before the person starts to show symptoms?

1. 2–14 days (within 2 weeks)
2. 2–4 weeks
3. >4 weeks
99. Do not know

70. What are the symptoms of COVID-19? **NOTE: Select all that apply:**

1. Fever
2. Cough
3. Tiredness
4. Body aches and pains
5. Sore throat
6. Difficulty breathing or shortness of breath
7. Chest pain
8. Headache

9. Loss of taste or smell
10. Diarrhoea
11. Nausea or vomiting
12. other (specify below)
99. Do not know

71. **If no. 70 above includes 12:** Please specify the other symptom. Word or Phrase:_____

72. Can people also have COVID-19 without showing any symptoms?

1. Yes
2. No
99. Do Not Know

73. Who are more at risk of having severe COVID-19? **NOTE: Select all that apply:**

1. Children
2. Younger adults
3. Elderly people
4. Slim people
5. Obese people
6. People with chronic illness
7. People who smoke
8. Pregnant women
99. Do not know

74. Is there a laboratory test to diagnose COVID-19?

1. Yes
2. No
99. Do not know**. If 2 OR 99: Skip to 77**

75. Where is laboratory test to diagnose COVID-19 done in Ebonyi state? **NOTE: Select all that apply:**

1. AEFUTHA
2. General hospitals
3. PHC centres
4. Missionary hospitals
5. Private hospitals
6. Private laboratory
7. Other (specify below)
99. Do not know

76. **If no. 75 above includes 7:** Please specify the other place lab test for COVID-19 is done in Ebonyi state. Word or Phrase:_____

77. Are there treatments for COVID-19?

1. Yes
2. No
99. Do Not Know

78. Are there vaccines for COVID-19?

1. Yes
2. No
99. Do Not Know

79. **If no. 78 above is 1:** Do you know any place where one can go and receive COVID-19 vaccination in Ebonyi state?

1. Yes
2. No

80. What are the ways to avoid/prevent getting COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of face mask in public places (especially indoor public places)
4. Frequent hands washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching of face (eyes, nose, & mouth) when one is in public places
7. COVID-19 vaccination
8. Taking chloroquine
9. Use of herbs or roots (“Agbo”)
10. Use of ginger or garlic
11. Taking hot drinks or “ogogoro”
12. Other (specify below)
99. Do Not Know

81. **If no. 80 above includes 12:** Please specify other way. Word or Phrase: _____

Attitude Towards COVID-19 and COVID-19 Vaccination

NOTE: For each of the statements below, take one option whether you: Strongly Disagree, Disagree, Not Sure/Do Not Know, Agree, or Strongly Agree.

82. COVID-19 is real.

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

83. COVID-19 a serious illness that can kill.

84. Everybody is susceptible to COVID-19 infection (Anybody can get COVID-19).

85. The risk of getting COVID-19 can be reduced by avoiding crowd (large group of people).

86. The risk of getting COVID-19 can be reduced by maintaining at least 1–2 metre distance away from people coughing or sneezing

87.The risk of getting COVID-19 can be reduced if everybody covers the mouth and nose (with handkerchief or bent elbow) when coughing or sneezing

88. The risk of getting COVID-19 can be reduced by wearing face mask when going out to public places (especially indoor public places).

89. The risk of getting COVID-19 can be reduced by washing hands with soap and water frequently (e.g before touching the face, before eating).

90. The risk of getting COVID-19 can be reduced by cleaning hands with alcoholic sanitisers frequently.

91. Chloroquine is an effective treatment (prevention) for COVID-19.

92. Herbs and roots (“Agbo”) are effective treatments (prevention) for COVID-19.

93. Ginger and garlic are effective treatments (prevention) for COVID-19.

94. Hot drinks or “ogogoro” are effective treatments (prevention) for COVID-19

95. COVID-19 vaccines are safe for people to receive

96. The risk of COVID-19 can be reduced by receiving COVID-19 vaccination

97. Everybody should receive COVID-19 vaccination that is recommended by the government

Practices about COVID-19

98. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Avoid or Prevent transmission of COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was ever practiced

99. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Avoid or Prevent transmission of COVID-19? **NOTE: Select all that apply:**

