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A mixed-methods study to assess the quality of infection prevention and control measures during delivery of seasonal malaria chemoprevention in Sokoto and Kano states, northern Nigeria

SMC-COVID-19 study report

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Acronyms

AE	adverse event
AQ	amodiaquine
CHW	community health worker
FGD	focus group discussion
HF	health facility
HMIS	health management information system
HQ	Headquarters
IPC	Infection prevention and control
KII	key informant interviews
LGA	local government area
MDA	mass drug administration
MoH	Ministry of Health
M&E	monitoring and evaluation
SMC	seasonal malaria chemoprevention
SP	sulfadoxine-pyrimethamine
UIC	unique identifying code
WHO	World Health Organization

1 Executive summary

1.1 Background

Seasonal malaria chemoprevention (SMC) is a World Health Organization (WHO)-recommended intervention for children 3–59 months living in areas of highly seasonal malaria transmission to provide protection against malaria morbidity and mortality during the rainy season. SMC is typically delivered door-to-door over a period of four days by trained community distributors in monthly cycles between July and October. Each SMC course involves one dose of sulfadoxine-pyrimethamine (SP) and three daily doses of amodiaquine (AQ). Operational guidelines were developed, based on WHO guidance, to support countries to ensure the safety of communities and community distributors when delivering SMC during the coronavirus (COVID-19) pandemic, through infection prevention and control (IPC) measures. The purpose of this study was to determine adherence to, and perceptions of, these IPC measures when delivering SMC during the COVID-19 pandemic.

1.2 Methodology

A cross-sectional study design was adopted to determine adherence to IPC measures during two SMC cycles in urban and rural areas of Sokoto and Kano states. Community distributors were directly observed by trained data collectors, who observed and recorded whether or not the community distributors received recommended equipment and adhered to IPC measures. Focus group discussions (FGDs) were also conducted with community distributors to explore their perceptions of the measures, as well as barriers and facilitators to adherence. Caregivers' views on, and satisfaction with, SMC delivery using IPC measures were explored through a structured survey.

1.3 Key findings

- Across the key IPC domains, there were varying degrees of adherence to IPC guidelines across the two states, with adherence in Sokoto state generally higher than in Kano state.
- Availability of necessary equipment for preventing and controlling COVID-19 transmission was not adequate, particularly in Kano state.
- Adequate knowledge and positive perceptions of the IPC guidelines among community distributors was a key facilitating factor for adherence, in addition to community distributors indicating that the measures were feasible to implement.
- A high proportion of caregivers in both states indicated that they agree the COVID-19 safety precautions were necessary, although more than half indicated that they were uncomfortable.

1.4 Key recommendations

- Future SMC campaigns should consider how to improve the community's awareness of IPC measures, including starting awareness campaigns as early as possible.
- To assist community distributors with maintaining a safe two-metre distance within compounds, 'graded recommendations' could be introduced, outlining distancing requirements for certain scenarios.
- To improve community distributor compliance to facemask-wearing, 'rest' periods could be introduced.

- Monitoring and supervisory structures and processes should be strengthened to improve community distributors' adherence to the enhanced IPC measures.
- Future SMC campaigns must address the shortage of certain IPC equipment in both states.
- Future campaigns should work with relevant stakeholders such as the National Malaria Elimination Programme to ensure national guidelines are in line with international guidelines, where possible.

2 Introduction

1.2 Background and rationale

The coronavirus (COVID-19) pandemic has grown exponentially across most parts of Europe and the Americas, representing a huge threat in Africa now and in the months to come. A combination of factors puts some African countries at great risk including: high population density in urban areas, poor community hygiene and sanitation, high prevalence of comorbidities, lack of sick pay for workers, high rates of self-employment and fragile health systems.[1] In these health systems, surveillance and laboratory capacity is not always strong,[2] and many countries have an insufficient number of appropriately trained health workers and insufficient critical care capacity to address the potential upsurge in severely ill COVID-19 patients — factors that all affected the response to the west African Ebola outbreak.[3,4]

There is potential for direct mortality from COVID-19 and indirect mortality from preventable or treatable conditions such as malaria to increase dramatically as a result of the pandemic. Previous epidemics have disrupted health systems broadly and impacted on control programmes targeting specific diseases. For example, malaria morbidity and deaths increased dramatically during the west African Ebola outbreak of 2014–2016.[5] Recent estimates suggest that if all malaria-control activities are highly disrupted due to COVID-19, then the malaria burden in 2020 could more than double that in the previous year, resulting in large epidemics across sub-Saharan Africa[6] and putting additional strain on already weak health systems.

In response to this, the WHO has released operational guidance to guide countries to reorganise and maintain safe access to high-quality, essential health services in the pandemic context,[7] and specific guidance for tailoring malaria interventions in the COVID-19 response.[8] This includes SMC, an essential health intervention that has been shown to be safe, feasible, effective and cost-effective for the preventionof malaria among children under five.[9]

Mass drug administration (MDA) of antimalarials was implemented during the Ebola epidemic in 2014. In Liberia, a study found that distributing two rounds of pre-packed artesunate/AQ to children and adults using stringent IPC procedures at a fixed point was challenging, but fast and feasible. Initiation of the MDA course was low because beneficiaries did not feel sick or were saving it for later.[10] Preliminary results from a study in Sierra Leone and Liberia suggest that MDA of antimalarials was feasible and acceptable by the community.[11] However, evidence of adherence to IPC was not explored in these studies.

SMC is typically delivered door-to-door over a period of four days by trained community distributors in monthly cycles between July and October each year. Each SMC course involves one dose of SP and three daily doses of AQ, with SP and the first dose of AQ given under the supervision of the community distributors as directly observed treatment (DOT), and the remaining two doses of AQ given by the caregiver over the following two days. Community distributors work in pairs — one is responsible for administering SMC to eligible children and the other is responsible for completing a tally sheet to record the distribution and then marking the houses as complete. Many community distributors are community health workers (CHWs), a recognised cadre of community-based primary healthcare workers who receive a small stipend from the government. Others are recruited specifically forthe SMC campaign, but all distributors should be from the communities they work with.

A number of factors make SMC delivery challenging in the context of COVID-19. Firstly, during the SMC campaign, community distributors come into close contact with a large number of children and caregivers when assessing the child's eligibility, directly administering SPAQ and giving health

promotion messages to the caregiver. This creates multiple opportunities for someone infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) — the virus responsible for COVID-19 — to transmit the virus through coughing, speaking or exhaling, producing infective respiratory droplets that can be inhaled by anyone close to them. Infected droplets can also land on nearby surfaces in the beneficiaries' homes or in SMC commodities. Community distributors use several materials when distributing SMC, such as job aids, pens, recording forms and blister packs, and have the potential to touch multiple surfaces. Since SARS-CoV-2 remains viable on surfaces for up to 72 hours,[12] these materials and other surfaces can become contaminated and contribute to transmission of the virus when another person touches them. The door-to-door delivery model of SMC has the potential to amplify transmission, with community distributors entering the households of multiple families every day. IPC measures are therefore critical to ensure the safe delivery of SMC during the COVID-19 pandemic.

To achieve the desired health impact, high-quality delivery as well as coverage of SMC is essential. In public health campaigns, quality is typically conceptualised in terms of the degree to which campaigns are safe, efficacious, timely, efficient, equitable and people centred.[13] During COVID-19, delivering SMC safely, in a way that minimises risks and harm to service users, is paramount. This requires addressing IPC needs and challenges with adequate staffing levels to maintain safety. In 2020, the global SMC community developed operational guidance documents to support countries and ensure the safety of communities and health workers when delivering SMC, especially in areas where COVID-19 transmission is reported or national health authorities consider there to be a high risk of community transmission.[14] The guidance documents recommend adaptations to the standard operating procedures for each element of the campaign.

Malaria Consortium's SMC programme aimed to reach almost 12 million under-fives with SMC in Nigeria, Burkina Faso and Chad in 2020. As a major SMC implementer, Malaria Consortium provides technical guidance on IPC behaviours for different types of activities carried out as part of the organisation's projects and programmes,[1] including specific operational guidance for SMC,[2] an accompanying community distributor job aid in English[3] and French,[4] — which outlines the steps for IPC and associated equipment required — and a learning paper on implementing mass campaigns during a pandemic.[5] This study focused on the IPC measures that are recommended for community distributors during the administration of SMC in the community and at the health facility. Safety measures for other intervention components, for example training and supervision, were not explored.

IPC steps to prevent transmission of COVID-19 during SMC administration can be categorised into six domains:

- hand hygiene
- COVID-19-related commodities use
- disinfection of reusable equipment

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[1] Malaria Consortium. COVID19 infection prevention and control behaviours for Malaria Consortium-related activities. London: Malaria Consortium; 2020.

[2] Malaria Consortium. Guidance on safe implementation of seasonal malaria chemoprevention in the contextof COVID-19. London: Malaria Consortium; 2020.

[3] https://www.malariaconsortium.org/gallery-file/06170924-10-smc_covid19jobaid.pdf

[4] https://www.malariaconsortium.org/gallery-file/06170925-46-cps_covid19aidememoire.pdf

[5] Malaria Consortium. Implementing mass campaigns during a pandemic: What we learnt from supporting seasonal malariachemoprevention during COVID-19. London: Malaria Consortium; 2021.

- waste management
- physical distancing
- ensuring community distributors are healthy.

For each domain, there are several moments or 'indications' where a specific IPC action should be followed by the community distributor, in the facility or in the community. For some of the indications, there are associated equipment requirements (see **Table 1**). Community distributors were trained on these measures, in addition to their normal training, prior to the start of the campaign.

Table 1: Definitions of infection prevention and control indications, actions and their corresponding equipment

Step no.	Indication by domain	Action for adherence	Equipment required for adherence
	Hand hygiene		
1.1	Before leaving the health facility for the community, after disinfecting SPAQ blister packs (start of day)	Wash hands for 30 seconds	Soap and running water or alcohol-based hand sanitiser
1.2	When entering a compound/household	Wash hands for 30 seconds	Soap and running water or alcohol-based hand sanitiser
1.3	After disinfecting laminated job aid and SMC materials in the community	Wash hands for 30 seconds	Soap and running water or alcohol-based hand sanitiser
1.4	After disinfecting all SMC materials and removing and disposing of face mask at health facility (end of day)	Wash hands for 30 seconds	Soap and running water or alcohol-based hand sanitiser
	COVID-19-related commodities use		
2.1	Before leaving the health facility	Put on face mask over nose and mouth	New face mask
2.2	When entering a compound/household	Put on face mask over nose and mouth	New face mask
	Disinfection of reusable equipment		
3.1	At health facility (start of day)	Disinfect all SPAQ blister packs	Disinfecting wipes*

3.2	After five households (or if touched by anyone else/placed on a potentially contaminated surface)	Disinfect all SPAQ blister packs	Disinfecting wipes*
3.3	At health facility before storage (end of day)	Disinfect all SPAQ blister packs	Disinfecting wipes*
	Waste management		
4.1	In the community	Dispose of used disinfecting wipes in bio-waste bag.	Bio-waste plastic bag**
4.2	At health facility (end of day) after disinfecting all SMC materials	Dispose of used disinfecting wipes in bio-waste plastic bag.	Bio-waste plastic bag**
4.3	At health facility (end of day)	Remove face mask and dispose in bio-waste plastic bag	Bio-waste plastic bag**
	Safe distancing		
5.1	During child triage	Practice safe distancing of two metres	None
5.2	When determining child's age	Practice safe distancing of 2 metres	None
5.3	When determining eligibility to receive SPAQ	Practice safe distancing of two metres	None
5.4	During SPAQ administration by the caregiver	Practice safe distancing of two metres	None
5.5	During instructions to give AQ tablets and completing record card	Practice safe distancing of two metres	None
5.6	When giving health promotion messages	Practice safe distancing of two metres	None
	Ensuring community distributors are healthy		

6.1	At the health facility (start of day)	Take temperature. Notify supervisor if temperature is >37.5°C orally, >37°C axillary or forehead, >38.0°C by ear	Infrared thermometer^
6.2	At the health facility (end of day)	Take temperature. Notify supervisor if temperature is >37.5°C orally, >37°C axillary or forehead, >38.0°C by ear	Infrared thermometer^

Source: Job Aid

An indication refers to a situation where an IPC measure must be practiced to prevent the risk of SARS-CoV-2 being transmitted from one person or surface to another.

*Or equivalent — bleach and 2ply tissue paper

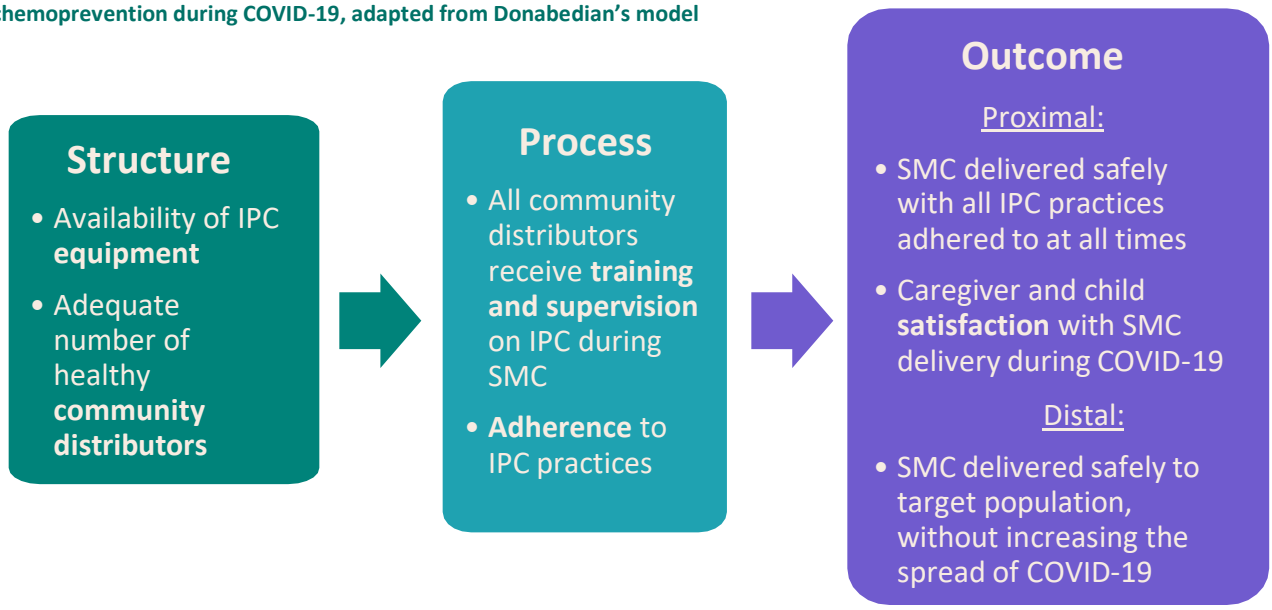
**Or equivalent — black polyethene bag

^Availability of infrared thermometer at health facility was not captured

Critical to the success of safe delivery of the SMC campaign during COVID-19 was the community distributors' adherence to IPC measures when delivering SMC.

Safe delivery of SMC through IPC measures is a core component of quality service delivery. To assess safe delivery of SMC, we adapted the conceptual framework described by Donabedian which outlines three determinants (structures, processes, outcomes) of quality.[15] This is a widely used model that allowed us to explore the underlying mechanisms driving quality (**Figure 1**). Donabedian argues that structure measures have an effect on process measures,which in turn affect outcomes; although, in reality, cause and effect can be more complex.

Figure 1: Conceptual framework for measuring safe delivery of seasonal malaria chemoprevention during COVID-19, adapted from Donabedian's model



The outcomes reflect the impact on the beneficiaries, which in the case of SMC are children and their caregivers. Implementing SMC during COVID-19 with IPC measures should ensure SMC is delivered without increasing the spread of COVID-19, in a way that is satisfactory to beneficiaries. The distal outcome, SMC delivery without increasing the spread of COVID-19, was not measured in this study. Process measures reflect the way in which SMC is delivered to ensure the desired outcome (i.e. with adherence to IPC measures to prevent transmission of COVID-19). Structure measures reflect the attributes of the service provider or the input measures. For SMC to be delivered safely, a sufficient number of healthy[vi] community distributors must be available with corresponding IPC equipment.

2.1 Study aim

To explore community distributors' adherence to IPC measures for SMC during the COVID-19 pandemic.

2.2 Objectives

Primary objective

1. To assess community distributors' adherence to IPC measures during two administration cycles of SMC

Outcomes

1.1 Overall adherence to IPC measures (percentage) by domain[vii]

Secondary objectives

2. To measure availability of equipment for prevention of COVID-19

Outcomes

2.1 Proportion of community distributors who received all equipment for prevention of COVID-19 on day ofobservation

2.2 Proportion of community distributors who received i) hand sanitiser; ii) at least one new mask; iii) disinfection wipes; iv) three sets of disposable cups and spoons; v) a bio-waste bag, on day of observation.

1. To measure caregiver satisfaction of SMC delivery with IPC measures

Outcomes

1.1 Caregivers' views on and satisfaction with SMC delivery using IPC measures

2. To explore community distributors' views on the IPC measures and perception of the barriers and facilitators to adhering to IPC measures

Outcomes

2.1 Community distributors' views on the barriers and facilitators to adhering to IPC measures

2.2 Community distributors' acceptability of the IPC measures

[vi] Not exhibiting fever, cough, body aches, sore throat or difficulty breathing. Not having had close contact with anyone exhibiting these symptoms. Temperature should be checked at the beginning and end of each day using infrared digital thermometers.

[vii] Number of correct actions performed divided by the total number of indications, by domain

3 Study design

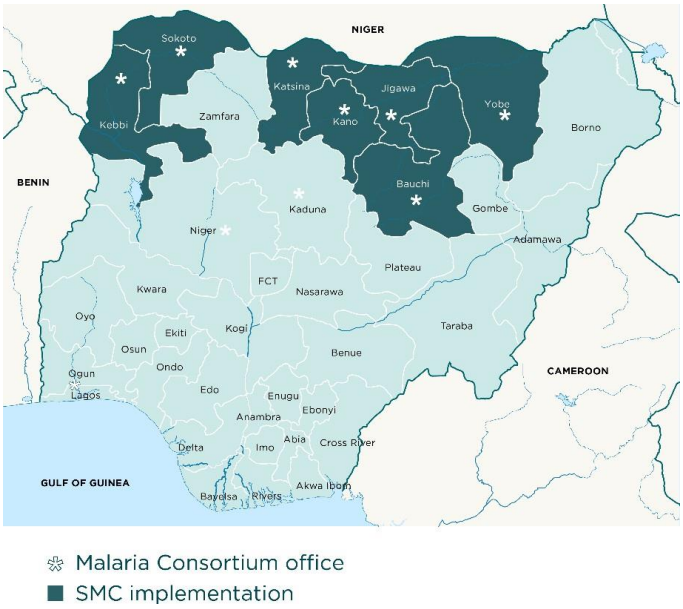
A cross-sectional study design was used to determine adherence to IPC measures during two administration cycles of SMC in September and October 2020. FGDs were conducted with community distributors to explore their perceptions of the IPC measures and barriers and facilitators to adherence.

