

Lessons from participatory community mapping to inform neglected tropical disease programmes in Nigeria

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Background: Participatory research methods promote collaborations between researchers and communities to collectively overcome implementation challenges for sustainable social change. Programmes usually take a top-down approach to addressing such challenges. This study developed and piloted contextualised participatory methods to identify community structures that could improve the equity of medicine administration for neglected tropical diseases (NTDs) in northern and southern Nigeria.

Methods: Participants and researchers conducted transect walks and social mapping to understand which community-based structures could be used to maximise accessibility and acceptability of medicines for NTDs.

Results: Using visual participatory methods with a diverse set of stakeholders facilitated the identification of new structures within the community that could be used to improve the equity of medicine distribution and access. Available materials such as sticks, stones and leaves were appropriately used by respondents in the rural areas, which increased meaningful engagement irrespective of their literacy level. Structures identified included Qur'anic schools, football grounds, mechanics shops, shrines, village head's houses and worship centres. Challenges in using these structures for medicine distribution included resistance from school authorities and restrictions to women's access due to traditions and norms, particularly within palaces and mosques.

Conclusions: This article highlights the importance of meaningful community engagement methods and engaging gatekeepers in visual participatory methods. It emphasizes the importance of including divergent views of various population groups in order to ensure that all communities are reached by NTDs programmes.

Keywords: equity, Nigeria, social mapping, transect walks.

Introduction

In participatory studies, academic researchers aim to involve people affected by the research topic as equitable partners in order to increase their capacity to identify and solve their own contextual problems. Participatory health research enables communities to play dominant and dynamic roles in choices that influence their lives, shape their outcomes and improve the quality of research

data and its interpretation and the dissemination of findings.^{1,2} Participatory methods utilise local expertise to foster sustainable social change.³ Researchers, community members, activists and donors utilise these methods to support mutual learning.⁴

Neglected tropical diseases (NTDs) are targeted for elimination through mass drug administration (MDA) as part of sustainable Development Goal (SDG) 3.3, which aims to 'end the epidemics of AIDS, tuberculosis, malaria, and NTDs and also to achieve

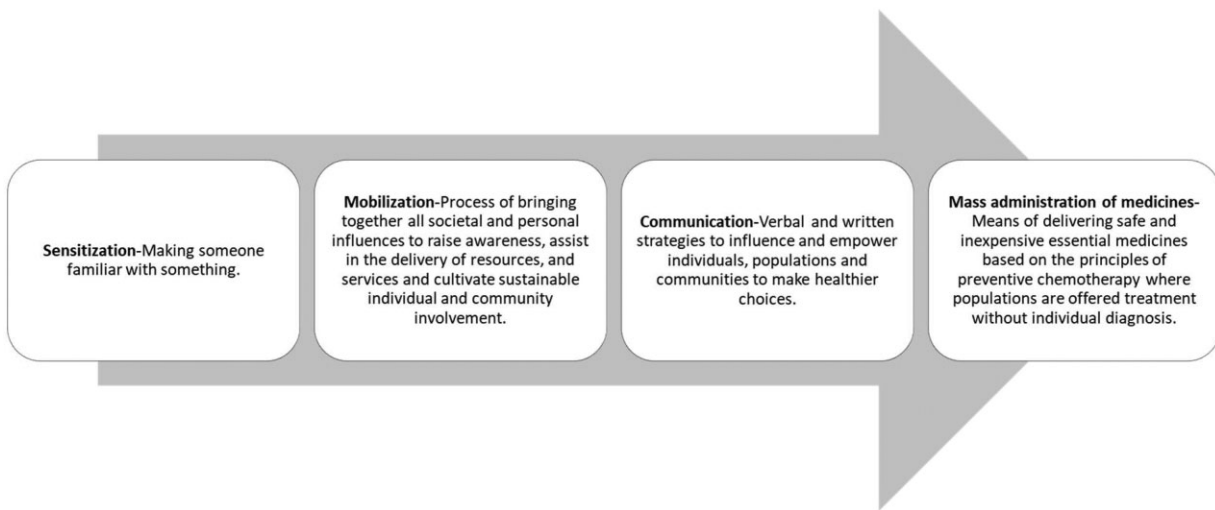


Figure 1. MAM pathway.