1. Avoiding crowd (large group of people)
2. Maintaining at least 1–2 metre distance away from people coughing or sneezing
3. Wearing of a face mask when going out to public places (especially indoor public places)
4. Frequent hand washing with soap and water
5. Frequent hand cleaning with alcoholic sanitisers
6. Avoiding touching your face (eyes, nose, mouth) when you are in public places
7. Covering your mouth and nose (with handkerchief or your bent elbow) when coughing or sneezing
8. Use of bleach/Jik or spirit/alcohol to clean surfaces that people touch frequently such as door handles, table tops etc
9. None of the above was practiced in the last two weeks

100. Since the COVID-19 pandemic started spreading in Ebonyi state (since 2020 till now), which of the following have you Ever Practiced because you wanted to Treat or Prevent COVID-19? **NOTE: Select all that apply:**

1. Taking chloroquine
2. Using herbs or roots (“Agbo”)
3. Using ginger or garlic
4. Using hot drinks or “ogogoro”
5. None of the above was ever practiced

101. Among those that you have ever practiced, which ones have you Been Practicing in the Last Two Weeks because you want to Treat or Prevent COVID-19? **NOTE: Select all that apply:**

1. Taking chloroquine
2. Using herbs or roots ("Agbo")
3. Using ginger or garlic
4. Using hot drinks or "ogogoro"
5. None of the above was practiced in the last two weeks

FGD Guide for FGD with Community Members

Q1. What is COVID-19?

Prompts:

1. Is COVID-19 real or not?
2. Is COVID-19 a new disease or an old disease?
3. Is COVID-19 a serious disease that can kill?

Probe: their views on cause, transmission, symptoms, diagnosis, treatment, and prevention of COVID-19

Prompt: Are there vaccines for COVID-19?

Q2. What are your views about COVID-19 vaccine/vaccination and the vaccination process?

Probe: safety, effectiveness, universal COVID-19 vaccination, and vaccination process

Q3. Some people have received COVID-19 vaccination but others have not received. What are the things that make people to receive or not to received COVID-19 vaccination?

Prompt: Why have some people not received COVID-19 vaccination?

Why have some people not received COVID-19 vaccination that *is available close to them?*

Q4. Among the people that currently have not received COVID-19 vaccination, some intend or plan to receive it but others do not intend or plan to receive it.

What are the things that make people to plan to receive or to plan not to received COVID-19 vaccination?

Prompt: Why do some people say they will not receive COVID-19 vaccination?

Q5. Among the people that say they will receive COVID-19 vaccination, some say they will go and receive it after some days, some say after some weeks, some say after some months, others say after some years.

What are the things that determines how long it takes before people go and receive COVID-19 vaccination?

Prompt: What will make some people go and receive the COVID-19 vaccination earlier and others to go later?

Q6. What do you think should be done so that people who have not received COVID-19 vaccination will go and receive or start planning to receive it?

Prompt: How can people be made to accept COVID-19 vaccination? Probe: Role of government, health workers etc.

Thank you very much for your time and views.

FGD Guide for FGD with Health Workers

Q1. What is COVID-19?

Prompts:

1. Is COVID-19 real or not?
2. Is COVID-19 a new disease or an old disease?
3. Is COVID-19 a serious disease that can kill?

Probe: their views on cause, transmission, symptoms, diagnosis, treatment, and prevention of COVID-19

Prompt: Are there vaccines for COVID-19?

Q2. What are your views about COVID-19 vaccine/vaccination and the vaccination process?

Probe: safety, effectiveness, universal COVID-19 vaccination, and vaccination process

Q3. Some health workers have received COVID-19 vaccination but others have not received. What are the things that make health workers to receive or not to received COVID-19 vaccination?

Prompt: Why have some health workers not received COVID-19 vaccination?

Why have some health workers not received COVID-19 vaccination that is *available close to them?*

Q4. Among the health workers that currently have not received COVID-19 vaccination, some intend or plan to receive it but others do not intend or plan to receive it.

What are the things that make health workers to plan to receive or to plan not to received COVID-19 vaccination?

Prompt: Why do some health workers say they will not receive COVID-19 vaccination?

Q5. Among the health workers that say they will receive COVID-19 vaccination, some say they will go and receive it after some days, some say after some weeks, some say after some months, others say after some years.

What are the things that determines how long it takes before health workers go and receive COVID-19 vaccination?

Prompt: What will make some health workers go and receive the COVID-19 vaccination earlier and others to go later?

Q6. What do you think should be done so that health workers who have not received COVID-19 vaccination will go and receive or start planning to receive it?

Prompt: How can health workers be made to accept COVID-19 vaccination? Probe: Role of government, other health workers etc.

Thank you very much for your time and views.