3.1 Study setting

SMC implementation in Nigeria started in 2013 with a phased implementation study implemented by Malaria Consortium in five local government areas (LGAs) in Katsina and Jigawa states. By 2019, the intervention had been scaled up to 81 LGAs in five states (Borno, Katsina, Jigawa, Sokoto, Yobe, Zamfara), targeting around 4.21 million children. In 2020, Malaria Consortium supported SMC implementation in 176 LGAs across seven states, targeting 9.1 million children (**Figure 2**). Kano, Bauchi and Kebbi were new to the SMC Programme in 2020.

Nigeria recorded its first COVID-19 case imported from China in January 2020 and the second case on 27th February 2020, afterwhich the emergency level was activated across the country. As of 23rd June 2020, 20,919 cases were confirmed, 7,109 cases have been discharged and 525 deaths have been recorded in 35 states and the Federal Capital Territory. Lagos was the worst affected state with 8,864 laboratory confirmed cases (23rd June 2020). In the seven states where Malaria Consortium implemented SMC in 2020, Kano was the worst affected, with >1000 cases and the third highest number of confirmed cases nationally (23rd June 2020). Sokoto, Katsina, Jigawa, Bauchi and Yobe recorded 501–1,000 cases and Kebbi recorded 101–500 cases.

Figure 2: Malaria Consortium's seasonal malaria chemoprevention programme in 2020, Nigeria



Accordingly, the Nigerian Centre for Disease Control (NCDC) implemented several measures to respond to the pandemic, including inter-state travel restrictions, increasing testing capacity, advice to use face masks and other guidance for particular risk groups.[8]

The study was conducted across two SMC implementation states in Nigeria: Kano and Sokoto (**Table 2**). These states were selected so that the study involved one state where SMC implementation was new, and to achieve representation of states in terms of funding: one funded through philanthropic funding and one funded by The Global Fund to Fight AIDS, Tuberculosis and Malaria. In Kano, the SMC implementation dates in 2020 were 13th–16th July (cycle one), 10th–13th August (cycle two), 7th–10th September (cycle three) and 5th–8th October (cycle four). In Sokoto, SMC was implemented 9th–12th July (cycle one), 8th–11th August (cycle two), 10th–13th September (cycle three) and 10–13 October (cycle four).

[8] https://covid19.ncdc.gov.ng/report/

Each state in Nigeria is divided administratively into three senatorial districts. Each of these senatorial districts is further divided into urban and rural LGAs. According to the National Population Commission (NPC), an LGA is classified as urban if the majority of the settlements in the LGA are urban or more than 50 percent of its population reside in urban settlements.

Where the majority of the settlements are rural, or more than 50 percent of the population reside in rural settlements, the LGA is classified as rural. Settlements are, in turn, classified as urban or rural if the population size is greater or less than 20,000, respectively.

Urban LGAs and rural LGAs in each state were selected. The selected LGAs were accessible and secure.

Table 2: Characteristics of selected seasonal malaria chemoprevention states, Nigeria

State	LGAs	Health facilities	No. community distributors	Target population (children under five)	Security (red / amber / green)	Urban / rural / mixed	No. COVID-19 cases confirmed (02.7.20)	Funding stream
Sokoto	23	671	8164	1146391	Amber	Mixed	151	Philanthropic
Kano (new in 2020)	44	1242	21,938	2,899,878	Green	Mixed	1,257	Global Fund

3.2 Sample size

The study was powered to estimate the proportion of community distributors in each country who adhered to all IPC measures for SMC during the COVID-19 pandemic. Using the calculation for a cross-sectional study for proportions,[16] a conservative estimate of 50 percent adherence, desired precision of 7.5 percent, $\alpha = 0.05$, design effect of 1.4[17] was used, with 10 percent increase applied to account for loss to follow-up or missing data. A minimum sample size of n=263 community distributors conducting SMC administration was required for each country.

Due to the variability across the states with SMC implementation in Nigeria, the study was conducted separately by state. Therefore, a total of 528 SMC administration observations was required (264 observations per state * 2 states = 528). Each state required 33 data collectors to conduct one assessment per day for two cycles lasting eight days. This equates to 66 data collectors across seven states. One data collector was assigned to one health facility to observe a different community distributor each day. This required a total of 33 health facilities across Nigeria (33 health facilities per state * 2 states) (**Table 3**).

Table 3: Data collection summary, Nigeria

Number of community distributors observed	Minimum number ofhealth facilities*	Number of data collectors	Length of data collection (days)
528	6	66	8

*Assumes there are eight community distributor pairs per health facility.

The sample size calculation assumed a minimum of eight community distributor pairs per health facility. Additional health facilities were enrolled in areas where fewer than eight community distributor pairs are available. One caregiver satisfaction questionnaire was conducted per health facility (33 per state in Nigeria). The sample size calculation assumes a minimum of eight community distributor pairs per health facility. Additional health facilities were enrolled in areas where fewer than eight community distributor pairs were available.

Health facilities were sampled (**Table 4**) using a multi-stage sampling method. The first stage involved the random selection of one senatorial district in each state. At the second stage, three LGAs (one urban and two rural) were randomly selected from the selected senatorial district in each state. The rationale for sampling more rural LGAs assumed that there were more functional health facilities in the urban areas than in the rural. At the third stage, 17 health facilities were randomly selected from the urban LGA, while 16 health facilities were randomly selected from the two rural LGAs (eight health facilities from each). The number of health facilities selected assumed that each health facility had at least eight teams of community distributors available for recruiting. Where there was a fewer number of teams, more health facilities were sampled until the sample size for community distributors was reached.

Table 4: Health facility sampling

	Nigeria (Sokoto)			Nigeria (Kano)		
	Senatorial district			Senatorial district		
	LGA 1	LGA 2	LGA 3	LGA 1	LGA 2	LGA 3
Urban	17	-	-	17	-	-
Rural		8	8		8	8

Regional health authorities at the LGA level were approached around four weeks prior to the data collection. The purpose of the research and the potential benefits and risks were discussed. It was explained that Malaria Consortium was interested in how SMC could be conducted during a pandemic. It was not discussed that the data collectors would specifically be observing IPC measures, to minimise the likelihood that the behaviour of the health facility or the community distributors could change during data collection. These regional health authorities then informed the selected health facilities. The health facility managers had an opportunity to ask any questions about the research. The health facility manager then had a few days to decide whether they would like the facility to be enrolled. The research coordinator confirmed participation or non-participation with the health facility manager by phone. The exact date of the data collection for the observation was not disclosed to the health facility.

3.3 Subject selection and criteria for inclusion and exclusion

All community distributors participating in the SMC campaign at the selected health facility on the day of the observation were eligible to participate. Within the pair, only the community distributor responsible for the SMC administration process was observed because they have more opportunities for IPC violations (when they are assessing child eligibility, administering the blister packs to the caregivers and giving health promotion advice), than the community distributor responsible for data collection.

For FGDs, all consenting community distributors who participated in the SMC campaign in 2020 at the selected health facilities were eligible to participate. Between six and eight community

distributors participated in each FGD. All consenting caregivers whose child received SMC during a cycle in the catchment of the selected health facility was eligible to participate.

4 Methodology

4.1 Pilot training

A four-day small-scale pilot training was held in Kano from Friday 7th to Monday 10th August. Participants included an external Research Assistant Consultant and state coordinators from the Malaria Elimination Programme, the Operational Research Specialist (Malaria Consortium) and the Technical Field Managers from Oxford Policy Management (OPM) Nigeria. The purpose of the pilot training was to test the training schedule, competency tests and training materials that were provided by Malaria Consortium and to identify areas for improvement and adaptation to the local context. The training schedule included the following sections:

- Welcome and introductions
- Introduction to SMC Programme
- Overview of SMC in Nigeria
- Study overview
- Introduction to Survey CTO
- Practice on Survey CTO
- Data collection tools
- COVID-19: Safe research measures
- Information giving and consent, role plays in Hausa
- Research integrity, ethical issues and considerations during data collection
- Confidentiality and anonymity during data collection, storage and transfer
- SOP review.

Pre- and post-training tests were administrated to the data collectors to test their knowledge of malaria in Nigeria, SMC, use of the Survey CTO application, qualities and skills required from a good data collector, data collection methods with infection prevention measures for COVID-19 and ethics of research. The endline test also contained additional questions drawn from topics raised in the training and a language-based test. Additionally, during the training, data collectors were tested each morning on the content of the training from the previous day.

At the end of the training, an advocacy visit was made to the selected LGA focal person to finalise the selection of the facilities to be visited. A mix of facilities with a high and low number of community distributors was selected so that data collectors were exposed to all possible scenarios and able to draw lessons in terms of ease of sampling at the facility, organisation and space.

4.1.1 Pilot fieldwork

The pilot fieldwork commenced on 12th of August (SMC cycle two), with 12 data collectors (six pairs) each assigned to one facility on the first and second day of fieldwork. A total of six health facilities in six communities were visited. Data collectors were supported by a state coordinator, with OPM Nigeria field staff overseeing and actively supporting. Each day of fieldwork concluded with data collectors capturing learnings in the pilot learning sheet. At the end ofthe fieldwork, 12 SMC community distributor observation tools and 24 caregiver satisfaction tools had been completed and sent to the server. The team met on Friday 14th August to debrief on the field work experience,

logistics, questions that were difficult to understand, experiences and responses. This informed decisions for the main data collection exercise. A summary of the findings and recommendations from the pilot can be found in Appendix 1.

4.2 Training

A four-day, in-person training of 41 data collectors in both Sokoto and Kano state was held from 3rd to 6th September 2020 for Kano and 6th to 9th September 2020 for Sokoto (SMC cycle three). Fieldwork began immediately after training was completed for each of the states. The training schedule and competency testing as per the pilot training were administered.

The mean baseline test score (out of 30), was 50.6 percent (Kano) and 46.1 percent (Sokoto). This increased to 81.9 percent (Kano) and 68.1 percent (Sokoto) post-training. Five data collectors (Kano) and three data collectors (Sokoto) were not recruited to participate in data collection because they did not meet the criteria: punctuality to training, scores in the daily tests, level of participation in class and ability to speak and read Hausa fluently. A total of 36 (Kano) and 38 (Sokoto) data collectors were recruited for the study.

4.2.1 Refresher training

On the 5th and 9th October 2020 (SMC cycle four) in Kano and Sokoto state, respectively, a one-day, in-person refresher training of data collectors was held. In Sokoto state, fieldwork began immediatelyafter training was completed while in Kano State, fieldwork began on the same day as the training. This was due to the state revising the time scheduled for commencement of SMC distribution without appropriate communication to the Malaria Consortium team.

For this cycle, the Sokoto team consisted of 36 data collectors, while in Kano, 37 data collectors participated in the training and fieldwork. Three data collectors who had served as quality assurance/supervisors in the previous cycle were assigned from each state to cover one LGA each, serving as inter-raters. The selected quality assurance personnel who equally served as inter-raters were selected based on their performance during the training in terms of active participation and performance in assessments throughout. They were assigned to monitor one adept, one mid-level and one weak data collector who were categorised on the basis of their performance in tests and the previous data collection round. Monitoring continued over the course of the cycle across all three LGAs, during which the inter-raters were tasked with observing the consent process and with collecting data simultaneously with each data collector they had been paired with for comparison.

Training for this cycle focused on the protocol for selecting community distributors, ensuring that no previously observed community distributor was reselected and emphasising that health facilities with fewer than six community distributors were to be dropped immediately to allow for a sufficient sample from which to randomly select. A refresher of all components of the training covered in the first data collection cycle was also covered.

4.3 Data collection

Observation

Prior to the start of the SMC cycle, a meeting of managers and community distributors at the facility was held to communicate the purpose of the study and take questions. The data collectors then came back the next day to identify those interested in taking part and to obtain consent from them. Depending on the organisation of the health facility, the data collector could visit the health centre the day before the SMC distribution to observe the distribution of SMC and COVID-19-related commodities to the community distributors.

Prior to each cycle, all data collection tools were reviewed and updated to reflect current national

guidance on COVID-19 prevention during SMC.

Data capture was performed using the SurveyCTO software application on mobile devices.[9] Standard operating procedures for data collectors and data managers were followed. Data collectors arrived at the health facility early in the morning before the community distributors arrived and prepared for data collection.

The data collector observed one community distributor per day. Once the community distributor had given consent, they were assigned a unique identification number. The data collector completed the basic information sheet with the community distributor. The observation checklist was designed to account for the possibility that a community distributor may violate IPC measures in the health facility (start and end of day) and in the community. The observational checklist recorded key procedures for the safe delivery of SMC according to the job aid. The observation followed the order of the job aid, but the data collector may have completed the checklist in a different order, according to what happened in practice. The data collector tried to be as discreet as possible, and avoided speaking or making any other noise or interference. They chose a position close enough to the community distributor to be able to see the procedures, but far enough away that they did not to interfere. If the data collector could not see the action clearly, they could record the option "cannot say".

At the health facility in the morning, the data collector observed the community distributor's temperature monitoring and recording, the equipment distribution and whether the recommended steps for IPC at the health facility were followed. The data collector then travelled to the community to observe SMC distribution. In the community, the data collector observed five compound/household SMC distributions. At the fifth compound/household, once the community distributor had left the area, the data collector completed the caregiver satisfaction questionnaire with the selected caregiver. They then returned to the health facility to observe the recommended steps for IPC at the end of the day. Once complete, the data collector synced the data collection forms to the cloud.

For a sample of observations (five percent), a second observer observed the same community distributor at the same time for quality assurance purposes, as previously described.

In **September**, fieldwork ran from 7th to 10th September in Kano state and from 10th to 13th September in Sokoto state. Thirty-four health centres were selected across three LGAs in Kano in the following order: Kano municipal, which was selected as an urban LGA, had 17 health centres; Kura and Warawa LGA, which were both selected as rural LGAs, had nine and eight health centres, respectively.

In the same vein, Sokoto state had 33 health centres selected across three LGAs in the following order: Sokoto South, which was selected as an urban LGA, had 17 health centres; Silame and Tangaza LGA, which were both selected as rural LGAs, had eight health centres each. Four community distributors and four caregivers were selected per health facility, with two additional community distributors as a backup. A total of 268 community distributors and caregivers participated in this study across the 67 health facilities selected across Kano and Sokoto states.

Each of the participants signed and submitted a consent form and the data collectors submitted a daily report of work completed, which was beneficial to the daily data checks. Reports were categorised into three major themes: completeness, clarity and consistency.

In **October**, fieldwork ran from 5th to 8th October in Kano state and from 10th to 13th October in Sokoto state. As with the first cycle, the same LGAs previously selected were maintained in keeping with the protocol of two rural and one urban LGA. Thirty-three health centres were selected within

[9] https://www.surveycto.com/

one senatorial district across the three LGAs in Kano, in the following order: Kano municipal, selected as an urban LGA, had 17 health centres; Kura and Warawa LGA, which were both selected as rural LGAs, had eight health centres each. While four health centres were replaced entirely, two were paired up with a newly selected health centre in order to meet the criteria of observing four different community distributors. This happened across Kura and Warawa LGA in Kano state. However, because distribution of malaria drugs started in Kano earlier than scheduled, only 21 out of the 33 health centres could be observed on the first day of SMC distribution.

In Sokoto state, though the same two senatorial districts were maintained, five LGAs were visited instead of three. The three LGAs selected in cycle one included Sokoto South (which was selected as an urban LGA having 17 health centres), Silame and Tangaza (which were both selected as rural LGAs having eight health centres, each). However, some health facilities selected in the previous cycle did not have the required number of community distributors for this cycle; therefore, six health facilities in Tangaza, three health facilities in Sokoto South and seven health facilities in Silame LGA were replaced. Some health facilities selected as replacements still had shortfalls as a result of differences between the number of community distributors reported and the actual number on the ground. As a result, two data collectors in Sokoto South additionally had to complete observations at health facilities in Sokoto North LGA. Moreover, due to a report of security threats in Labsani in Tangaza LGA, three data collectors had to complete observations at Wammako LGA. This was because replacements had been exhausted in both Sokoto South and Tangaza. Three data collectors in Silame also had to complete work at other health facilities, though fortunately, within the same LGA.

A total of 252 community distributors and caregivers participated in this study across 75 health facilities selected in Kano and Sokoto states. Each of the participants signed and submitted a consent form and the data collectors submitted a daily report of work completed, which was beneficial to the daily data checks.

Caregiver satisfaction questionnaire

Caregivers in the catchment area of enrolled health facilities were informed about the study by the village leaders and had an opportunity to ask questions. Participation in SMC was verified by child SMC record cards. A caregiver from every fifth household/compound to be observed receiving SMC was selected. On the day of administering the questionnaire, caregivers were given information about the study and taken through the informed consent process by the data collector (**Table 5**). Each caregiver was given ample time to decide whether or not they would like to participate.

Table 5: Summary of data collection methods and participants, by objective

Objective	Data collection method	Participants
1. To assess community distributors' adherence to IPC measures during two administration cycles of SMC	Direct observation	Community distributor responsible for SMC administration, participating in the SMC campaign at the selected health facility on the day of the observation
2. To measure availability of equipment for prevention of COVID-19	Direct observation	As above

3. To measure caregiver satisfaction of SMC delivery with IPC measures	Satisfaction questionnaire	Caregiver of child under five whose child received SMC during the cycle in the catchment of the selected health facility
4. To explore community distributors' views on IPC measures and perception of the barriers and facilitators to adhering to IPC measures	FGD	Community distributors who participated in the SMC campaign in 2020 at the selectedhealth facilities

Focus group discussions

In September and October, a meeting of managers and community distributors at the facility was held to provide information about the qualitative study and answer questions. The data collectors then came back the next day to identify those interested in taking part and obtained consent from them.

FGDs were conducted in a quiet environment where community distributors felt comfortable to speak openly and without disturbance. All community distributors were taken through the information-giving and consent process and their basic information was captured.

FGDs were conducted to explore the barriers and facilitators to delivering SMC with IPC measures. The topic guide was designed to explore key factors relating to quality of safe delivery: training, challenges of adhering to safe delivery of SMC, equipment availability, acceptability of IPC measures, and knowledge and awareness of COVID-19. To facilitate open discussion, male and female community distributors were split into separate discussion groups, where possible. Two-to-four FGDs were conducted per state. These samples, it was felt, were sufficient to reach theoretical saturation. On review of the transcriptions, if saturation was attained before reaching the full sample size for FGDs, we considered stopping qualitative evaluations early.