universal health coverage'.⁵ NTDs are 'a medically diverse group of conditions that are prevalent among low-income populations in Africa, Asia, and the Americas. They are caused by viruses, bacteria, protozoa, and helminths'. Some NTDs, including lymphatic filariasis (LF), onchocerciasis, schistosomiasis, soil-transmitted helminths (STHs) and trachoma, can be controlled and eliminated through preventive chemotherapy medicines.⁶

Nigeria accounts for 25% of the burden of NTDs in sub-Saharan Africa.⁷ Adapting mass administration of medicines (or MAM, as MDA is referred to in Nigeria) to suit contextual needs is vital, as communities have different structures and cultures that impact on medicine uptake.⁸ For example, in urban contexts, the availability of the eligible population for treatment is impacted by local dynamics of gender, power and positional-ity.⁹ Men are at work during the day and miss out on MAM if it happens during that time. In Nigeria, women's and girls' access to healthcare is less autonomous and is frequently influenced by the husband, father or other male authorities in the family.¹⁰

In Nigeria, the MAM pathway of programme implementation consists of sensitization, mobilization, communication and medicine distribution as shown in Figure 1.¹¹⁻¹³

For several years, pharmaceutical companies, donors and non-governmental development organisations have funded and provided technical support for research on NTDs in endemic countries.¹⁴ Yet many vulnerable people who need medicines are still being left behind in MAM campaigns across Africa. Inequities in MAM delivery are largely due to a reduction in community engagement that can support programmes to understand how to deliver medicines at a time, place and space that suits them.^{15,16} For example, in Nigeria, women, girls, migrants, the elderly, youth, urban populations and some ethnic and religious groups are left out of MAM, which potentially increases health inequities.¹⁶⁻²⁰ In order to improve access to MAM, understanding how different population groups interact with their environment, structures and institutions is key to reaching those currently left behind in NTD programmes.²¹

Participatory studies can facilitate bottom-up, person-centred approaches to developing solutions for NTDs-related challenges. They support the inclusion of poor and marginalised populations whose voices are often unheard in health intervention design.²² As contexts change and develop, researchers and decision makers need to regularly review how communities can engage as partners within NTDs programming. Instead of seeking solutions for them, participatory research seeks to actively involve the expertise of marginalised populations in identifying solutions to improve access to MAM and overcome health inequities.¹⁷⁻²⁰ Lessons are needed on how to apply participatory research methods to maximise the benefits for research involving communities and NTDs programmes.

Global mapping to understand current disease burdens, treatment patterns and in some cases to identify equity challenges have been conducted for NTDs using geographical information systems.²³ In Nigeria, mapping has been completed for schistosomiasis in the southeast and for LF and loiasis in the southwest.^{24,25} However, community-based mapping that engages local populations to demonstrate how they would like MAM interventions implemented is uncommon. Thus, in this study, we aim to share lessons on utilising participatory community mapping to improve MAM implementation in Nigeria. By engaging with a variety of community stakeholders, some of whom are frequently marginalised within MAM delivery, we also aim to highlight how visual participatory mapping processes can enhance and ensure equity in NTDs programme delivery.

Methods

Study design

This research was part of the exploratory phase of a participatory action research (PAR) project to increase equity within MAM, which is detailed in Ozano et al.²⁶ and shown in Figure 2. The study was designed and adapted by the research team in collaboration with stakeholders involved in NTDs programme

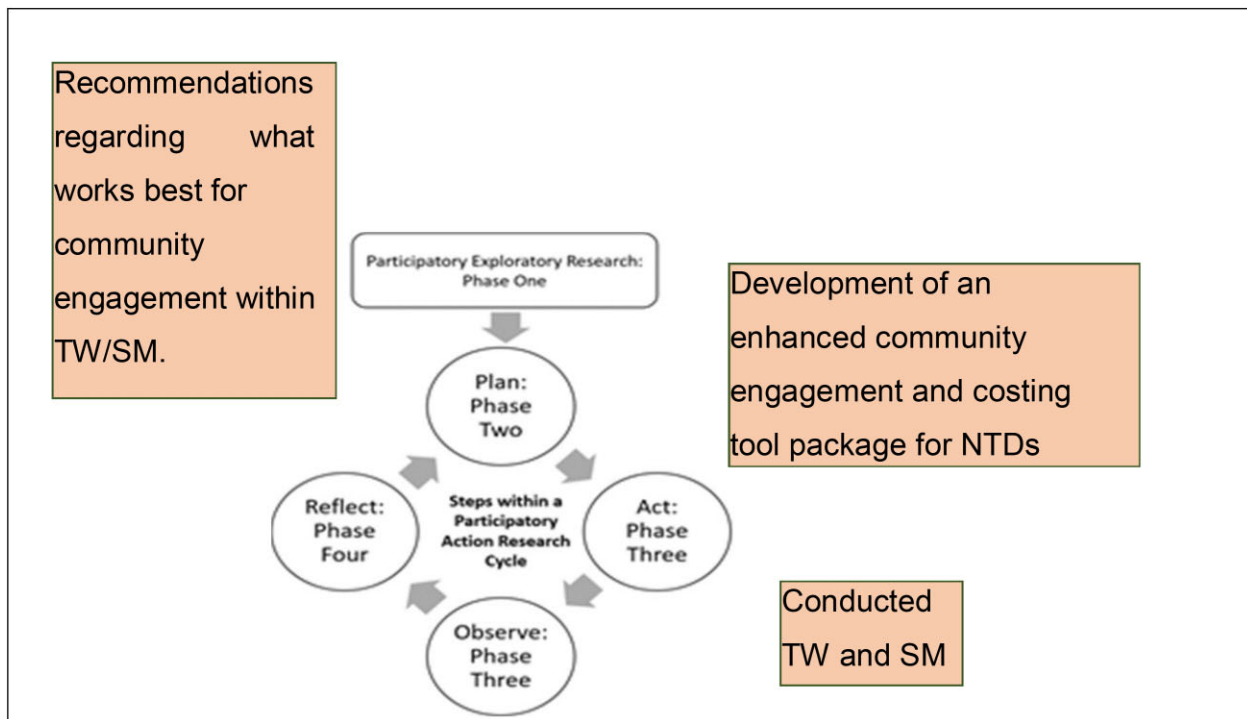


Figure 2. Participatory action research cycle employed in the study.

implementation (national, state, district and community levels) between January 2018 and October 2019. State-level implementers were trained and facilitated the transect walks (TWs) and social mappings (SMs), analysed data and implemented the study. Community participants were community leaders and members from different social groups. Power dynamics were managed through disaggregating participants by cadre, gender and age. The research team guided participants to ensure that everyone was free to contribute to discussions and decisions. Details of the COUNTDOWN project (Calling Time on Neglected Tropical Diseases) can be found at <https://countdown.lstmed.ac.uk/about-countdown>. The focus of this article is on the participatory mapping methods that were adapted, piloted and utilised to identify community-based structures that could maximise accessibility and acceptability of medicines for NTDs, ultimately improving programme equity.

Setting and selection of study sites

We conducted our study in Ogun (northwestern) and Kaduna States (southwestern) in Nigeria. We purposively selected these states based on their level of experience in NTDs programming. While Kaduna has benefitted from long-term government, donor and technical support in NTDs programme implementation, Ogun is still in the ‘infancy’ stage, receiving minimal support.²⁷ The therapeutic coverage of NTDs intervention from 2017 to 2020 in Ogun ranged from 41 to 66.1%. For the time in Kaduna, the therapeutic coverage was 65–95%.