All FGDs were facilitated by a team of two data collectors consisting of a moderator and a note taker, and all interviews were recorded on a Dictaphone. The moderator was responsible for asking questions and moderating the discussion and the note taker was responsiblefor setting up the Dictaphone and recording notes. Qualitative data collection started with a four-day Zoom online training with four data collectors. The training was conducted from 19th to 21st October and included a day to pilot the tools for the study and debrief on findings and observations. Fieldwork began on 22nd October and was conducted overa period of four days until 25th October.

FGDs were conducted with community distributors who participated in this year's round of SMC. Data collectors selected two community distributors through convenience sampling across four health facilities to converge at a central facility for each discussion. A total of eight sessions were carried out with three female sessions and a male session in the urban LGAs across both Kano and Sokoto states, and a male and female session each across the two rural LGAs in both states. These sessions were recorded.

4.4 Data Analysis

Quantitative data were aggregated and cleaned in Microsoft Excel. Data analysis was conducted in STATA/SE version 16.

For descriptive statistics, frequencies and proportions were calculated for categorical data, whereas mean, standard deviation and range were calculated for continuous data. Adherence to IPC was calculated at the indication level and then summed up to give a total adherence proportion per domain: 1) hand hygiene; 2) disinfection of SPAQ blister packs; 3) mask use; 4) waste management; 5) safe distancing in the compound; and 6) ensuring community distributors are healthy. For each indication, adherence was coded as 'one' if the community distributors correctly performed the action or 'zero' if they did not. If the community distributor did not have the necessary equipment to perform the action, or the data collector could not visibly see the action, it was coded as missing and was excluded from the numerator and denominator. Adherence to IPC measures was analysed descriptively, reported as a proportion for each individual indication and overall, by domain.

Equipment availability analysis was conducted at the level of the community distributor, expressed as a proportion and disaggregated at the LGA level (Nigeria).

For the caregiver satisfaction questionnaire, free-text responses were analysed and common themes described. Illustrative quotes were presented. Multiple choice answers were analysed at the caregiver level to summarise the number and proportion of caregivers who responded with each answer. Graphs were used to display this information visually.

To explore predictors of hand-hygiene adherence, we did bivariate and adjusted analyses. When deriving standard errors, we accounted for clustering at the level of the individual due to repeated observations on individuals.

Inter-rater reliability was calculated for a proportion of observations where two data collectors observed a single community distributor at the same time.

We conducted a thematic analysis of the qualitative data.[18] Transcripts of FGDs were read by two members of the team to generate a coding list, which was then applied to all transcripts. The team used NVivo (2018) qualitative data analysis software to code, manage and retrieve data. Potential themes were identified and all data relevant to each theme collated. Themes were then discussed together by the full team and consolidated. Theme names were agreed by the team and each theme description was refined to elaborate the similarities and differences across the states and substantiated with compelling participant quotes.

4.5 Quality assurance

During data collection, a number of quality control measures were applied to ensure the data recorded reflected the actual facts, responses, observations and events. A standard operating procedure with roles and responsibilities of the data collectors was prepared to ensure standardised methods for capturing data. Standardised topic guides that have been back-translated to check for authenticity during translation from English to the local language were used.

The project coordinator and the Principal Investigator (PI)/co-PI were present for the duration of the study to oversee datacollection. They were on site, but did not directly observe the FGD, so as not to bias the responses.

Data capture was performed using the SurveyCTO software application, which was prepared for the survey. During fieldwork, daily quality assurance checks were carried out using STATA 16 and to flag inconsistencies in the tabulations of each question for each tool. Inter-rater reliability between two data collectors observing the same community distributor was calculated for a sample (five percent) of observations: kappa: 0.77, standard error: 0.02. This can be interpreted as 'high' agreement. Daily quality assurance checks were also carried out for the qualitative data through the back-translation of transcripts to check for authenticity during translation into English.

4.6 Challenges encountered during fieldwork

- Community distributors in some communities arrived at the health facility as late as11 a.m., which resulted in a delay to the start of activities.
- Ahead of the start of fieldwork, some health centres were replaced due to a reported low number of community distributors in those health centres. Across both states, but more so in Sokoto, some health facility in-charges reported 'recorders' (the community distributor of the pair responsible for recording SPAQ administration as opposed to supervising SPAQ administration) as community distributors when contacted. For example, they gave a community distributor strength of six, but when data collectors got to the health facility, they realised the staff strength of six was actually three community distributors and three 'recorders'. This meant that observations had to occur across two facilities in some instances. Data collectors had to go ahead with observation on the first day in the facility with the shortfall, since leaving to go to another facility at the time of discovery would result in their missing the beginning of day observation, considering travel time. The enumerator was then assigned anew health facility the next day to complete observations. As much as was practicable, we maintained the same LGA; however, for Sokoto South and Tangaza LGA — both of which recorded a shortage of facilities — replacement facilities were selected from Sokoto North and Wammako LGAs, respectively.
- In Sokoto, during the September round of data collection, on the third day of fieldwork, there was an incident of kidnap on Gurdam Road a few hours after the team left the area. This resulted in roadblocks. The data collector assigned to Gurdam health post was then re-assigned to Tangaza town dispensary to complete the last day of work.
- There was also a security threat in Labsani, Tangaza LGA on the first day of work. As a result this location had to be replaced immediately with PHC Kasarawa in Wammako LGA, since the remaining health facilities in Tangaza LGA could also not be accessed for security reasons.
- Further challenges encountered during the qualitative data collection included the following:
- FGDs happened concurrently with the polio immunization exercise in Sokoto states. Some community distributors participated in this exercise, which meant that interviews had to be scheduled later in the day to accommodate them. In some cases, interviews had to be rescheduled when they were all available.
- Identifying and maintaining silence in the interview locations was difficult because discussions had to be held within the hospital premises. The teams did their best, however, to limit noise and movements within the vicinity.

5 Results

6 Quantitative findings

6.1.1 Health facility characteristics

Table 6: Health facility characteristics, by state

	Total	
Characteristics	**Value (n)**	**Percent (%)**
Number of health facilities	79	100.0
State		
Kano	38	48.1
Sokoto	41	51.9
LGA		
Kano Municipal	17	21.5
Kura	11	13.9
Silame	11	13.9
Sokoto South	19	24.1
Tangaza	11	13.9
Warawa	10	12.7
Urbanicity		
Rural	43	54.4
Urban	36	45.6
Abbreviations: n=number of health facilities with characteristic		

Out of the 79 health facilities involved in the study, there was a slightly larger number of health facilities in Sokoto (52 percent) compared to Kano (48 percent) state, with more located in rural areas than in urban ones (54 versus 46 percent, respectively). The highest proportion of health facilities was located in Sokoto South LGA (24 percent) in Sokoto state, and in Kano Municipal LGA (22 percent) in Kano state.

6.1.2 Community distributor characteristics

Table 7: Community distributor characteristics, by state

	Kano		Sokoto	
Characteristics	**Value (n)**	**Percent (%)**	**Value (n)**	**Percent (%)**
Number of community distributors participating in observation	252	100	259	100
Age (years), mean [SD], min, max	26.3	[6.4], 18, 55	28.7	[10.2], 18, 70
Age (years)				
<30	185	73.4	168	64.9
30-49	66	26.2	73	28.2
≥50	1	0.4	18	6.9
Sex				
Female	217	86.1	232	89.6
Male	35	13.9	27	10.4
Education				
No education	1	0.4	21	8.1
Arabic/Islamic school	4	1.6	31	12.0
Some primary	0	0.0	5	1.9
Completed primary	2	0.8	11	4.2
Some secondary	9	3.6	25	9.7
Completed secondary	76	30.2	87	33.6
Some tertiary	58	23.0	26	10.0
Completed tertiary	102	40.5	53	20.5
Years of experience within SMC programme, mean [SD] min, max	3.0	[1.0], 1, 6	3.2	[1.7], 1, 7

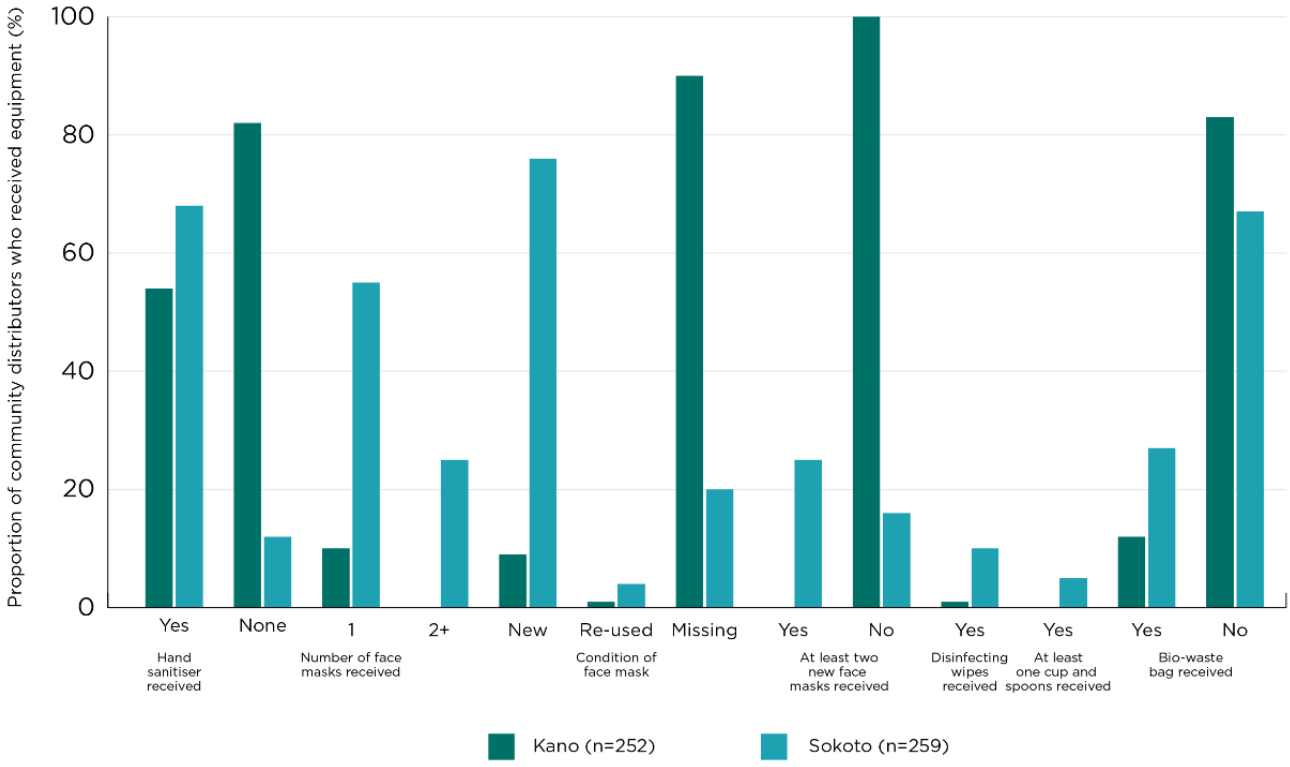
There were 252 and 259 community distributors in Kano and Sokoto state, respectively. The majority of community distributors were aged under 30 (65 percent and 73 percent in Sokoto and Kano state,

respectively), and female (90 percent in Sokoto and 86 percent in Kano state). In Sokoto state, the majority of community distributors (34%) completed secondary education, four percent had completed primary education, while nine percent had received no education. In Kano state, the majority of community distributors (41 percent) had completed tertiary education and <1 percent completed primary education or had no education.The average number of years of experience working within the SMC programme was around three years in both states.

6.1.3 Equipment availability for seasonal malaria chemoprevention distribution

Fifty-four percent and 68 percent of community distributors in Kano and Sokoto state, respectively, reported receiving hand sanitiser. In Kano state, a very high proportion (82 percent) of community distributors reported not receiving any face masks, and only 10 percent reported receiving one face mask. In Sokoto state, 55 percent and 25 percent of community distributors received 1–2 or more face masks, respectively. Twenty-seven percent of community distributors received a bio-waste bag; five percent reported receiving at least one cup and spoon; while 10 percent received disinfecting wipes in Sokoto state. In contrast, in Kano state, 12 percent of community distributors received a bio-waste bag, one percent received disinfecting wipes and none received a cup and spoon.

Figure 3: Equipment availability for seasonal malaria chemoprevention distribution, by state



6.1.4 Adherence to infection prevention and control, Kano State

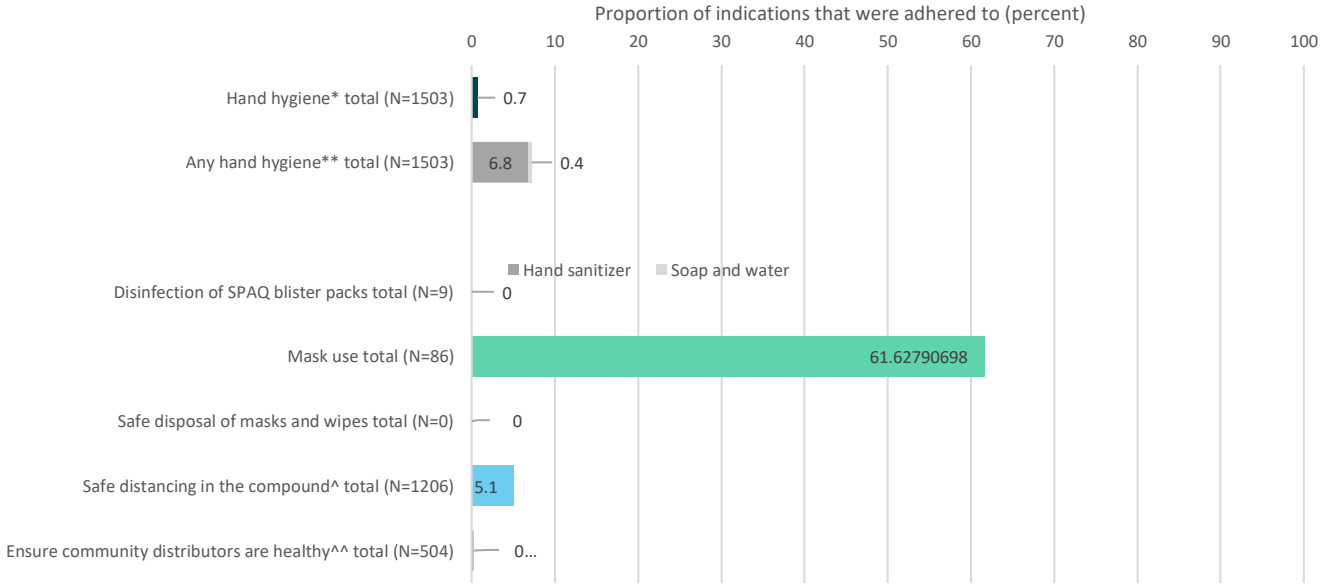
In total, there were 1,503 opportunities for performing hand hygiene at several stages of the SMC campaign: before entering the community, at each of the five compounds, after disinfecting materials inthe community, and after disinfecting materials and disposing of masks and wipes. A total of 0.7 percent of indications was adhered to (11 out of 1,503), all of which were with hand sanitiser for ≥30 seconds. Out of the 1,503 opportunities for performing hand hygiene with both soap and water or hand sanitiser, 6.8 percent was achieved using hand sanitiser and 0.4 percent using soap and water, which is inadequate. Adherence to IPC measures was greatest for mask use at 61.5 percent. Safe distancing in the compounds was 5.1 percent, indicating a low level of IPC

adherence. Among community distributors, there was zero adherence to the disinfection of SPAQ blister packs and safe disposal of masks and wipes. These data are summarised in **Figure 4** below.

Out of the 1,206 total opportunities for safe distancing, 5.1 percent were performed with adherence to IPC measures. Safe distancing was practised most when determining a child's age (35.8 percent), during triage (27 percent) and when giving instructions for day 2 and 3 AQ administration (27 percent). This was lowest when giving health promotion messages, at just 10 percent (see **Table 15** of the annex).

The average time community distributors spent washing their hands at the health facility in the morning was 15 seconds, with time spent ranging from two to 35 seconds. In the evening, the average time spent washing hands at the health facility was 22 seconds, with the time spent ranging from five to 42 seconds (see **Table 14** of the annex).

Figure 4: Adherence to infection prevention and control measures in Kano state, Nigeria



*Washed hands with soap and running water or hand sanitiser for ≥30 seconds

**Washed hands with soap and running water or hand sanitiser

^ during triage *and* when determining age eligibility *and* SPAQ eligibility *and* SPAQ administration *and* instructions*and* messages

^^Take temperature with infrared thermometer

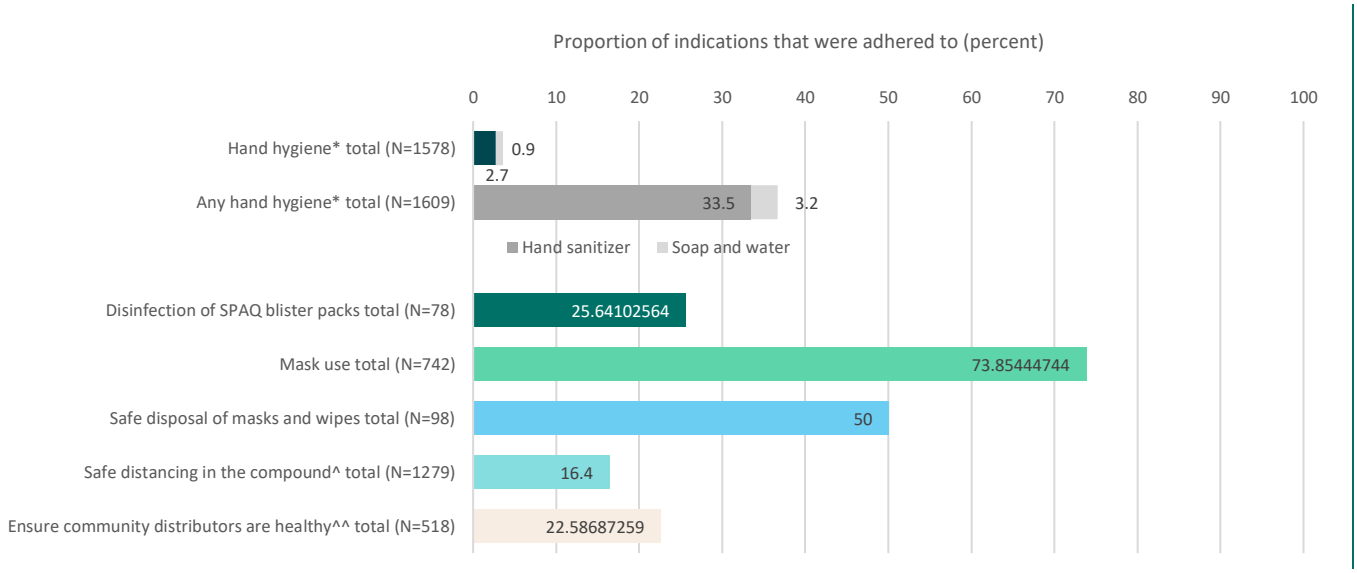
6.1.5 Adherence to infection prevention and control, Sokoto State

In total, there were 1,578 opportunities for performing hand hygiene at several stages of the SMC campaign: before entering the community, at each of five compounds, after disinfecting materials in the community, and after disinfecting materials and disposing of masks/wipes. A total of 3.5 percent of indications were adhered to (56 out of 1,578), which included either washing hands with soap and running water (0.9 percent) or hand sanitiser (2.7 percent) for ≥30 seconds. Out of the 1,578 opportunities for performing hand hygiene with both soap and water or hand sanitiser for <30 seconds, 33.5 percent was achieved using hand sanitiser and 3.2 percent using soap and water. Adherence to IPC measures was greatest for mask use at 73.9 percent, of which there were 742 opportunities in total. Adherence to the disinfection of SPAQ blisters packs and safe disposal of masks and wipes was 25.6 percent and 50 percent, respectively. These data are summarised in **Figure 5** below.