We developed a sampling matrix for the communities and their chosen characteristics, as shown in Table 1. Selection cri-

teria were as follows: population density (>300 km for urban and <300 km for rural communities), migrant communities (where farming or mobile communities reside, i.e. herdsmen) and border communities (geographic boundaries of political entities or legal jurisdictions).²⁸

Rural communities (Figure 3) in this study have mixtures of mostly sparse populations living in block and mud houses with thatched and rusty roofs, poor road networks and erratic power supplies.

The urban areas (Figure 4) were more densely populated. In the less wealthy areas, there were overcrowded informal settings consisting of non-standard houses with inadequate water and sanitary amenities.²⁸ The wealthier areas had modern houses with better social amenities.

Description of the methods

Community members, implementer-researchers at the national and state levels and the research team used participatory research methods to identify structures along the MAM pathway.^{29,30,31} Staff of the state team and the national NTDs programme manager were trained to use the methods, were involved in data collection and are authors of this article, adding immediate learning and skills within the health system.

TWs

The research team explained the aim of the TWs to the community leaders, who agreed on the route and guided the researchers through their community to identify the different groups of

Table 1. Sampling matrix for chosen communities

State	Community	Geographic location	Cultural characteristics
Kaduna	Rural	Southern Kaduna	Home of Tyap, Hausa, Rumaya, Chawai, Surubu, Kono, Fulani, Amawa, Kitimi and Gure tribes
	Urban	Central Kaduna	Home of mainly Hausa Fulani and Gwari tribes
Ogun	Migrant/border	Central Kaduna	Major tribes are Bajju, Gbagyi, Fulani, Hausa
	Rural	Western Ogun shares a border with the Republic of Benin	Home of the Yewa tribe
	Urban	Eastern Ogun	Home of the Ijebu tribe
	Border	Eastern Ogun	Eastern Ogun
	Migrant	Central Ogun	Eastern Ogun

**Figure 3.** Rural study communities (photo: Luret A. Lar).**Figure 4.** Urban study areas (photo: Luret A. Lar).

people who reside there, what roles they play, different areas or meeting points and important landmarks or physical structures that are regularly used.^{32,33} Participants guided the route of the walk based on the initial description of the walk's purpose by the research team, which was to understand the areas where different groups are located and interact and how they are or could be used to deliver health programmes within the community (Figure 5).

We conducted eight TWs in Ogun and six in Kaduna, lasting 45–60 min. The TWs begin to immerse the researcher within the study communities, to gain a preliminary understanding of the social and structural composition of the study communities.^{29,34,35}

In Kaduna, conducting the TW in the urban location was more challenging because community leaders were at work or away for other daily activities (Figure 5), therefore some TWs had to

be rescheduled. The routes were shorter and the walks lasted less than the average 3–6 h in the rural areas across both states. In both states there were only a few female community leaders who joined the walk, especially in the Hausa-dominated areas in Ogun, where the sociocultural restrictions around women's visibility were obvious. However, in the rural area, more women participated in the TWs (Figure 6) and the routes were longer. There were interruptions by other community members to find out what was going on in both study sites, especially in Ogun, where the youth noticed unfamiliar faces.

SM

Fourteen SM sessions were conducted with six to eight participants that lasted 1–2 h. The SM was done following the TWs and involved the research team and younger and older men



Figure 5. Rural TW (Kaduna) showing researcher and community members (photo: Luret A. Lar).



Figure 6. Rural TW (Ogun) showing researchers and community members (photo: Ogun research team).

and women in the communities who were not involved in the TWs. Participants drew a map of their community, locating existing boundaries, significant structures and areas where different social groups gather. Descriptions of interactions between different community groups and structures at specific times and points during the year were also collected.^{36,37} As participants drew the maps and specified the structures, the research team recorded the sessions and took notes. The SM sessions were initially done with different groups of community members separately (women, men, youth) to gain a greater level of detail from a broad range of perspectives.³⁸ Specifically, it provided in-depth visual descriptions of how they are currently engaged or could be engaged in the delivery of MAM. Once each of the SM activities was completed with all the groups separately, they were brought together to compare the maps and explore divergent views. The



Figure 7. Social map among older women in a rural community (photo: Ogun research team).

collective discussion of maps facilitated a deeper understanding of community structures and provided additional insights into the use of space based on different sociodemographic characteristics such as age, gender and community position.³⁹

Data collection

Language considerations

Hausa is the language spoken in Kaduna and Yoruba is spoken in Ogun. The study tools were translated to these languages and research assistants who were fluent in these languages collected the data. Following the completion of data collection, the information was translated and transcribed from these languages to English. Someone who was fluent in both languages independently translated and back-translated the transcripts to maintain the content.

Participants and data collection

To facilitate positive community entry, the TWs were conducted with community leaders, who often acted as gatekeepers. We then conducted SM with disaggregated groups of other community members. This order and grouping of shared demographic factors enabled the research team to navigate pre-existing power dynamics within communities.

Available materials such as sticks, stones and leaves were appropriately used by participants in the rural areas, especially in Ogun, as illustrated in Figure 7. This allowed the respondents to meaningfully engage with these methods irrespective of their literacy level. The use of drawings and creativity in producing social maps also supported the identification of new community structures that could be used by disease programmes.

Data analysis

The participatory nature of the methods involved in phase 1 and 2 of this study meant that analysis was an ongoing process. This involved the core research team and implementer-researchers at the national and state levels. The outputs from each method formed the data that were analysed and triangulated from this research method. These included maps,

matrices, audio-recorded discussions between the researcher and the participants, sketches and notes or photographs taken by the researcher during the walk. Where feasible, data were recorded and transcribed verbatim and notes were taken for quality control, triangulation,³⁶ to document emerging findings and to capture reflections on the application and adaptation of methods. A coding framework was developed by the research team in Nigeria and at the Liverpool School of Tropical Medicine (LSTM) after familiarisation with the different data formats. Coding of data was conducted by gender, age, community role and location to identify any patterns. NVivo version 11 (QSR International, Burlington, MA, USA) was used to code the data, which was subsequently synthesised into themes. Reflections taken from research diaries and ongoing reflexivity sessions of implementing the research methods were added to the discussion.

Ethics

Ethical approval was obtained from the National Health Research Ethics Committee of Nigeria (NHREC/01/01/2007-19/12/2017) and LSTM (19-092). Informed consent (written, thumb printed and verbal) for involvement in the study and for photographs was obtained from participants based on their literacy level.

Results

The following findings show how MAM can be improved through utilisation of additional community structures in intervention delivery. The TWs and SMs supported the identification of potential venues for medicine delivery, considering any opportunities and limitations (e.g. timing of MAM, gendered issues) of the structure. The study participants in both states generally had fair to good knowledge of NTDs, as they could identify existing and potential structures along the MAM pathway (Figure 1) that were relevant for programme implementation. They had also received many years of MAM campaigns, and some had one or more NTDs or had family and friends who had been affected by an NTD.

Educational sites

Public, private, primary, secondary, Islamic and *almajiri* (a system of Islamic education) schools were identified as current and potential structures for sensitization, mobilization, communication and medicine administration. This was across all study contexts and participant groups, as youth, women and children engage with these structures throughout the year. However, the *almajiri* schools were specifically mentioned in urban Kaduna.

Most of the youth groups in the rural and urban areas felt that the sensitization and communication of the programme would be more successful if the Parent Teacher Association (PTA) was engaged.

...since they will hear and be aware on behalf of their children, wards, and the family. Everybody will like to go there, be it male, female and youth, 90% of the people in the community will go there. [youth, urban, Ogun, SM]

Nevertheless, some community leaders in both states mentioned the challenges of distance, holidays and absenteeism.