Out of the 1,284 total opportunities for safe distancing, 17.2 percent were performed with adherence to IPC measures. Safe distancing was practised most during triage (61.6 percent), when determining the child's age (57.4 percent) and when determining eligibility to receive SPAQ (54.8 percent). This was lowest when giving health promotion messages, at just 30.4%percent (see **Table 15** of the annex).

The average time community distributors spent washing their hands at the health facility in the morning was 15 seconds, with time spent ranging from two to 35 seconds. In the evening, the average time spent washing hands at the health facility was 22 seconds, with the time spent ranging from five to 42 seconds (see **Table 14** of the annex).

Figure 5: Adherence to infection prevention and control measures in Sokoto state, Nigeria



*Washed hands with soap and running water or hand sanitiser for ≥30 seconds;

**Washed hands with soap and running water or hand sanitiser;

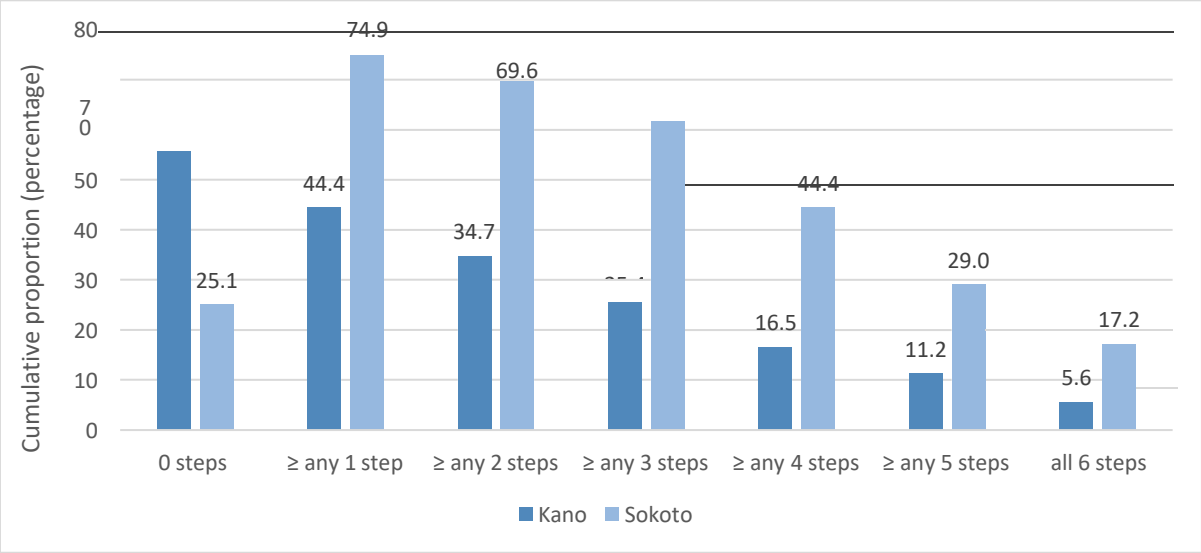
^ during triage AND when determining age eligibility AND SPAQ eligibility AND SPAQ administration AND instructions AND messages

^^Take temperature with infrared thermometer

Total number of steps where safe distancing was adhered to across all compounds

Adherence to safe distancing during all six key steps of the campaign (during triage, determining age eligibility, SPAQ eligibility, SPAQ administration, giving instructions and health messages) was 5.6 percent in Kano and 17.2 percent in Sokoto state. Adherence to safe distancing was highest in Sokoto state (74.9 percent) in at least one step (see **Figure 6** below).

Figure 6: Total number of steps* where safe distancing was adhered to across all compounds



*During triage; age eligibility; SPAQ eligibility; SPAQ administration; instructions; health messages

6.1.6 Exploratory analysis — exploring predictors of hand hygiene adherence

For all these assessments, the hand hygiene outcome was defined as hand hygiene using running water and soap or hand sanitiser for at least >30 seconds.

In Kano state, important predictors of hand hygiene adherence, as presented in table 8 below, include:

- Age: Increasing age in years was significantly associated with increased odds of hand hygiene adherence, after controlling for the environment, sex, SMC years of experience, and education
- Years of experience within the SMC programme: increasing CHW experience was significantly associated with reduced odds of IPC adherence, after accounting for the environment, sex, age, and education.

Table 8: Predictors of infection prevention and control adherence, using full adherence to hand hygiene with water and soap or hand sanitiser as outcome — Kano state, Nigeria

Characteristic	Unadjusted		Adjusted	
	Odds ratio (OR) (95 % confidence interval [CI])	p-value	OR (95% CI)	p-value
Observation time*	0.69 (0.48 – 0.99)	**0.049**	0.61 (0.32 – 1.18)	0.141
Environment				
Health facility	*1*	**Ref**	*1*	**Ref**
Community	0.52 (0.15 – 1.84)	0.310	1.79 (0.24 – 13.27)	0.570
Sex				
Female	*1*	*Ref*	*1*	*Ref*

Male	1.37 (0.29 – 6.59)	0.693	1.14 (0.24 – 5.24)	0.870
Age	1.11 (1.03 – 1.19)	**0.006**	1.14 (1.04 – 1.25)	**0.007**
Years of SMC experience	0.61 (0.38 – 0.97)	**0.038**	0.57 (0.36 – 0.92)	**0.022**
Education	1.07 (0.49 – 2.35)	0.860	1.22 (0.69 – 2.18)	0.494

Note: Hygiene method was not applicable in Kano due to data sparseness. *Time of day that theobservation was done.

In Sokoto state, important predictors of hand hygiene adherence, as presented in **Table 9** below, include:

- Sex: male sex was significantly associated with lower odds of hand hygiene adherence
- Hygiene method: sanitiser was significantly associated with lower odds of hand hygiene adherence.

Table 9: Predictors of infection prevention and control adherence using full adherence to hand hygiene with water and soap or hand sanitiser as outcome — Sokoto state, Nigeria

Characteristic	Unadjusted		Adjusted	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Observation time*	0.91 (0.75 – 1.09)	0.308	1.05 (0.91 – 1.22)	0.490
Environment				
Health facility	*1*	*Ref*	*1*	*Ref*
Community	0.30 (0.17 – 0.50)	**<0.001**	0.61 (0.15 – 0.59)	0.183
Sex				
Female	*1*	*Ref*	*1*	*Ref*
Male	0.32 (0.08 – 1.26)	0.103	0.23 (0.06 – 0.94)	**0.041**
Age	0.97 (0.93 – 1.00)	0.082	0.98 (0.93 – 1.03)	0.446
SMC years	1.06 (0.86 – 1.30)	0.578	1.20 (0.97 – 1.50)	0.096
Education	1.23 (1.03 – 1.47)	**0.023**	1.01 (1.01 – 1.50)	0.946
Hygiene method				
	1	*Ref*	*1*	*Ref*
Sanitiser	0.18 (0.09 – 0.39)	**<0.001**	0.23 (0.09 – 059)	**0.002**

Note: After accounting for method of hygiene in the adjusted model, the significant effects of environment and education that were present in the adjusted model without hygiene methoddisappear. *Time of day that the observation was done.

6.1.7 Caregiver characteristics

There were 252 and 260 caregivers who participated in Kano and Sokoto state, respectively. The average ages were 31 (min. age 22; max. age 65) in Kano and 30 (min. age 20; max age 60) in Sokoto state. In total, 99.2 percent of caregivers were female in Kano state, while in Sokoto state, 99.6 percent were female.

Around 95 percent of caregivers were the mother of the child receiving SMC in Sokoto state, while this was 95.6 percent in Kano state. Over a quarter (26.2 percent) of caregivers in Kano state had completed secondary school, while 19 percent had no education. In Sokoto state, around a third of caregivers (33.5 percent) had attended Arabic or Islamic school, 10.8 percent had completed secondary education and 29.2 percent had no education. More than half (54 percent) of the caregivers in Kano state were residents of Kano Municipal; similarly, more than half (53.1 percent) of the caregivers in Sokoto state resided in Tangaza LGA.

Table 10: Caregiver characteristics, by state

	Kano		Sokoto	
Characteristics	**Value (n)**	**Percentage (%)**	**Value (n)**	**Percentage (%)**
Number of caregivers participating in thequestionnaire	252		260	
Age (years), mean [SD] min max	31.3 (7.7), 22–65		30.1 (7.5), 20–60	
Age (years)				
<30	99	39.3	125	48.1
30-49	148	58.7	127	48.8
≥50	5	2.0	8	3.1
Sex				
Male	2	0.8	1	0.4
Female	250	99.2	259	99.6
Education				
No education	48	19.0	76	29.2
Arabic/Islamic school	48	19.0	87	33.5
Some primary	16	6.3	17	6.5
Completed primary	26	10.3	14	5.4

Some secondary	26	10.3	11	4.2
Completed secondary	66	26.2	28	10.8
Some tertiary	3	1.2	8	3.1
Completed tertiary	18	7.1	18	6.9
Other	1	0.4	1	0.4
Relationship to the child				
Mother	241	95.6	246	94.6
Father	1	0.4	0	0.0
Grandmother	8	3.2	9	3.5
Grandfather	1	0.4	0	0.0
Other	1	0.4	5	1.9
LGA				
Kano Municipal	136	54.0		
Kura	59	23.4		
Warawa	57	22.6		
Sokoto South			61	23.5
Silame			61	23.5
Tangaza			138	53.1

6.1.8 Caregivers' awareness of COVID-19, sources of knowledge and satisfaction with the enhanced infection prevention and control measures

Table 11: Caregiver awareness of COVID-19, sources of knowledge and satisfaction with seasonal malaria chemoprevention distribution with enhanced infection prevention and control measures, by state

	Kano		Sokoto	
Characteristics	**Value (n)**	**Percentage (%)**	**Value (n)**	**Percentage (%)**
Number of caregivers participating in the questionnaire	252		260	
Aware of COVID-19?				
Yes	250	99.2	236	90.8

Heard or seen any COVID-19 messages?				
Yes	234	93.6	217	83.5
One message that stayed with them				
Two metres safe distancing	15	6.4	41	17.5
It kills	62	26.5	65	27.8
It causes fever	24	10.3	24	10.3
Wash hands regularly	55	23.5	44	18.8
Take vitamin C and lemon	1	0.4	0	0.0
Symptoms like malaria	13	5.6	1	0.4
Causes difficulty in breathing	37	15.8	17	7.3
Important to wear a face mask	20	8.5	13	5.6
Other	7	3.0	12	5.1
Source of knowledge (non-exclusive categories)				
Community distributors	1	0.4	8	3.4
Health worker	27	11.5	26	11.1
Newspaper	6	2.6	5	2.1
Social media	53	22.6	41	17.5
Govt. website	2	0.9	1	0.4
Radio	202	86.3	151	64.5
TV	90	38.5	57	24.4
International radio	7	3.0	13	5.6
International TV	7	3.0	14	6.0
SMS	42	17.9	25	10.7
Word of mouth	59	25.2	27	11.5
Other	5	2.1	11	4.7
Caregiver felt that COVID-19 safety precautions were necessary				
Strongly agree	122	48.8	109	46.2
Agree	106	42.4	112	47.5

Neither agree nor disagree	10	4.0	10	4.2
Disagree	8	3.2	5	2.1
Strongly disagree	4	1.6	0	0.0
Caregiver felt that COVID-19 safety precautions were uncomfortable				
Strongly agree	70	28.0	63	26.7
Agree	68	27.2	77	32.6
Neither agree nor disagree	13	5.2	12	5.1
Disagree	79	31.6	68	28.8
Strongly disagree	20	8.0	16	6.8
Caregiver felt that COVID-19 safety precautions were sufficient				
Strongly agree	90	36.0	86	36.4
Agree	124	49.6	132	55.9
Neither agree nor disagree	12	4.8	6	2.5
Disagree	16	6.4	11	4.7
Strongly disagree	8	3.2	1	0.4
What else could the community distributor do to ensure safety? (non-exclusive categories)				
Two metres safe distancing	87	34.8	104	44.1
Wash hands more frequently	119	47.6	88	37.3
Wash hands with soap and water	50	20.0	43	18.2
Work outside the compound	7	2.8	5	2.1
Give mask to caregivers	53	21.2	30	12.7
Give hand sanitiser to caregivers	17	6.8	10	4.2
Nothing	46	18.4	52	22.0
Other	23	9.2	18	7.6
Positive changes that should remain after the pandemic (non-exclusive categories)				
Caregiver administers day 1 SPAQ	11	4.4	45	19.1
Hand hygiene	186	74.4	137	58.1
Two metres safe distancing	65	26.0	66	28.0

Wearing face mask	94	37.6	59	25.0
Nothing	24	9.6	30	12.7
Other	25	10.0	12	5.1
Community distributor sanitised hands as they entered the household (non-exclusive categories)				
Yes	23	9.1	67	28.4
No	192	76.2	117	49.6
Don't know	35	13.9	52	22.0
Missing	2	0.8	24	10.2
Community distributor wore a mask				
Yes	80	32.0	173	73.3
No	163	64.7	52	22.0
Don't know	7	2.8	11	4.7
Missing	2	0.8	24	10.2
Mask covered community distributor's nose and mouth				
Yes	63	78.8	147	85.0
No	16	20.0	23	13.3
Don't know	1	1.3	3	1.7
Community distributor maintained two-meter distance with caregiver and child				
Yes	124	49.6	155	65.7
No	123	49.2	66	28.0
Don't know	3	1.2	15	6.4

Overall, 99.2 percent of caregivers in Kano state and 90.8 percent in Sokoto state were aware of COVID-19, while 93.6 percent and 83.5percent in Kano and Sokoto state, respectively, had heard or seen any COVID-19-related messages. Among caregivers who had heard or seen COVID-19 messages, the one message that was most remembered was 'It kills' (Kano: 26.5 percent; Sokoto: 27.8 percent). Other key messages that stayed with caregivers included 'Wash hands regularly' (Kano: 23.5 percent; Sokoto: 18.8 percent), 'Two metres safe distancing'(Kano: 6.4 percent; Sokoto: 17.5 percent), 'It causes fever' (Kano: 10.3 percent; Sokoto: 10.3 percent), 'Causes difficulty breathing' (Kano: 15.8 percent; Sokoto: 7.3 percent) and 'Important to wear a face mask' (Kano: 8.5 percent; Sokoto: 5.6 percent). The most common sources of caregivers' knowledge were the radio (Kano: 86.3 percent; Sokoto: 64.6 percent) and TV (Kano: 38.5 percent; 24.4 percent).

In Kano state, 48.8 percent and 42.4 percent of caregivers reported that they 'strongly agree' and

‘agree’, respectively, that the COVID-19 safety precautions were necessary. In Sokoto state, 46.2 percent and 47.5 percent of caregivers reported that they ‘strongly agree’ and ‘agree’, respectively. However, more than half of caregivers in both states indicated that they ‘strongly agree’ or ‘agree’ that COVID-19 safety precautions were uncomfortable. In contrast, 31.6 percent of caregivers in Kano state and 28.8 percent in Sokoto state ‘disagree’ that the COVID-19 safety precautions were uncomfortable. Over 80 percent of caregivers in both states reported that they ‘strongly agree’ or ‘agree’ that the COVID-19 safety precautions were sufficient.

When caregivers were asked ‘What else could the community distributors do to ensure safety?’ the most common responses included ‘Wash hands more frequently’ (Kano: 47.6 percent; Sokoto: 37.3 percent), ‘Two metres safe distancing’ (Kano: 34.8 percent; Sokoto: 44.1 percent), ‘Give mask to caregivers’ (Kano: 21.2 percent; Sokoto: 12.7 percent) and ‘Wash hands with soap and water’ (Kano: 20 percent; Sokoto: 18.2 percent). Caregivers highlighted ‘Hand hygiene’ (Kano: 74.4 percent; Sokoto: 58.1 percent) as the key positive change that should remain after the pandemic. Over three-quarters of caregivers (76.2 percent) in Kano and about half (49.6 percent) in Sokoto reported that community distributors did not sanitise their hands as they entered their household. Almost two-thirds (64.7 percent) of caregivers in Kano and 22 percent in Sokoto reported that community distributors did not wear a mask, while for those that wore masks, 78.8 percent of caregivers in Kano and 85 percent in Sokoto reported the mask covered the community distributor’s nose and mouth. Around half (49.6 percent) of caregivers in Kano and almost two-thirds (65.7 percent) in Sokoto reported that the community distributor maintained a two-metre distance with the caregiver and child.