However, the challenge may be resistance by owners of the school who may not want visitors entering their schools, especially if there is a misconception about the medicines. People may also not like to go there due to distance since the place is in the outskirts of the community. [community leader, rural, Kaduna, TW]

Men in Kaduna and Ogun identified schools as potential structures since they had previously been used for cholera and diarrhoea programmes. This specifically applies to Qur'anic schools, where the Imam (Muslim cleric) has a strong influence on the pupils. They also felt that parents were more likely to cooperate with Imams because they believed in them and would listen to them. The male youths in urban Kaduna emphasised that free medicines may raise suspicion within the community.

Imams were influential in sensitization and mobilization, which would promote medicines distributions and acceptance, within these schools. [older male, rural, Kaduna, SM]

According to the men in Kaduna, sensitization could be carried out in orthodox schools during the morning assembly when all children gather, or it could be distributed class by class. However, most women and youth in Kaduna and Ogun said that public schools were more engaged for medicine distribution than private schools. A participant mentioned a challenge of this engagement as:

...the noise during the MAM exercise can disturb the school academic activity for weekends. [older female, rural, Ogun TW]

Personalities or influential individuals

Male and female participants across the rural and urban areas mentioned that personalities and influential individuals are currently and could potentially be engaged for MAM. The community meets in these places for various activities, from voting to meetings, which MAM activities could leverage upon.

Women in the rural community in Kaduna identified the houses of a politician and a legislator as currently being engaged for sensitization and mobilization. Similarly, men in both states in the rural and urban areas identified those who have served in government or politicians and the palace of the community leader. Since all community members gather there on specific days, they could be informed about the diseases and need for medicines. This may be because men have greater access to the palace than women, due to sociocultural norms.

He has helped the community a lot and has built classes for the primary school. Everyone in the community can go there if not for the fact that the place is too small. [male, rural, Ogun, TW]

Male and female youth in both states also identified politicians as community mobilizers for voting and health interventions, such as cholera and diarrhoea programmes. They also identified that these houses had been used for the polio programme, which had facilitated acceptance of the vaccine in rural Kaduna. Therefore these community members are socially significant and could potentially influence the acceptance of other health interventions.

However, a youth mentioned the following challenge:

...is used for sensitization and the selection of CDDs, but if MAM activity wants to take place there, non-party members may not want to go and the occupants of the house were only present at the house during the festive seasons. [older male, urban, Kaduna, SM]

Community leaders in urban and rural Kaduna and Ogun and in the border context identified the district and village head's houses for sensitization and medicine distribution, as mosquito nets had also been distributed there.

...even on market days the town announcers will make announcement to the community that an event (drug distribution) will take place in Baale's (community leader's) place at a specific time and date and there is a monthly meeting for all the chiefs and community members, both young and old on every last Saturday of the month. They need to inform the Baale beforehand and he will ask the town announcer to announce to the community. If letters were brought to the community, they will take it to him and he will ask those that can read it for him, he will then do the needful. He is still the head of community at present, and he needs to approve it before anything can be done. [younger female, border, Ogun, SM]

They mentioned the challenges of intimidation from guards, limited freedom to talk and removing their shoes to enter the palace. A participant had a contrary view about these challenges:

The place is very spacious and there will be no problem at all using it for all MAM activities. [female, border, Kaduna, TW]

Traditional leaders also participated during sensitisation. There was a use of local community entertainers which led to more community members to participate during the sensitisation. [male, Ogun, working group member]

Religious or places of worship

All participants of both genders and ages mentioned that religious places are being engaged for MAM. Yet there are gendered differences to utilizing these structures. A potentially new structure—the shrine—was identified by men in Ogun.

Males, females, youth and community leaders in the rural, urban and border contexts in Kaduna and Ogun mentioned that churches and mosques are being used currently for medicine distribution and sensitisation and could potentially be engaged with more. Men felt this would be best immediately after Jumaat

prayers on Friday, since more people visit the mosque, especially the Fulani nomads. Some women in urban areas felt that the current engagement in mosques is mainly for men, who could inform their families when they get home, therefore it could be a potential structure. Older men and women in the rural areas of both states mentioned that the mosques are not ideal, as they are places of prayer and people do not spend too much time there.