7 Qualitative findings

7.1 Basic information

Table 12: Characteristics of community distributors participating in the focus group discussions

Characteristics	Value - n (%)
Number of community distributors participating infocus group discussion	111
Age (years), mean [SD] (min, max)	**Mean: 29.91, [SD: 14.05] (min: 18, max: 100)**
Age (years)	
<30	78 (70.3)
30-49	24 (21.6)
≥50	9 (8.1)
Total N (%)	111 (100)
Sex	
Male	38 (34.2)
Female	73 (65.8)
Total N (%)	111 (100)
Education	
No education	11 (9.9)
Arabic/Islamic school	4 (3.6)
Some primary	2 (1.8)
Completed primary	2 (1.8)
Completed secondary	57 (51.4)
Completed tertiary	34 (30.6)
Other	1 (0.9)
Total N (%)	111 (100)
State/region	
Kano	54 (48.6)

Sokoto	57 (51.4)
Characteristics	**Value - n (%)**
Number of community distributors participating infocus group discussion	111
Total N (%)	111 (100)
LGA/district	
KMC	35 (31.5)
Kura	9 (8.1)
Warawa	10 (9.0)
Sokoto-south	31 (27.9)
Tangaza	12 (10.8)
Silami	14 (12.6)
Total N (%)	111 (100)

A total of 111 community distributors participated in the FGDs, with slightly more community distributors from Sokoto participating (51.4 percent) than from Kano (48.6 percent). Across both states, the mean age of community distributors was about 30 years; however, the majority (>70 percent) was aged under 30 years. There were also more female (65.8 percent) than male (34.2 percent) community distributors. Over half of the community distributors had completed secondary education (51.4 percent) and around 10 percent had no education. The participating community distributors came from six LGAs across Kano and Sokoto; however, the highest proportion of community distributors in Kano came from Kano Municipal (31.5 percent), while in Sokoto, the majority came from Sokoto South LGA (27.9 percent).

7.2 Acceptability of infection prevention and control practices

7.2.1 1.1 Community distributors' awareness and perceptions of infection prevention and control measures

Community distributors had adequate knowledge of the SMC IPC guidelines. They provided elaborate explanations of how all COVID-19-related commodities should be used, including the guidelines for observing hand hygiene, the use of face masks, and disinfection of work equipment and clothing. Details were also mentioned of the routine precautionary measures carried out at the facility at the start and end of the day, such as temperature check and safe disposal of waste.

> *"Since I started hearing about this COVID-19, I pay attention to all the guidelines that the government said people should follow. Some of these things, we have already started doing them at the hospital ourselves. So, it was a good thing that the same things like handwashing, use of facemask, keeping a distance and others were part of what they asked us to be doing." (Sokoto, Silami_male_07)*

"Just as my colleague said, in protecting ourselves from the situation we found ourselves in during the sharing of medication, since from training they told us that when we want to enter a house, we should give social distancing, ensure that the cup used to give the child medicine is washed, and how to protect ourselves with facemask and the rest." (Kano, KMC male_01).

Almost all community distributors were trained on the IPC measures at the LGA level. Aside from training, a few community distributors from Sokoto also mentioned that they were handed posters and job aids that provided guidance and contained other necessary precautions to be taken.

"Honestly, we undergo a lot of training and we were told of the preventive measures, of how we will interact with the people in the house and to keep socialdistance of two metres between us." (Kano, Warawa female_02)

"I can remember, we were taught how to wash our hands; it was done practically in front of everyone and how to twist the fingers and so on." (Sokoto, Sokoto South_male_01).

Further to this, across Sokoto and Kano states, community distributors had a positive perception of the IPC measures that were put in place to curtail the spread of COVID-19 during the 2020 round of SMC drug distribution. Community distributors mentioned that such measures made them confident to participate in this round, even with the presence of COVID-19. For example, a male community distributor from Kano admitted that he was initially scared of getting infected, but being trained and assured that IPC materials would be provided put him at ease.

Similarly, community distributors felt that the use of the COVID-19-related commodities and branded clothing (hijab for women and T-shirt and cap for men) made them easily recognisable by community members as health volunteers/workers. A few community distributors mentioned that this made family members and some friends regard them with respect, which made them feel a part of something significant, given the prevailing situation.

"The measures helped us to always stay clean and professional, unlike before, and now we know more on how to maintain hygiene." (Kano, Silami_male_08).

"These are very important measures, I tell you. It is very necessary for keeping us safe. I think it should not just be for COVID alone, because we used to enter a lot of places and talk to different persons; we should have been doing this before now." (Sokoto_Tangaza_female_06).

"What amazes me about this year's work is the clothing to identify us as [community distributors]. I never appreciated that I was a health worker or a drug distributor for the prevention of sickness until this year. Last year, there was no means of identification but

this year there is face mask, your clothes, then there is sanitiser. Anyone that sees you knows who you are immediately. Even small children know that we are health workers." (Sokoto, Sokoto South_male_01).

7.2.2 Observations on caregivers' perceptions of infection prevention and control measures

The study findings indicate that some caregivers were worried about community distributors' visits to their homes. Some of them felt that these visits posed a threat to the safety of their households, whereas others felt that some of the measures were unnecessary, due to misconceptions about the reality of the virus in the country.

Reluctance from caregivers to have SPAQ administered was another common challenge encountered. Caregivers in urban areas in both Kano and Sokoto were observed to have more positive perceptions of the IPC measures compared to those in rural areas. A good number of the community distributors from urban LGAs in Sokoto disclosed that because some of the caregivers in the area where they worked were educated, they were more receptive to the community distributors, knowing that they were simply observing the preventive measures. Community distributors from rural LGAs in Kano revealed that many caregivers had, at first, refused to grant them access because they believed SMC drugs are meant to test for COVID-19. In one of the female sessions, a female community distributor stated that this could be because the caregivers were not familiar with SMC distribution, as it just started in the state (Kano), and that the launch coincided with when the COVID-19 infection rate and several misconceptions were at their peak. Cases of refusal were also more frequent during the initial cycles of SMC drug distribution. For subsequent cycles, this was reported to have reduced as more people became familiar with the community distributors and more aware of the danger that COVID-19 poses. Because Kano state was experiencing SMC distribution for the first time, it took a little longer (towards the end of cycle two and the start of the third cycle) to observe a change in caregivers' perceptions.

"We used to have problem with the people; the ones who are a bit enlightenedand the educated ones understand us a bit, but when we started entering the houses of people who are not very exposed, some of them started hiding their children and saying that we are 'corona people', because of what we were wearing." (Kano, KMC Male_01)

To accept the drug or let us in, honestly, we have to explain to them. After muchexplanation, they accepted us — especially when we got to round two of the exercise, they were more willing to let us in." (Kano, KMC female FGD_04)

The effort of community leaders and awareness activities via the media played a vital role in addressing most of these fears. For example, a male community distributor from a rural LGA in Sokoto recounted how a malaria town crier/announcer goes around households to create awareness before the SMC cycle begins and was constantly being referred to by caregivers as their source of information about the general COVID-19 prevention guidelines.

"It is not easy to be refused every time by the mothers and even

the husbands ofthe house. They find it hard to believe us because of this COVID-19 that happened. Part of what helped us is those who have heard the advert on the radio before now and in the communities where the district head passes information around to make the people aware of our role, that's what made

things a bit easy for us." (Sokoto_Tangaza_male_06)

7.3 Implementation of infection prevention and control measures

7.3.1 Feasibility to implement

Mixed evidence emerged on how feasible it is to implement IPC measures. Although most respondents judged the IPC measures as feasible to implement, they noted that because these were new to many of them, a few of the procedures were quite uncomfortable and frustrating. In general, FGD findings indicated that compliance was not optimal, especially for parameters that stipulate frequency and duration. For example, even though most community distributors reported compliance to hand hygiene, this was not being performed according to the guidelines, which stipulate that handwashing should be performed for a duration of 30 seconds before contact with any caregiver.

Additionally, compliance on various components of IPC measures varied by the type of parameter. Some community distributors were very mindful of being noticed in the community without their facemask. In an urban LGA in Sokoto, four community distributors stated that the IPC measures were not new or challenging as they work in a hospital, where people are already used to wearing face masks and observing hand hygiene.

"[W]earing the face mask gave me a lot of problem[s], but because the supervisor made it compulsory for us to use it, that was why I managed to use it.Anything that will make your breath not to come out properly is a problem to humans and we were not used to it." (Sokoto_Silami_female_07).

"I always use my face mask. I do not have any problem because I got used to it. When I put it on, I only remove it at intervals to enjoy fresh air before putting it back after some minutes." (Kano, KMC_female_02).

"The wearing of face mask and washing of hands is possible, but for the social distance, it is a little bit difficult." (Kano, KMC female_05).

7.4 Reported constraints to the implementation of infection prevention and control components

7.4.1 Social distancing

According to community distributors, social distancing was the least adhered to IPC measure. Across both states, they mentioned that it was difficult to observe the recommended two-metre physical distance because they themselves either sometimes forget, or are influenced by caregivers and community members' perception of it; in a few instances, they are constrained by space in households. A few caregivers also insisted that community distributors move closer to them as a condition for accepting SMC drugs.

The influence of community members' perceptions is worse in rural areas, where community distributors work in environments where they are expected to exchange the usual pleasantries with community members, especially the elderly. Some male community distributors in a rural LGA in Kano reported that they could barely keep the two-metre distance because it was a familiar environment, children kept rushing to them and the male caregivers often insisted on a handshake. In another female session in Sokoto, all the female community distributors agreed that caregivers often expressed displeasure at the community distributors' refusal to come close to them or greet in the usual manner. Such caregivers interpreted keeping a distance or refusing to greet with a handshake as an indication that community distributors were irritated or that they thought they would contract COVID-19 from caregivers.

Female community distributors reported that some women, especially new brides, prefer that community distributors come into the room or remain close to their door post to converse with them, rather than the women coming out to the wider compound. Such space is usually small and does not provide room to observe the recommended distance. Moreover, children in the community usually throng along with community distributors from house to house, out of curiosity, which further limits community distributors' efforts to maintain distance. Likewise, male community distributors reported that during their visits, male caregivers/household heads usually request handshakes from them. Such persons considered it disrespectful when community distributors refused. More often than not, this led to refusal of the SMC drugs.

Some female community distributors reported that the social distancing rule is mostly not feasible to implement. They opined that, as long as the face mask is worn and proper hand hygiene is observed, physical distancing will be more practicable if the required distance is reduced to a metre.

> *"You know Hausa people like greeting all the time, so if a man comes out from the house, the first thing he expects is for you to shake hands and, if you refuse because you are trying to protect yourself, they will think you are running away from them, so this is a big problem we face. Also, our people here, if they see youwith a face mask inside their house, they think you are not comfortable with them, so they will now think that why should they accept what you bring to them since you are not comfortable with them." (Kano, Kura_male_06)*

> *"When you enter a house and you want to give a child medicine and you are trying to maintain social distancing, sometimes the parents think you are disgusted by the child. But, we try to explain to them that what we are doing is in line with the measures of*

protecting ourselves and them from COVID-19." (Kano, KMC male_01)

"[I]f they want this distribution of medicine to continue smoothly, they need to remove this social distance. I know you have to protect yourself, but this social distance is a big challenge because [even] if you convince some parents, you can't convince others." (Kano, Kura_female_05)

7.4.2 Hand hygiene

Community distributors across both states recognise handwashing as part of good hygiene. They consider the hands as one of the likeliest means of introducing infection into the body, either through their mouth, hands or nose. Therefore, many community distributors mentioned that they ensured that their hands were washed multiple times during the day and not just as frequently as stated.

Adherence to the frequency and duration of washing or application of hand sanitisers was minimal, even in the urban areas across both states. Community distributors opined that, although practising hand hygiene is something they are happy with and have adjusted to over time, they were unable to keep washing for 30 seconds per time; some think that alcohol-based disinfectants cause unpleasant irritations on their hands, while for others, applying it frequently makes their hands dry.

The majority indicated that hand sanitisers were more convenient to use compared to handwashing using soap and water. Concerns about hand sanitisers also being alcohol-based and thus religiously forbidden, came up in only three instances: two in Kano and one in Sokoto. Such community distributors were more likely to use soap and water compared to alcohol-based hand sanitisers. However, the challenge was that water was not readily available in some households for use. Some community distributors mentioned carrying water around by themselves in a container for their use; however, few community distributors admitted that this was done regularly, as it adds to their workload.

Also, a male community distributor from Sokoto disclosed that he could not really use hand sanitisers because he was also using chalk to record on houses. Mixing the chalk particles with the sanitiser soiled their hands and getting water in the communities to wash their hands was difficult.

Having supervisors who check on community distributors unannounced was a motivation for adhering to the protocol. Some of community distributors also saw it as an instruction that must be carried out and so kept to this.

"[H]and washing is easier because it is part of cleanness and even before corona

you are supposed to be washing your hands often." (Kano, Kura_female_05)

"Some [community distributors] do not use the hand sanitiser. They do say it contains alcohol and so

on and that because of that, their prayer is affected." (Sokoto, S. South_male_01)

"I can only say I did my best with the hand hygiene, but I am not certain aboutadhering to the 30 seconds rule." (Sokoto, Sokoto South_female_02).

7.4.3 Face masks

The majority of the respondents did not have an issue with the use of face masks. It was something they all agreed was necessary to use. A couple of them were able to keep masks on for most of the day because they had supervisors who were conducting unannounced spot-checks, while some disclosed that they had been using the mask pre-COVID to prevent dust that usually blows in the arid region. So, it was quite comfortable for most to use.

> *"Right from the beginning, I like closing my face. That's why it is not a problem for me to use the mask because I normally close my nose…if am going out, if I do not have handkerchiefor face mask, I will feel as if I'm not comfortable. I will feel as if my body is naked" (Sokoto, South South_female_02).*

> *"The reason I got used to it is because it is compulsory for you to wear it and workwith it. Because of that, I was patient and wore it. I continued using it normally* that now I am used to it; it does not bother me or give me any problems honestly."
> (Kano, KMC_male_01)

The major concern that emerged was the duration for which the mask was to be used throughout the discharge of tasks. Other complaints relate to feeling of breathlessness, pain around the ear, headache and body pains. Masks made out of fabric were reported to be too thick and more discomforting. Community distributors said the likelihood of experiencing breathlessness was greater when the cloth mask was used. The majority of masks distributed in Kano state were made of fabric. Community distributors who complained of the discomfort said that, as time went on, especially during cycle three, they were already used to their masks.

There was also the misconception that people might not hear community distributors clearly if they spoke through their mask. So, even though they kept masks on when administering the drugs, some community distributors took them off during the health talk and when giving instructions for drug administration. Also, in both states, a few community distributors added that caregivers complained frequently about not being able to hear them well because their mouths are always covered with a mask, and they tended to stand at a distance.

In addition, a general challenge that was mentioned in all sessions in Kano is that the caregivers always wanted to see the face of the community distributor administering the SPAQ; they associated the wearing of face masks as a ploy by community distributors to disguise themselves in case the drug had adverse effects. Community distributors mentioned that some caregivers requested that they take off their mask for identification before they were allowed into homes. This happened even in urban areas. One respondent from a rural LGA in Sokoto mentioned that although they do not have issues wearing a mask all day, the problem is that they lack a sufficient supply. There were also incidences where the community distributors were labelled 'corona people' in the community as a result of face mask usage. Children were said to be seen running after them chanting, "the corona people". This drew a lot of attention to them and made them feel uncomfortable using masks. On two occasions, two community distributors in Sokoto reported that in a particular community, people called them "corona-infected people" etc. Such incidences are likely to discourage adherence.

"The mask I was given was made out of fabric and it's very thick. So, sometimes Ihave to adjust the mask down and expose my nose to get fresh breath." (Kano, Warawa_female_02)

"Some will ask you to open your face so that they will know who they are talking to, how you look like. You can meet the owner of the house with a face mask on your face but they will insist that you should remove it so that they can know youwell." (Kano, Warawa_male_05)

7.4.4 Disinfection of work materials

Only a few respondents spoke about disinfection of work materials across the two states. A few respondents in an urban area of Sokoto reported that they had not been trained to disinfect their work materials and that no disinfectant wipes had been provided. This statement was corroborated by the findings from the female sessions in the rural areas of the same state. Some community distributors in Kano reported that they were trained to disinfect their work material and were provided with hand gloves. One community distributor disclosed that, before the start of day, the whole of their work equipment was usually sprayed with a disinfectant. However, a couple of the community distributors were also of the opinion that there was no need to disinfect the work materials, since the drugs come sealed in a pack. They held the opinion that the only material that needed to be disinfected is probably their pen.

"Before we set out for the day, they spray our bags and the supplies in the facilityand we go out. They also give us hand gloves so that we can work well without staining our hands." (Kano, KMC female_01).

"We were told not to clean them because they were already inside a bag and inside a packet. The only thing that would have required dusting was the chalk, but even the chalk was inside a pack and it was separately held. So, you see, theywere inside packets and bag and once you open it, you'll quickly close it and put back into the bag. There was no need to disinfect anything." (Sokoto, Sokoto South_femle_04).

7.4.5 Waste management

There was general consensus regarding waste management, that there was hardly anything that needed to be disposed of except the empty packs of the drug that community distributors gave to the in-charge of the facility each day after work. Other community distributors kept their materials in the bag and did not really need to discard anything till they returned to the health facility, where waste bags were positioned for them to dispose of their used materials after returning at the end of the day. Only a few community distributors across Sokoto and Kano were given the waste bags to carry along.

Some community distributors mentioned that hand sanitiser and gloves would only last for three days, after which they used their own money to buy IPC equipment. In some cases, they had to substitute hand sanitiser with methylated spirit. One of the male community distributors stated that he had improvised by going around with a keg of water to wash his hands whenever his sanitiser

finished. As for the face mask, a male community distributor said he was initially given one face mask (disposable) to be used for the whole cycle, but was later given a washable face mask, which he uses and then washes each day after work.

> *"There is a nylon that they gave us so that when we finish, we can keep the facemask and the hand gloves inside so that children will not pick it and play with it and catch that disease." (Kano, KMC male_02)*

> *"Like the tally sheet, you see we cannot trash it, we have to leave it and the referral form, but all these empty cartons that we come back with, and the usedface mask we put it in the trash bin." (Sokoto, Sokoto South_female_04).*

7.5 Other constraints to implementing infection prevention and control measures

7.5.1 Transport of work supplies

Transportation of work materials did not pose any challenge according to most community distributors in both states. All community distributors agreed that a bag for carrying work supplies was provided and the materials were light in weight. Moreover, because they worked in pairs, most of them said they shared the responsibility with their partner whenever they got tired of carrying it.

A few concerns that some male community distributors in Kano mentioned included that the bag was not very durable and gets dirty easily given the dusty terrain, and that they walk long distances daily on foot. Likewise, a few male community distributors in Sokoto remarked that it felt awkward walking around the community holding a bag, as they are not used to it. One female community distributor in a rural LGA in Kano added that, at the endof one cycle, her shoulder hurt mildly from hanging and carrying the bag for most of the day.

Community distributors in rural areas are mostly based in the community where the drugs are distributed; therefore, they do not necessarily need to use commercial transport to work. However, a few community distributors in the urban centres disclosed that they sometimes had to use public transport to access their facilities and the communities. Secondly, these urban community distributors said that they had incurred unfavourable costs as they had to maintain social distancing. This meant they could no longer share motorcycles as previously done and they now had to individually ride motorcycles where distribution took place. Some community distributors in Sokoto felt that, since they were already using the bag pre-COVID-19, there was nothing new about what they needed to transport. The only additional supply they felt was the hand sanitiser.

> *"The additional work materials were not a burden to us; they helped us bygiving us that bag to put in all our materials. You will put hand sanitiser, the medicine you were given, the chalk for house marking and all." (Sokoto, Sokoto South_Male_02).*

> *"Yes, truly the bag became a burden for us at first because it is something thatwas new to us as men…but after one or two days*

we became used to it and that's how we continued with it" (Sokoto, Sokoto South_Male_01)

"Based on transportation, almost all of us live in the community, so we can trek totheir houses with our bags. It is only if it is far that we take a bike. So, to me we don't face any problem carrying our things because of corona." (Kano, Kura_male_03)

7.5.2 Workload

Mixed evidence emerged as to whether SMC distribution workload has increased as a result of the IPC measures instituted for this round. Some community distributors felt that observing the IPC measures resulted in increased workload for them. Other community distributors see the IPC measures as a welcome and important idea that has not significantly affected workload, provided individuals know how to manage themselves and their time. Others, however, felt that it has increased their workload. They attributed this to the time required to deliver the health talk to caregivers on the COVID-19 preventive strategy, time needed to provide instructions and support caregivers to administer the first dose, and effort required to address caregivers' concerns of the credibility of the programme given the COVID-19 context — all of which they said resulted in extended work hours for them. Some community distributors estimated that they now spend close to 1½ extra hours on the job daily.

For time spent creating awareness among caregivers on the credibility of the SMC programme, evidence suggests that community distributors in Kano invested a lot more time in this, given that it was the first time the programme was being implemented in the state. Across both states, more effort was required in rural communities than in urban areas; time spent sometimes also varied from household to household. According to a community distributor in Sokoto, you might have to spend some time sensitising caregivers in one household, while in another household where they have more knowledge of the preventive measures, it does not take much time.

"The work you can finish in 30 minutes, for example, when you come and do your introduction…will increase to 50 minutes. This is because you will have to go through the preventive measures and tell them about it step by step." (Sokoto, Sokoto South_female_02).

"First of all, all the safety measures we took did not take our time; we were working normally in our normal hours and the challenge of accepting us by theparents of the children was not much." (Kano, KMC_female_03).

"My work is taking much time but it has not become a problem for me because what was added is important for the prevention of the virus. The additional work is for prevention, not for any other thing and it didn't cause us anything." (Sokoto, Sokoto South_female_04).

7.5.3 Equipment availability

IPC equipment was mostly adequate and available in Sokoto and especially so for health facilities in urban areas across both states. Most community distributors in urban parts of Sokoto state revealed that there was never a time they that experienced a shortage of most IPC equipment; they were even given back-ups of almost all COVID-19-related commodities in some instances. The only issue of concern was the quality of masks made out of fabric. The materials issued to them were sufficient to the best of their knowledge and when they returned at the end of the day, they discarded the used, disposable materials and left all other materials at the health facility, to be collected at the start of the next day.

For Kano, some community distributors reported that they had to ration the quantity of hand sanitiser they used each time because they were mindful that there might not be a replacement if it were finished. Other shortages experienced were for hand gloves, face masks and disinfectants. In one case, a community distributor from a rural area said that not all community distributors got sanitiser when it was distributed. Disposable face masks were issued to some community distributors in the urban areas in Kano. They felt that the cloth masks would have been better since itcould be recyclable.

The number of hijab handed out in Kano was limited. Community distributors were meant to return these at the end of each workday. The problem was that no names were written on garments, so for subsequent cycles, the hijab were redistributed without necessarily matching people to the one they had used previously. Community distributors felt that this was not good because one might end up wearing a hijab used by someone else. There was also a shortage of tally sheets and chalks for house marking. One community distributor in Kano said that community distributors were only issued one sheet, such that they had to spend out-of-pocket to produce the quantity they needed if more were required.

> *"Like using hand sanitiser, we try to minimise usage so that it gets us through the cycle. Sometimes, we do not apply it when we come out of the fifth compound because we might not get another." (Kano, KMC_male_01).*

> *"We weren't short of items because like the hand sanitisers, they were given for four days. When we come for day one, they give us for day one and cycle one andthen when we go for cycle two, we were given too; when we went for cycle three, we were given another till cycle four and, honestly, we have never had* Issues." (Sokoto, Sokoto South_female_04).

7.6 Outcome of new drug administration rule

Caregivers' levels of adherence to instructions provided by community distributors on administration of SMC doses are discussed here. Reports indicated that compliance levels were high, as confirmed by lead mothers (female members of the community who are recruited by community leaders to ensure adherence to day 2 and 3 doses of AQ), although cases existed where the drugs were not administered at all.

7.6.1 Caregivers' adherence to instructions

Following the IPC guidelines, the new rule stipulates that caregivers administer the first dose of SPAQ to the child under the supervision of the community distributor, which is in contrast to the previous SMC protocol that did not specify who should administer the drugs (however, out of habit rather than explicit guidance, this was mostly the community distributor). Community distributors provide hand sanitiser to the caregiver and direct them to apply it over their hands for the stipulated 30 seconds before the drug is administered.

In one FGD with female community distributors in Sokoto, it was mentioned that some caregivers requested the first dose of SPAQ be given to them to administer to the child later, but when the community distributor followed up the next day, they discovered the drug was not given to the child. This finding was corroborated by male community distributors, who disclosed that when the lead mother went back for a check-up the next day, they discovered the drug had not been administered to the child.

Most children reacted positively to drugs administered by caregivers and were happy to receive the drugs from their parents. Only a few showed displeasure through crying and running away, and insisted that the community distributors administer the drugs. Community distributors felt that this was more common among older children who remembered previous instances when health workers would give them sweets after administering drugs as they do while administering polio immunisation. This statement was corroborated by a female community distributor as a suggestion for all female community distributors in a different session in Kano, proposing that sweets should be given as incentives to the children. Community distributors were concerned that, with the new practice, caregivers tended to make up excuses for not having to give the child the first dose in the presence of the community distributor, since they realised they would be the ones who had to administer it. Some community distributors felt that parents used the excuse of a child's having not yet eaten, that they were absent or still sleeping to persuade the community distributors to leave the drugs for them to administer later.

Additionally, all community distributors reported that the time taken to deliver drugs increased. This was not necessarily related to administering the drug itself, but because of all the necessary precautions required before the drugs could be administered, such as hand hygiene processes by community distributors and caregivers. However, most did not seem negatively affected by the additional workload. Many agreed that for subsequent cycles, the time taken to administer the drug would likely decrease as caregivers became more aware of the quantity of water and how to dissolve the drugs with minimal instructions/supervision from the community distributors.

> *"First, when we go out, we showed them how to give the children the medicine and when we went back again…there was no problem — they gave them like they should." (Kano, KMC_ female_03)*

> *"We do give them the regulations like the way our superiors gave us regulationsand they follow. We tell them and they understand." (Sokoto, Sokoto South_ female_03)*

> *"There are those that will prefer taking from their parent because they do not know us and, sometimes, the parents have to struggle with the child before he will agree to take it." (Sokoto, Sokoto South_ female_03).*

7.6.2 Community distributors' support to caregivers

Caregivers mostly adhered to instructions of how the first dose of the drug should be administered. During the first cycle, a few caregivers (especially young mothers in Kano) insisted that community distributors administer the drug themselves; however, in subsequent cycles, they did this without assistance. Community distributors agreed that they had to assist the caregivers at some point, especially during the first cycle. This was usually by administering the drug to one child while supervising the caregiver to administer the drug to other children, including supervising the quantity of water the caregiver used when administering SPAQ.

Community distributors disclosed that they had to provide some form of assistance to the caregivers when administeringthe SMC drugs to children. This was done either by administering the drug to the child directly on the first day, then giving advice on the appropriate dosage for days two and three, or cajoling the child by singing so that the child would take the drug from the caregiver directly.

A few female community distributors disclosed that some caregivers tend to force-feed children who dislike like the SMC drugs, but they try to advise the caregivers to rather cajole and sometimes carry sweets along in the event that they come across such children. For this reason, some children preferred the community distributors to administer the drug themselves and would not take SPAQ from their caregivers, causing community distributors to administer SPAQ in some cases.

> *"When the child refuses to collect it from the mother, I collect it and give thechild." (Sokoto, Silami_female_03).*

> *"Surely, there are times where they will need our help to give the medicine to their children, like sometimes we have to show them how they will dissolve the medicine in water and the amount of water needed and how they will give it to them." (Kano, Warawa_male_04)*

7.7 Adaptation to implementing infection prevention and control measures

In some instances, community distributors were forced to improvise to make up for a lack of resources or to adjust to measures that were not comfortable for them. This included:

- The use of methylated spirit or bleach as an alternative to hand sanitisers that had been finished
- Resorting to carrying kegs of water around, or sourcing water at the community for handwashing, for those community distributors who reacted to the alcohol-based sanitisers
- Taking off the mask intermittently to adjust for breathlessness
- Spending out-of-pocket to replace some materials — only one community distributor in an urban area in Kano mentioned being given money from the facility to replace COVID-19-related commodities when they ran out.

In one of the female sessions, a female community distributor stated that she had to improvise by using hand sanitiser after visiting three compounds, instead of after each compound as she had been trained, to effectively manage the amount so as not to run out. Some of the community distributors also initially had difficulties with having to use face masks and would intermittently remove them to breathe before putting then back on to continue their work.

"The parents of the children were scared when they saw us putting on face mask, because they thought we came with something new and some said they could nothear us. So, we employed a new tactics of maintaining a distance before removing our mask to address the caregivers." (Sokoto, Tangaza_Female_04).

7.7.1 Perceptions of community distributors about COVID-19

Generally, community distributors believe that COVID-19 exists and took the necessary precautions. A male community distributor disclosed that he had seen and conversed with recovered COVID-19 patients who had shared their experiences — hence, his belief in the existence of the virus, regardless of rumours. Community distributors were generally reassured and motivated to go about their work because they were fully kitted out with COVID-19-related commodities. However, community distributors reported that many caregivers still had some misconceptions about COVID-19. A couple of caregivers believed that the virus was politically manufactured to generate funds for the states, while others felt that although the virus exists, it only infected the rich and people who had travelled abroad recently. Community distributors felt that these misconceptions affected the seriousness with which caregivers adhered to instructions, contributing to increasing their workload when they tried to sensitise people.

Several misconceptions about the treatment and cure for COVID-19 persist. Some community distributors believe that COVID-19 is like a cough and can be treated with cloves, blackpepper and ginger, while others believe that bathing with very cold water would be effective in reducing the symptoms. In addition, community distributors in Kano discussed rumours about treating COVID-19 with garlic or chloroquine. They also spoke of a particular page in the Holy Qur'an that mentioned that a tiny strand of hair soaked in water can be ingested to cure COVID19. Other suggested cures including lemon, vitamin C, and metronidazole (Flagyl).

"Up until now, there are some people who don't believe that COVID-19 exists, so if you find those kinds of people you will suffer before you convince them. They may listen to you but won't believe what you are saying; if you find those kinds ofpeople, there is a problem." (Kano_Kura_male_01)

"We believe corona disease is true, because we've seen it on social media; wehave seen it affect other people and people we have worked with have seen itwith their eyes and told us it's true that corona exists." (Sokoto, Tamgaza_male_04).

8 Discussion

This study aimed to assess the quality of, and community distributors' adherence to, IPC measures for SMC delivery during the COVID-19 pandemic in Nigeria. The results provide valuable insights into both, with community distributor adherence varying across the different IPC domains in Kano and Sokoto state.

Availability of COVID-19-related commodities during the 2020 SMC campaign varied in both states, with the overall findings suggesting that the availability of necessary equipment for preventing and

controlling COVID-19 transmission was not adequate. Disparities in availability of equipment across both states is likely due to differences in the procurement processes of the different funders of SMC implementation in Sokoto (philanthropic funding) and Kano (Global Fund). In addition, these differences in equipment availability could also be reflective of the different levels of experience in implementing SMC among key programme personnel, especially since SMC has been implemented in Sokoto for comparatively longer than in Kano state. There is also evidence of differences in the efficiency of distribution processes, systems and infrastructure across states in Nigeria,[19] sometimes resulting in a disconnect between the expected time of delivery and actual delivery of goods. Consequently, the level of equipment availability reported during the study, especially in Kano state, most likely did not provide the optimal level of IPC required to reduce COVID-19 transmission.

Evidence of a lack of adequate IPC equipment was reinforced by the qualitative findings. Community distributors indicated that, for example, hand sanitiser supplies lasted for just a few days and some had to use their personal funds to buy essential IPC materials when no replenishment was provided. Having to buy COVID-19-related commodities might have been demotivating for the community distributors, potentially affecting the quality of service delivery during the campaign. Challenges with the availability of equipment also led to community distributors trying to adapt and make adjustments while implementing IPC measures. For example, some community distributors used methylated spirit or bleach in place of hand sanitiser, and used hand sanitiser only after every few houses, instead of after each house, to manage their supply. Although against national guidelines, these types of adjustments were consistent with reports from other settings.[20–22] Furthermore, where community distributors resorted to carrying containers of water for handwashing — which significantly added to the weight of what they carried and most likely slowed down their movements — this may have impacted on their ability to meet daily household targets.

Overall, adherence to IPC measures was comparatively better in Sokoto state than in Kano state. Notably, more community distributors in Sokoto adhered to hand hygiene measures and practised safe distancing. Better adherence to IPC measures in Sokoto may be due to stricter supervision and monitoring of adherence to IPC measures by supervisors, perhaps as a result of more established supervisory structures and processes. As suggested elsewhere, conformity to guidelines will be higher if supervision and monitoring of the community distributors is strict and effective.[23] Community distributors in Sokoto reportedly had job aids and posters in their possession, which they used more frequently, which may explain their higher level of IPC compliance. A similar finding has emerged in studies that have demonstrated increased adherence to guidelines due to job aids.[23–25]

Across the key IPC domains, there were varying degrees of adherence to IPC guidelines across the two states. Adherence to hand hygiene with soap and water or hand sanitiser was low, particularly in Kano state. It is, however, important to highlight that the study applied strict standards to measure adherence to IPC measures (i.e. a binary yes or no). 'Partial' adherence was not assessed, which could have resulted in lower levels of adherence being reported. Among those that did adhere, more community distributors used hand sanitiser than soap and water; community distributors stated that hand sanitiser was more convenient to use and that water was not readily available in some households for washing with soap. Adherence to hand hygiene for the recommended time period was even lower, potentially linked to concerns over meeting daily household targets.[26] Handwashing guidance deliberately recommended 30 seconds in order to increase the likelihood of community distributors washing their hands for at least 20 seconds, which was the standard international guidance at the time of the study. There was some evidence that adherence varied by health worker characteristics: most notably, female community distributors in Sokoto state and older community distributors in Kano state adhered to hand hygiene measures more frequently.

Practising safe distancing throughout the campaign was clearly a challenge for community distributors in Kano, and this could be due to the limited space within compounds. In both states,

community distributors also occasionally forgot to maintain a 2m distance and some caregivers insisted that community distributors move closer to them as a condition for accepting SPAQ. In rural Kano, male caregivers often insisted on a handshake and perceived the refusal as signifying community distributors' fear of contracting COVID-19 from them. Sougou et al. describe how social values, including solidarity between extended family groups, make respecting social distancing during COVID-19 in west African societies particularly challenging.[27] To overcome this, 'graded recommendations' could be introduced for distancing in certain scenarios, e.g. whether the community distributor is indoors vs. outdoors, and whether they are wearing a mask. Some community distributors argued that as long as a face mask is worn and proper hand hygiene is observed, adequate physical distancing will be more feasible if the required distance is reduced to one metre.

A higher proportion of community distributors had their temperature checked with an infrared thermometer in Sokoto than in Kano. However, due to a lack of data on availability of infrared thermometers at the health facility, we cannot conclude whether this difference is due to compliance or equipment availability. Community distributors' perceptions of the importance of temperature taking and knowledge of asymptomatic infection must be considered. In the absence of a fever, some community distributors may feel they cannot have COVID-19 and so do not need to take extra precautions with regard to hand hygiene, social distancing etc.

Due to low availability of disinfection wipes and bio-waste bags, there is a high level of missing adherence data for these indications in both states, making these findings inconclusive.

In Kano state, due to supply chain issues, some community distributors did not receive a new face mask. Instead, they were asked to use their own personal face mask (personal communication, SMC Programme Director, Nigeria). Data from the caregiver satisfaction survey suggest that around a third of community distributors inKano were wearing a face mask when they visited households.

Adequate knowledge and positive perceptions of the IPC guidelines among community distributors was a key facilitating factor for adherence, in addition to community distributors indicating that the measures were feasible to implement. The qualitative findings suggest that the IPC guidelines were clearly communicated during trainings, which is vital to increase adherence.[23–25] However, to further increase knowledge of and cooperation with the IPC measures, and to develop community distributors' ability to communicate these with caregivers, future trainings could utilise role plays, which have proved to be a useful communication tool.[28]

Community distributors mentioned that these measures made them confident to participate in the 2020 SMC distribution, even with the presence of COVID-19. They explained that the measures alleviated their fears of contracting COVID-19, with some community distributors in Kano indicating that they would not have been willing to "risk their lives" for the job if they had not been trained on the IPC measures and if COVID-19-related commodities had not been available. Community distributors from Sokoto suggested that the IPC measures provided an important and previously missing protective measure for them, arguing that such measures ought to have been put in place even prior to COVID-19. There appeared to be clear recognition of the usefulness of face masks and handwashing as effective IPC measures, especially among community distributors who are trained health workers and, thus, were already familiar with their benefits.[23,25] Community distributors having supervisors who checked on them unannounced to enforce adherence to the guidelines was another facilitator.[23,25]Community distributors felt that the use of COVID-19-related commodities and branded clothing made them easily recognisable and respected by community members, which motivated them to adhere. Another key facilitator was that IPC equipment was mostly adequate and available, particularly in Sokoto and especially so for health facilities in urban areas across both states. Most community distributors in urban parts of Sokoto state revealed that there was rarely a shortage of IPC equipment and, in most instances, they were even given backup. Additionally, most community distributors in both states indicated that the transportation of additional IPC materials

did not pose a challenge as work supplies were relatively lightweight. The media and community leaders, as part of community engagement strategies for mass drug distributions[29] were also crucial in disseminating relevant information with respect to COVID-19 among caregivers within communities.