...it is only males except Fridays when females can join...even on Fridays it is not compulsory for them to go to the mosque. [youth, urban, Kaduna, SM]

Increased awareness and acceptability of medicines due to proper community engagement. More structures were identified and used for MAM activities e.g., church was used as fixed post in Kaduna North LGA. Extensive community sensitisation about NTDs and MAM activities was carried out. [female, Ogun, working group member]

All participants mentioned that MAM would be suitable in churches, preferably immediately after the announcement on Sundays, since most community members come to worship. However, community leaders in rural Ogun identified a shrine as a potential structure that could be used for sensitization.

...by February, the shrine is meant basically for prayers and cannot be used for medicine distributions because not everyone goes there. Women and few men use a certain place in the shrine, there is masquerade shrine, and it is only males who go there. Another structure close to the masquerade shrine is called Ile Oosa (shrine for gods) and only few selected individuals go there, the Ogun shrine is for men and youth during Ogun festive period and at times to perform sacrifice. [community leader, rural, SM]

The Fulani migrant community objected to churches, as it was contrary to their religion and culture. One Fulani participant in Ogun said,

...you know we will not allow our women to enter such places. [male, migrant, SM]

Social amenities

Various social amenities were mentioned by participants as current and potential structures for MAM engagement. These ranged from health facilities, as mentioned by women, drinking establishments mentioned by men and the football field mentioned by youths, among others.

All groups in the rural communities in both states identified the health facility as currently being used for sensitization and mobilization. Women also mentioned this structure being used for administration of medicines. Women and community leaders also cited the dispensary or chemist as potential structures for sensitization and mobilization, as posters are placed there so that all members of the community who visit are aware of NTDs. However, the youth felt that the chemists was not the best option

for medicine distribution, as free medicines are usually perceived to be of inferior quality.

...it is a private clinic which opens 24 hours all year, the structure is for everybody in the community. That's, male, female, youth, and children. About 10 persons visit the health facility daily. [male, youth, rural, Kaduna, SM]

Doctors and nurses provide accessible services to all community members in the clinic. Therefore this structure could potentially be engaged along the MAM pathway.

Youth centres and drinking establishments were identified in urban areas of Kaduna. Motor parks and markets were highlighted as current and potential structures for engagement in the rural setting across both states.

All youth in rural Kaduna identified the football field as a potential site for sensitization, mobilization, communication and medicine distribution, as all community members have contact there at various times of the day and year round.

Boreholes and taps were mentioned across all groups in both states as potential and current structures for sensitization, and in the rural areas, the car wash and river were mentioned, as community members come there to get water. Since water is an essential commodity used by all, these sites can attract community members for wider health promotion.

...every community member goes to the tap to fetch water but since there is no light to power the pumping machine, people now go to other places to fetch water, more than 50 people often go there to fetch water, male, female, youth, children. Only people who refused to pay for the fuel that was purchased to power the pumping machine are not allowed to fetch water and N50 is the minimum amount. [male, community leader, rural, Kaduna, TW]

In urban Kaduna, all youth and women identified the youth forum and meeting point in the community for sensitization since it is centrally located and a lot of young people converge there every day. *Gidan mata* (meaning home of women, where commercial sex workers reside) was also identified as a potential structure for sensitization by the women in rural Kaduna.

Trading places

Men identified viewing centres (where people go to watch football matches and films) and beer parlours (local pub) as potential structures for sensitization in urban and rural Kaduna and Ogun. They mentioned the noisy nature of the place, which can be overcome by carrying out the sensitization during halftime, or by clearing the table to catch their attention, after which the message can be presented. The timber contractor meeting point was also identified by participants as a potential structure during a TW.

The category of people that can be found there are male, it is strictly for men, although a few women go there. About 15 people averagely converge there on the meeting day. Though sometimes they might be more than that when they are doing their anniversary. The meeting often takes

place on the market day, 9th day, 10am, all year). Non-members of the association are not allowed to the meeting. The challenge is that there are no seats, and a canopy is needed. [female trader, rural, Kaduna, TW]

All youths mentioned viewing centres and mechanics shops as being potential sites for sensitization, as posters could be placed around them. The drinking establishments and film house were identified in urban Kaduna.