Many community distributors were not used to wearing face masks for prolonged durations. Similar to other studies,[23] some community distributors reported that they found them uncomfortable and struggled to use them throughout the day. Some community distributors complained of difficulty breathing, while others indicated that caregivers were not able to hear and understand them properly while they were wearing face masks. There were also reports that caregivers always wanted to see the face behind the masks, sometimes thinking that there were ulterior motives behind wearing masks during SMC campaigns. Future campaigns could focus more on discussing the importance of mask-wearing during caregiver awareness-raising to dispel misconceptions. Also, mask 'rest' periods could be introduced for community distributors, e.g. when travelling outdoors between compounds, or at other times when a 2m distance can be maintained to minimise discomfort.

A risk factor for infection was the use of the public transport system to access some communities and health facilities, potentially exposing some community distributors to COVID-19 since government regulations of safe distancing are not always enforced. Some community distributors argued that implementing the IPC measures increased their workload due to the time it took to raise awareness, address any questions and provide instructions on administering the first dose — all of which were barriers to adherence. However, other respondents argued that the IPC measures did not significantly affect their workload, as this was simply a function of whether community distributors effectively managed their time.

There were high reported levels of awareness of COVID-19 among caregivers in Kano and Sokoto, possibly due to the high volume of COVID-19 messages heard or seen, with the radio being the most common source of information. Such insights about where caregivers receive the majority of their information about COVID-19 should be utilised to maximise awareness creation within communities as part of strategies to mitigate transmission, as has been proposed in other disease outbreaks.[30] Most caregivers reported that the one key message that stayed with them was 'COVID-19 kills'.

This key message, as well as others such as 'washing hands regularly', 'two metres safe distancing', and 'important to wear a face mask' should be strategically and effectively utilised to mitigate COVID-19 transmission, as has been done in other pandemics.[31] Caregivers recommended hand hygiene as a key positive change that should remain after the pandemic, a clear acknowledgement that hand hygiene is a crucial aspect of IPC, even beyond the coronavirus pandemic. Over 90 percent of caregivers in both Kano and Sokoto state indicated that they agree the COVID-19 safety precautions were necessary, although more than half of caregivers indicated that these were uncomfortable, which is similar to findings from other studies.[23]

The new SMC drug administration strategy, whereby caregivers administer SPAQ under the supervision of a community distributor, had some untoward effects. Lapses in SMC drug administration arose as some caregivers requested that the drugs be left with them to administer later; however, upon return the next day, community distributors discovered that in some instances, the drugs had not been given to the child. Such lapses could and should be addressed in future trainings by emphasising that all community distributors ***must*** observe the caregivers administering the SMC drugs on the first day, complete tally sheets and mark houses accordingly. This instruction should be followed up through strict monitoring by supervisors and lead mothers. Adequate counselling should be provided to caregivers, while also stressing that forcing children to take the SMC drugs is forbidden and can even be dangerous for the child. During household visits, community distributors should use and give advice on other persuasive approaches to increase compliance by children.[32]

Caregivers' perceptions of both the COVID-19 pandemic and IPC measures seemed to affect the seriousness with which they regarded the instructions, as well as their level of compliance with the community distributors, including acceptance of the SMC drugs. The finding that some caregivers were worried when community distributors visited their households because they felt that community distributors posed a health threat, or that the IPC measures being implemented were unnecessary, should be taken seriously and addressed. This can be achieved by emphasising the benefits and importance of the IPC measures using targeted public health messages through the media and other relevant communication channels.[23,24] Engaging with community leaders and deploying these targeted messages using established community structures and networks will also be beneficial, especially in rural communities where there were fewer positive perceptions about the IPC measures compared to urban areas, as highlighted by the qualitative findings. Corrective messages, for example using radio jingles, should be used to counter misconceptions that COVID-19 can be treated with herbal remedies, especially since radio was identified as a key source of information for most caregivers. It should also be appropriately communicated that the coronavirus pandemic is not political propaganda being used to generate funds by some politicians.

The international guidance and standards for safe implementation of SMC that were rapidly developed for the2020 campaign were based on the best available evidence at the time, including the relative contribution of different transmission pathways to the spread of COVID-19. It is evident that differences between national and international IPC standards existed. In Kano state, for example, due to supply chain issues, some community distributors were asked to use their personal mask (personal communication, SMC Programme Director, Nigeria). Future campaigns should work with relevant stakeholders, such as the national malaria programme, to ensure national guidelines are in line with international guidelines, where possible.

9 Limitations

There are several limitations of the observational tool used in this study. Firstly, it was based on direct observations that could have been subject to the Hawthorne effect, whereby the community distributor alters their behaviour because they are being observed.[33] We explored the potential impact of the Hawthorne effect using logistic regression. In the adjusted analysis, there was no evidence that observation time was associated with hand hygiene adherence in Kano or Sokoto state. The observation tool was also restricted to the SMC IPC activities stipulated in the job aid and based on international guidance. Due to the rapidly changing nature of the COVID-19 pandemic, there were local adaptations to the types of equipment used and the order in which some of the activities took place, which could not be captured in the data collection tool. Efforts were made to accommodate local adaptations where possible in the data collector training, but it is plausible that the indicators reported here underestimate the actual compliance where equivalent equipment were used or IPC events took place at a different time to when they were observed. Finally, the tool did not capture availability of the infrared thermometer at the health facility, or soap and water at the health facility or compound, and results should be interpreted with this caveat in mind.

It is worth noting that the quantitative findings presented here relate to IPC adherence and equipment availability in the latter two cycles of SMC, and for the selected urban and rural geographical areas. Readers should interpret the quantitative findings within these boundaries. Qualitative findings allow the reader to gain insight into additional issues occurring throughout the four-month campaign.

10 Conclusions

Large-scale delivery of health interventions such as SMC present a significant challenge in terms of

IPC, which is particularly important in the context of the COVID-19 pandemic. Here, we describe adherence to important IPC measures that were rapidly introduced for the SMC campaign in Nigeria in 2020. Varying degrees of adherence to the IPC guidelines were observed across both Kano and Sokoto state, with some measures proving particularly challenging, which may be partly due to equipment availability. However, factors such as adequate knowledge and positive perceptions of the IPC measures, as well as feasibility of implementation, provided facilitators to adherence.

11 Research uptake

The table below outlines the research uptake plan, including specific activities and the targeted stakeholders. The research uptake process will involve advocacy and sensitisation, further communications via progress meetings with internal and external key stakeholders etc., and knowledge management.

Research uptake objectives	Research uptake activities	Targeted key stakeholder(s)	Stakeholders needs
To engage key stakeholders throughout the study inNigeria	1. Host introductory meetings when developing the research proposal	NMEP, FMoH	Consult
		Malaria Consortium key technical and operational staff	Consult
		GiveWell	Inform
		SMC technical advisory committee	Consult
	2. Sensitisation meetings	Community leaders	Raise awareness,
		Health facility workers/community distributors	Influence and inform
		LGA PHC unit	Inform
		Caregivers	Inform
	3. Progress meetings during the study implementation	NMEP	Inform
		Malaria Consortium key technical and operational staff	Consult
		GiveWell	Inform
		Technical advisory committee	Consult
	4. Produce research report, research brief, newsletter updates etc.	All key stakeholders: NMEP, SMEP, Malaria Consortium team, Implementing partners	Inform and influence

12 Recommendations

- Future SMC campaigns should consider how to improve the community's awareness of enhanced IPC measures to promote caregiver acceptance of the IPC measures. Awareness campaigns should start as early as possible and consider visual and audible information, such as posters and radio jingles to support illiterate caregivers, using existing community structures such as town criers and lead mothers.
- Future community distributor training must emphasise the importance of the enhanced IPC measures to increase knowledge of and cooperation with the measures, and develop community distributors' ability to communicate these with caregivers. The identification of role models to help other community distributors feel more confident with the protective measures could be integrated into the training.
- To assist community distributors with maintaining a safe two-metre distance within compounds, graded recommendations could be introduced, outlining distancing requirements for certain scenarios, e.g. whether the community distributor is indoors or outdoors and whether they are wearing a mask.
- To improve community distributor compliance with wearing a face mask, 'rest' periods could be introduced, e.g. when travelling outdoors between compounds and at other times when community distributors are able to maintain a two-metre distance.
- Monitoring and supervisory structures and processes should be strengthened to improve community distributor adherence to the enhanced IPC measures, which may include the enforcement of regular, unannounced spot checks by community distributors' supervisors.
- Future SMC campaigns must address the shortage of certain IPC equipment in both states, as this was a key barrier to compliance with the some of the enhanced IPC measures, e.g. hand hygiene and safe disposal of equipment.
- As adherence to individual IPC measures was low, future guidance must include different types of measures to maximise the odds of at least some measures being adhered to at any given time.
- There should be ongoing review of current IPC guidelines in light of further knowledge of infection risk from COVID-19, to determine where some measures could potentially be eased to aid adherence.

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15 Annexes

Table 13: Adherence to infection prevention and control measures in Kano State, Nigeria

	Kano		
Indication and domain	**Value (n)**	**Number (N)**	**Percentage (%)**
Number of community distributors overall	252		100
Hand hygiene* total (N=1503)	**11**	**1503**	**0.7**
Hand sanitiser (N=1503)	11	1503	**0.7**
Soap and water (N=1503)	0	1503	**0.0**
Any hand hygiene total (N=1503)**	**109**	**1503**	**7.3**
Hand sanitiser (N=1503)	103	1503	6.8
Soap and water (N=1503)	5	1503	0.4
Disinfection of SPAQ blister packs total (N=9)	**0**	**9**	**0.0**
Disinfection before leaving for the community (N=3)	0	3	0.0
Disinfection after five compounds (N=3)	0	3	0.0
Disinfection at health facility before storage (end of day) (N=3)	0	3	0.0
Mask use* total (N=86)	**53**	**86**	**61.6**
Safe disposal of masks and wipes total (N=0)	**0**	**0**	**0.0**
Safe disposal of wipes in the community	0	0	0.0
Safe disposal of mask at health facility at end of day	0	0	0.0
Safe disposal of wipes at health facility at end of day	0	0	0.0
Safe distancing in the compound^ total (N=1206)	**62**	**1206**	**5.1**
Safe distancing at compound 1	11	242	4.5
Safe distancing at compound 2	11	243	4.5
Safe distancing at compound 3	12	239	5.0
Safe distancing at compound 4	18	240	7.5
Safe distancing at compound 5	10	242	4.1
Ensure community distributors are healthy^^ total (N=504)	**1**	**504**	**0.2**

*Washed hands with soap and running water or hand sanitiser for ≥30 seconds

**Washed hands with soap and running water or hand sanitiser

^ during triage AND when determining age eligibility AND SPAQ eligibility AND SPAQ administration AND instructions ANDmessages; in compounds where the space was not too small to be measured

^^Take temperature with infrared thermometer at start and end of the day at the health facility

Table 14: Adherence to infection prevention and control measures in Sokoto State, Nigeria

Indication and domain	Sokoto		
	Value (n)	Number (N)	Percentage (%)
Number of community distributors overall	259		100
Hand hygiene* total (N=1578)	**56**	**1578**	**3.5**
Hand sanitiser	42	1578	2.7
Soap and water	14	1578	0.9
Any hand hygiene total (N=1578)**	**578**	**1578**	**36.6**
Hand sanitiser	528	1578	33.5
Soap and water	50	1578	3.2
Disinfection of SPAQ blister packs total (N=78)	**20**	**78**	**25.6**
Disinfection before leaving for the community (N=26)	5	26	19.2
Disinfection after five compounds (N=26)	7	26	26.9
Disinfection at health facility before storage (end of day) (N=26)	8	26	30.8
Mask use* total (N=742)	**548**	**742**	**73.9**
Safe disposal of masks and wipes total (N=98)	**49**	**98**	**50.0**
Safe disposal of wipes in the community (N=18)	10	18	55.6
Safe disposal of mask at health facility at end of day (N=62)	29	49	59.2
Safe disposal of wipes at health facility at end of day (N=18)	10	18	55.6
Safe distancing in the compound^ total (N=1279)	**211**	**1279**	**16.4**
Safe distancing at compound 1	42	254	16.5
Safe distancing at compound 2	42	258	16.3
Safe distancing at compound 3	41	252	16.3
Safe distancing at compound 4	40	256	15.6
Safe distancing at compound 5	46	259	17.8
Ensure community distributors are healthy^^ total (N=518)	**117**	**518**	**22.6**

*Washed hands with soap and running water or hand sanitiser for ≥30 seconds

**Washed hands with soap and running water or hand sanitiser

^ during triage AND when determining age eligibility AND SPAQ eligibility AND SPAQ administration AND instructions ANDmessages; in compounds where the space was not too small to be measured

^^Take temperature with infrared thermometer at start and end of the day at the health facility

Table 15: Adherence to hand hygiene with water/soap or hand sanitiser, by environment (health facility or community) and state

Indication and domain	Water and soap	Hand sanitiser	Value (n)	Number (N)	Percentage (%)
Kano					
Hand hygiene with soap/sanitiser for ≥30s total (N=1503)	**0**	**11**	**11**	**1503**	**0.7**
Hand hygiene before community (N=241)	0	3	3	241	0.2
Hand hygiene at the compounds (N=1257)	0	8	8	1257	0.6
Hand hygiene at compound 1	*0*	*4*	4	*251*	*1.6*
Hand hygiene at compound 2	*0*	*1*	1	*252*	*0.4*
Hand hygiene at compound 3	*0*	*1*	1	*251*	*0.4*
Hand hygiene at compound 4	*0*	*2*	2	*252*	*0.8*
Hand hygiene at compound 5	*0*	*0*	0	*251*	*0.0*
Hand hygiene after disinfecting materials in community (N=3)	0	0	0	3	*0.0*
Hand hygiene after disinfecting materials and disposing of wipes and mask (N=2)	0	0	0	2	*0.0*
Kano					
Indication and domain	**Water and soap**	**Hand sanitiser**	**Value (n)**	**Number (N)**	**Percentage (%)**
Any hand hygiene total (N=1503)	**5**	**103**	**108**	**1503**	**7.2**
Hand hygiene before community (N=241)	*3*	*22*	25	241	10.4
Hand hygiene at the compounds (N=1257)	*2*	*80*	82	1257	6.5
Hand hygiene at compound 1	*2*	*34*	*36*	*251*	*14.3*
Hand hygiene at compound 2	*0*	*13*	*13*	*252*	*5.2*
Hand hygiene at compound 3	*0*	*11*	*11*	*251*	*4.4*
Hand hygiene at compound 4	*0*	*14*	*14*	*252*	*5.6*
Hand hygiene at compound 5	*0*	*8*	*8*	*251*	*3.2*
Hand hygiene after disinfecting materials in community (N=3)	*0*	*0*	0	3	*0.0*
Hand hygiene after disinfecting materials and disposing of wipes and mask (N=2)	*0*	*1*	1	2	*50.0*

Sokoto					
Indication and domain	**Water andsoap**	**Hand sanitiser**	**Value (n)**	**Number (N)**	**Percentage (%)**
Hand hygiene with soap/sanitiser for ≥30s total (N=1578)	**14**	**42**	**56**	**1578**	**3.7**
Hand hygiene before community (N=252)	11	6	17	252	7.1
Hand hygiene at all compounds (N=1278)	2	30	32	1278	2.5
Hand hygiene at compound 1	*0*	*12*	*12*	*257*	*4.7*
Hand hygiene at compound 2	*1*	*4*	*5*	*254*	*2.0*
Hand hygiene at compound 3	*0*	*5*	*5*	*255*	*2.0*
Hand hygiene at compound 4	*0*	*2*	*2*	*255*	*0.8*
Hand hygiene at compound 5	*1*	*7*	*8*	*257*	*3.1*
Hand hygiene after disinfecting materials in community (N=26)	0	4	4	25	*16.0*
Hand hygiene after disinfecting materials and disposing of wipes and mask (N=23)	1	2	3	23	*13.0*

Sokoto					
Indication and domain	**Water and soap**	**Hand sanitiser**	**Value (n)**	**Number (N)**	**Percentage (%)**
Any hand hygiene total (N=1579)	**50**	**521**	**571**	**1579**	**36.2**
Hand hygiene before community (N=252)	*33*	*78*	111	252	44.0
Hand hygiene at all compounds (N=1278)	*12*	*416*	428	1278	33.5
Hand hygiene at compound 1	*3*	*109*	112	257	*43.6*
Hand hygiene at compound 2	*2*	*82*	84	254	*33.1*
Hand hygiene at compound 3	*2*	*76*	78	255	*30.6*
Hand hygiene at compound 4	*3*	*79*	82	255	*32.2*
Hand hygiene at compound 5	*2*	*70*	72	257	*28.0*
Hand hygiene after disinfecting materials in community (N=26)	*1*	*17*	18	26	69.2
Hand hygiene after disinfecting materials and disposing of wipes and mask (N=23)	*4*	*10*	14	23	60.9

Table 16: Time spent washing hands, by location of hand hygiene and state

Indication	Kano			Sokoto		
Time spent washing hands at health facility (seconds) (morning)	Value (n)	Number (N)	Percentage (%)	Value (n)	Number (N)	Percentage (%)
Mean [SD] min, max	15.1 [9.7] 2, 35			20.3 [7.3] 5, 48		
No hand hygiene	227	252	90.1	147	260	56.5
Time spent washing hands in compound 1 (seconds)						
Mean [SD] min, max	15.9 [11.0] 3, 51			19.4 [7.3] 5, 35		
No hand hygiene	216	252	85.7	146	260	56.2
Time spent washing hands in compound 2 (seconds)						
Mean [SD] min, max	14.1 [7.1] 5, 30			18.4, [6.8], 5, 30		
No hand hygiene	239	252	94.8	172	260	66.2
Time spent washing hands in compound 3 (seconds)						
Mean [SD] min, max	17.3 [9.9], 3, 40			19.3 [7.0], 5, 30		
No hand hygiene	241	252	95.6	178	260	68.5
Time spent washing hands in compound 4 (seconds)						
Mean [SD] min, max	17 [10.5] 5, 40			18.3 [6.3], 2, 31		
No hand hygiene	238	252	94.4	177	260	68.1
Time spent washing hands in compound 5 (seconds)						
Mean [SD] min, max	13.9 [5.6], 8, 25			18.5 [7.4], 5, 35		
No hand hygiene	243	252	96.4	187	260	71.9
Time spent washing hands in facility (seconds) (PM)						
Mean [SD] min, max	21.5 [10.2] 5, 42			21.9 [6.5] 8, 32		
No hand hygiene	234	252	92.9	208	252	82.5

Table 17: Adherence to mask use, by environment (health facility or community) and state

Indication and domain	Value (n)	Number (N)	Percentage (%)
			Sokoto
Mask use* total (N=742)	**548**	**742**	**73.9**
Mask use before leaving for community	169	207	81.6
Mask use at compound 1	77	107	72.0
Mask use at compound 2	79	107	73.8
Mask use at compound 3	76	107	71.0

Mask use at compound 4	73	107	68.2
Mask use at compound 5	74	107	69.2
			Kano
Indication and domain	**Value (n)**	**Number (N)**	**Percentage (%)**
Mask use* total (N=86)	**53**	**86**	**61.6**
Mask use before leaving for community	16	26	61.5
Mask use at compound 1	8	12	66.7
Mask use at compound 2	9	12	75.0
Mask use at compound 3	7	12	58.3
Mask use at compound 4	7	12	58.3
Mask use at compound 5	6	12	50.0

Table 18: Proportion of indications where safe distancing was practiced, by step – Kano state

	Kano Sum of compounds		
Step	**Value (n)**	**Number (N)**	**Percentage (%)**
Safe distancing practiced			
During triage	325	1202	**27.0**
When determining child's age	433	1210	**35.8**
When determining eligibility to receive SPAQ	316	1205	**26.2**
During SPAQ administration	313	1235	**25.3**
During instructions for day 2/3	328	1217	**27.0**
When giving health promotion message	115	1148	**10.0**
The space is too small to be measured	62	1206	**5.1**

Table 19: Proportion of indications where safe distancing was practised, by step, Sokoto state

	Sokoto Sum of compounds		
Step	**Value (n)**	**Number (N)**	**Percentage (%)**
Safe distancing practised			
During triage	796	1292	**61.6**

When determining child's age	729	1271	**57.4**
When determining eligibility to receive SPAQ	693	1264	**54.8**
During SPAQ administration	591	1269	**46.6**
During instructions for day 2/3	596	1280	**46.6**
When giving health promotion message	387	1275	**30.4**
The space is too small to be measured	211	1278	**16.5**

Table 20: Proportion of community distributors who had their temperatures taken, by state

	Kano (N=252)			Sokoto (N=259)		
Indication	**Value (n)**	**Number (N)**	**Percentage (%)**	**Value (n)**	**Number (N)**	**Percentage (%)**
Overall adherence*	1	504	0	117	518	22.6
Temperature taken before leaving for community						
Infrared	1	252	0.4	78	259	30.1
Standard	0	252	0.0	27	259	10.4
Thermometer disinfected before leaving for community	0	252	0.0	0	259	0.0
Temperature recorded before leaving for community	1	252	0.4	87	259	33.6
Temperature taken at health facility at the end of the day						
Infrared	0	252	0.0	39	259	15.1
Standard	0	252	0.0	20	259	7.7
Thermometer disinfected at health facility at the end of the day	0	252	0.0	1	259	0.4
Temperature recorded at health facility at the end of the day	0	252	0.0	51	259	19.7

*Temperature taken with infrared thermometer

16 Appendices

Community distributors' awareness of the SMC IPC guidelines

"We were also told that after we enter five compounds, that is when we should change hand gloves and wash hands. To remove the glove, they want the hand gloves that is on your right hand to hold the glove on your left and pull it out gently. When you turn you will hold the right one and pull it over the left one and get a nylon to discard it so that we will not throw them away carelessly and children will pick it and play with it and catch that disease. We should be careful…" (Kano, urban male_01).

Community distributor perception of IPC measures

"Honestly, like the face mask really helped us because there was this woman, I entered her house who had cough. God helped me that I had face mask and I wore it. You see, it made me not to worry because if not so, I could contract whatever was making her cough and take it home." (Kano, urban female _02)

"The imposed rule is of benefit. These measures of coronavirus have been very useful, everybody was happy about it, not even only us working that is happy about it, even some people not working with us when they see us doing it, they normally watch and they are also learning it and are really happy about it." (Sokoto_rural_female_07)

Community distributors' observations about caregivers' perception of IPC measures

"Some women, when they see us with face mask, they fear we are distributing coronavirus medicine because they have the rumours that there will be coronavirus medicine distribution, so they used to refuse us. We have to convince some to believe that it is malaria prevention medicine we are distributing, and this is becauseof the mask we wear." (Kano_rural_female_08)

"It is not easy to be refused every time by the mothers and even the husbands of the house. They find it hardto believe us because of this COVID-19 that happened. Part of what helped us is those who have heard the advert on the radio before now and in the communities and where the district head pass information aroundto make the people aware of our rule, that's what made things a bit easy for us." (Sokoto_rural_male_06)

Caregivers' adherence to SMC administration instructions

"Because at first when we came for [cycle] one, we gave them and they saw how we gave them so for the rest of the cycle, they already know how to give the first dose." (Kano, urban_ female_04)

"For the first day in cycle one, I gave the children the drugs myself and then I will tell the caregiver how to give them the next day." (Kano, urban_ female_04)

"After they will consent to our activities, we have to drop our bags, use water to wash our hands and then also give the mother of the child to do same, after which she will then have to get us a container to soak the drugs she will give her child. We will take about 30 minutes if the child didn't cry before we are done." (Sokoto, urban_female_04)

"Other children prefer you give them the medicine because if their mother collects it, she will deceive the child before giving him. We do lure them with candy. Before some children will collect medicine, they want you to show them candy first. I do buy candy a lot because whenever I show them, they do collect. We do tell them that if they take it, we will give them the sweet." (Kano, urban_female_01)

"Sometimes it's the child that will say they prefer their mother to give them not you." (Kano, rural_female_05)

"There were two houses that we entered to give the medicine. The children — when we give their children the medicine, then they will start crying that they don't want, that they prefer the person giving the medicine

to give to them." (Sokoto, urban_female_03)

"Possibly there is sickness that the child had and the mother will press him in giving the medicine, she will give him until he feels like suffocating. They noticed that when we come to give them the medicine we don't do that kind of giving medicine to them, so if we give the mother to give, the child will say, 'No, give it to her to give me'. They will now give us to give the child; they will now say that since the child says we are then ones to give, we should please give the children to take the medicine." (Sokoto, urban_female_03)

"They honestly followed the instructions because before we prepare the medicine to give a son, but now, we will just open and give the mother of a child to give him. So before now, you see, since from the beginning, there used to be issues that some of them will say, how will you be the one to give their children medicine? So now they were happy because you will just open and give them to give their children". (Sokoto, urban_female_03)

Compliance is feasible but not optimal

"To me, face mask is easier to do because you can put it inside your bag when going out and wear it

Whenever you feel like it without any problem." (Sokoto_urban_male_01)

"Honestly, I always use my face masks, I do not have any problem because I got used to it. When I put it, I will only be removing it at intervals to enjoy fresh air before taking it back after some minutes." (Kano, urban_female_02)

Compliance varied by parameters

"For me, to wash my hands or apply hand sanitise was very easy compared to the rest." (Kano,

urban_female_04)

"For example, if you enter a house, you may know someone who lives there, if you do not go close to greet her or touch her, she will think you embarrassed her, or you disgrace her. From then she will be angry with you. So, this social distance is more difficult for me to do; hand washing is easier." (Kano, rural_female_05)

Cultural norms made it difficult to observe social distancing

"Honestly, there used to be forgetfulness. There is no one that doesn't forget things, especially when we get to a house where we will laugh with the family and the children, we do forget that we are supposed to stand afar." (Sokoto, rural_female_05)

"Like that of social distancing, since you know the person and they know us, it is hard not to come, sit and discuss and even shake." (Sokoto_Rural_male_03)

"For example, if a caregiver notices that you are standing far from them, they will say is it because of the medicine you are doing all this? They will ask you to come close; if you refuse, they will not accept the medicine." (Kano, Rural_female_05)

"If you enter a house, for example, if there is no corridor or it is a home of a new wife who is always in the room, she will insist that you enter the room because they are not going to come out and if you don't do as they want, other elders in the compound can even embarrass or disgrace you." (Kano, rural_female_05)

"When you give a distance between caregivers, some tell us to come closer to them; some we even say are

we avoiding them." Kano_rural_female_04)

Adherence to hand washing requirements was sub-optimal

"Yes ma, since it's a promise you have taken upon yourself, you have to follow it diligently because they were appropriate and if you don't want any problem, you just have to adhere to the directives." (Sokoto_rural_female_05)

"If you come out from one, two houses you will have to wash your hands again, and if you write you still have towash your hands again. So, we are already used to washing of hands but not as many times as they said. Seriously, we all know it's a protection, and we know washing hands won't harm us. It's a protection against coronavirus, but it is too often." (Sokoto_ Rural_male_02)

"Face mask did not disturb me, social distancing did not disturb me, but washing of hands was a challenge for me because of the chemical and I have to do it plenty times" (Kano_URBAN_female_03)

"The only thing I face is that using the alcohol-based sanitiser doesn't allow me to pray. Whenever I use it, I still wash my hands with soap when I get to the hospital because I must go back to the hospital to drop the work materials and then pray" (Kano, Rural_female_05)

"People are complaining that the sanitiser is hot, hence, hurts them because of the volume of the chemicals

involved in it and for that even after using it, they will still use water to wash their hands. One of my colleagues told me that whenever she uses it, she observed that her skin gets swollen especially when the sun is very hot because her skin is sensitive. But for me, its normal, nothing had ever happened, and whenever we go to work, her skin peels off. (Kano, rural_female_05).

"Honestly, I did not face any problem because hand hygiene is above everything because when you standup you will carry something and put in your mouth and touch your nose and your eyes, you might get infected easily if you do not get hand sanitiser and apply it immediately." (Kano, urban_female_01)

Hand hygiene timing and frequency

"I always wash my hands, but sometimes it is not up to 30 seconds and not after every target. When I finished from a compound and I come out and see that I have time, then I will take the time to wash." (Kano_urban_male_01)

"Honestly me, sanitising my hands often was what gave me problems. Like every now and again you must wash your hands." (Kano_urban_female_03)

"Well, by the grace of God, though I cannot say I maintained the timing all through, but I tried my best in

estimating it since it is only God that is perfect." (Sokoto_urban_female_04)

"They said we should wash our hands every 30 seconds; well for me, I do not think I did it up to that."

(Sokoto_rural_female_03)

Wearing face masks for prolonged periods was uncomfortable

"I do forget to use it at times, and it disturbs me. When they gave it to me after we started work it do disturb me so I removed it. When I removed it and went to work till I come back, honestly, I would forget putting it on. There was even a time my colleague asked me where my face mask is. I said 'It is in my pocket'. They now told me I must be putting it on. To me I felt it was disturbing me." (Sokoto, urban_male_01)

"Honestly, my face mask has finished before I finish work. Sometimes my child is crying and so he drags the face mask and tear it; that's the only reason for which I do not wear it." (Sokoto, urban_female_02).

"Well, when we were given face mask at first, I was honestly feeling peppery on my face when I started using it and my breath will be doing as if it will cease, but I endured because they said the face mask protects us and I get used to it that way." Sokoto, urban_female_03)

"No, honestly, I don't feel anything even though some people complain that when they put on the face mask, they feel as if it will take their breath…for me, honestly at first, when I started using it, my system started changing but when I continued using it, I feel comfortable with it." (Sokoto_urban_female_04)

"We didn't face any problem, except for the fact that whenever we enter some houses, some older men and even the younger ones that stay by road side do tag us the 'the corona people' and whenever they sight us from afar, they begin to say 'There come the corona people'. Some tell us that the boxes we carry and the face mask we wear resemble cows that are tied to ropes and cow isn't human being." (Sokoto, urban_female_04).

"Yes, honestly we somehow faced challenge because, we had some challenges using the face mask for the fact that we were not used to it before. Even though we were using it in the past but now we use it often, we put it on during work, even after until we go back to the house before they say we can remove it. We need to have it on like 6–7 hours; we are not used to this duration." (Sokoto, urban_female_04)

"When I use for like 40 to 45 minutes like that, I do bring it down a little so that I can take some air or drink Water like that then I will put it back." (Kano_Urban_female_03)

"Sincerely speaking to me I have challenges with wearing face mask, like when taking the medicine from facility to the distribution place if it is not nearby and the weather is hot you will have shortness breath, due to that you will need to have enough ventilation more than when you are wearing Facemask" (Kano_Rural_male_04)

"The challenges I face is regarding myself; I can't wear it for a long time. I suffer a lot because of my breathing it won't be clear as before." (Kano, rural female_05)

"I remove it sometimes, you know I have told you I have breathing problem so I remove it to have some fresh air and put it back to continue my work. Sometimes I removed it if I enter each and every house." (Kano, rural_female_05)

Availability and management of IPC and SMC equipment

"Honestly, it is only the empty drug carton we have. I returned them to the facility in charge at the end of the day. I do not know what they do with it because we do return it to them empty." (Kano, urban female_02)

"If we finish with the used materials, we keep it with us until we get to the facility or we go out and find a dustbin to throw away where children can't touch." (Kano, rural female_05)

"We were given a nylon bag, it is a big leather and it is thick" (Sokoto, Urbanfemale_02).

"If they have shortage, we will find some spirit and use it instead of sanitiser, because sometimes they will give you sanitiser it will not take you up to the end of four days or the 4– 5 days that you will do before you will collect another one. And if they give you one and it finishes you should not come back because they also give account." (Kano, urban_male_01)

"Yes, sometimes we get a jerrican and go with it but not everyone goes with water when they don't have Sanitiser like the sanitiser when we have shortage; we use spirit to wash our hands or face mask. If our own is old, we can buy another one and add" (Kano, Urban_Female_03).

"The challenges are almost the same that we faced. We don't have abundant hand gloves and hand sanitiser. Because of that they gave us money if it happens that it does not take us like they said it is four days at least two days or three days it will finish, it is a must for you to buy." (Kano, urban_male_01)

Limited equipment availability impacted consistency in adherence to IPC measures

"Like for the facemask as I told you, sometimes it is only one that they give us and it is not sufficient for us because you have to wash it at the end of every day to use it the next day." (Kano, urban_male_01).

" Sometimes, when we go out to work, we run out of some of them. If we have water, we will try to wash our hands to protect ourselves and for the hand gloves we go for them to give us for day one and sometimes when you come you will not be given." (Kano, urban_female_02)

Yes, honestly when they shared it, not everybody was given sanitiser because it was not enough — there was a problem — and also not every team. There was a cycle they gave ten people a sanitiser. How is it possible to use it when they do not work at the same place? That was the problem we faced in that cycle. If it was two people to a sanitiser, it would not have been a problem." (Kano, urban_male_01)

The first challenge was, the hijab they do give us to use, they are supposed to say that during cycle one that someone was given hijab. They should make sure that the hijab belongs to that person alone until you finish the work before returning it. Since after returning it and coming back the next day, it is not the bag you used the previous day that will be given to you." (Kano, urban_female_02)

"Yes, they will give you one paper and tell you to use your money for photocopy. The same thing with chalk. They will tell you that they have given you money that when it finishes, you willuse your money to buy it. You will use your money to buy chalk and do photocopy." (Kano, URBAN_female_02)

"We almost have shortage of hand gloves, chalk for house marking and tissue." (Kano, Kuru_female_05).

"Honestly, it doesn't finish, and nobody can open their mouth to say it finished because before we go out, they give everybody like two bottles of sanitiser and you cannot say you will finish it in four days. So, we always have what we need." (Sokoto, urban_female_02).

Mixed views on the impact of IPC measures on workload

“We have to stay and enlighten them till they understand what we are doing before they accept. It was possible but, honestly, we had to sit them down and enlighten them. But it wasn’t immediately they took it in.” (Sokoto, urban_male_01)

“Well, it has increased the workload compared to the previous years.” (Sokoto, urban_female_03)

“Instead of going straight to introducing yourself, you start by talking about coronavirus. You start by asking if they have any idea of the coronavirus — that’s the first question you ask and if they have the idea, you ask the measure they take on it. All this takes time. And when they tell you the measures they take, then you ask if they know that one of the measures is to wash hands and take a distance before they can take anything with their hands. Some will tell you that they have no idea; then we use the sanitiser given to us to demonstrate for them to see, and show that before we touch the drugs, we have to put on the face mask and tell them that this is because when we are talking to one another, we breathe.” (Kano, rural_female_03)

“The work increased a bit because when you enter into a house, you will be the one to show the mother how to give the child medicine and that will take time for you to explain to her how it is done.” (Kano, urban_female_03)

“It is not a problem for me honestly. The only thing that became an issue to me is the additional time of closing. We were closing by either 12:30 or 12p.m. but now we have additional 35–40 minutes to it, and you see, that’s not an issue. Honestly, we didn’t take it as an issue.” (Sokoto, urban_female_04)

“It does not cause any delay. Even if it will delay, it will not be for more than five or ten minutes — that is the little delay we can get. It is a must for you to know how you will explain to them in short seconds and it will be useful you know how to manage time.” (Kano, urban_male_01)

“Based on giving the children medicine like before we gather almost 50 people in one place for example if you go to a big house which has 15-17 households you will gather them in one place and give them the drug all at once. But now, because of Corona you will have to separate them and attend to them one by one, so this takes our time" (Kano_Rural_male_02).

“How I did this work in this time of coronavirus pandemic, I didn't enjoy it. The reason is, if it is not during the coronavirus pandemic the work will be much faster, because if I went to a house before the pandemic, since we don't know anything social distance, I just went in give them the medicine, fill the card and come out — no social distance and other things, there is none. I don't have to use hand sanitiser and wash my hands. You see, if there is no coronavirus, I will be faster; the things that I will do in 30 minutes I can do it may be in 10 minutes.” (Kano_rural_female_03).

Rumours and misconceptions about COVID-19

"Honestly I heard from some people that there is medicine that cures corona, but they said the one I heard first is you should go and look for Quran if you check it you will find it there. You should take your hair and put it inside water and drink — that is the medicine for COVID-19 — and some said chloroquine injection is medicine for COVID-19 and some said you can eat garlic. It is a medication for it but truly I did not see but that is how I heard it." (Kano, urban_male_01)

"All of us agree that it is real because, honestly, this virus exists except like my colleague said, in this part of Nigeria, we did not see anybody that is infected with it but we keep hearing in the rest of countries that

They are infected with it." (Kano, urban_male_01).

"The biggest problem we had was that some people did not even agree with the COVID-19. Honestly, they did not even accept that the medicine is that of malaria. They thought it was COVID-19 medicine that we came to share and not malaria medicine. You have to explain to them that it is not corona medicine, but malaria medicine. That is the problem." (Kano, urban_female_02)

"This disease is real because we have been hearing about it before it comes to this country, so let's keep the issue of politician aside. If, for example, it started from this state, we can say it doesn't exist but it started from developed countries that have advanced health care." (Kano_rural_female_04)

"When you ask them for their reason of not wearing face masks, they will tell you that there is no corona and they say corona is a lie and most people do not believe that there is corona. When you try to enlighten them, they will say he don't know any corona and he will never believe you — he will tell you there is no corona, that is hunger that exists." (Sokoto_rural_male_03)