All the women in rural and urban Kaduna agreed that the market, milling stall and tailoring shop were not the best places to distribute medicines, since people only stay there for short periods of time. The provision store, small market, chemist, factory, cosmetic shop, tailor, photo shop, barber salon, tea house, mechanic shop, milling stall, *waina* (cassava cake) shop, car wash, meat stall, petrol station, farms, shops for sale of firewood and cow market were also identified by women and youth of both genders in rural and urban Kaduna as current and potential places for sensitization. One of the women suggested the use of petrol stations for sensitization, but not for medicine distribution during fuel scarcity,

Since community members come to buy fuel at the petrol station, they can receive medicines there, as it is close to the village head's house, who is influential. It is a filling station, people buy petrol there, clients come and go, you can only see a crowd when there is fuel scarcity, and it cannot be used to distribute drugs. [youth, female, urban, Kaduna, SM]

A participant stated that the market could be engaged for all MAM activities.

...the community market day which is every 5 days... 8am-12 noon. The market would be preferred by all because selection of any other location would mean that there would be a need to procure chairs and canopies to provide shade as against using the market which already had shades and some benches. [younger female, youth, rural, Ogun, SM]

Some youths in rural Ogun identified the market as a current communication structure, as health workers communicate information there. Although traders at trading places engage with customers, they could be engaged with further for communication and sensitization; however, one woman highlighted that not everyone would be interested, as they had other priorities:

People who engage with these structures only want to focus on the reason why they are there, so they may not be effective for administration of medicines. [female, rural, SM]

Reflections on methods implementation and summary of structures

During implementation of the participatory methods, a number of reflections were captured in research diaries and notes. For example, facilitators attempted to manage power dynamics by

Table 2. Differences in the findings between area and context

Difference	State		Sector	Rural	Urban
	Kaduna	Ogun			
Educational places					
<i>Almajiri</i>	Yes	No	Men, women, youth, community leaders	No	Yes
Qur'anic schools	Yes	Yes	Men	Yes	Yes
Parent Teacher Association	Yes	Yes	Youth	Yes	Yes
Politician, legislator	Yes	No	Women	Yes	No
Worship centres/shrine	No	Yes	Community leaders	Yes	No
Social amenities					
Drinking establishments	Yes	No	Youths	No	Yes
Youth forum	Yes	No	Youths, Women	Yes	No
<i>Gidan mata</i> (literally home of women, where commercial sex workers reside)	Yes	No	Women	Yes	No
Trading places (drinking establishments and film houses)	Yes	No	Youths	No	Yes

actively seeking to include those who were quiet or to redirect conversations away from more dominant participants. Where it was unruly, participants were asked to speak one at a time. During a TW in a migrant community, the only female participant was shy and hiding behind a youth, who served as her spokesperson. Researchers encouraged her to speak up. One of the mappings in an urban area also had an influential person who initially dominated the discussions. These communication challenges were similar to findings from a study conducted among refugees in Australia, where there was inadequate communication or a cold reception from neighbours who disliked youths who gathered in public places.³⁹ Another study conducted in India with students who interacted with community members using TWs showed that they overcame communication barriers, as villagers openly expressed their opinions on different public health issues.³⁸

However, across all contexts (specifically urban communities) there were sociocultural issues around access, restricted entry to some streets and households, and in some cases, access was denied. In rural areas, participants were willing to join the TWs and SMs, but in the urban areas, getting them to do this was challenging. The Fulani in the migrant context gathered at the king's palace and had to be mobilised and granted permission from him prior to the exercise. They mentioned that they were usually mobilised for such activities but were often forgotten at implementation. These challenges were not like those in a study conducted in Tanzania, South Africa, Zimbabwe and Thailand to map intervention decisions for people with human immunodeficiency virus, as the TWs and SMs established the basis for collaborative community research partnerships.³⁵

As evidenced throughout our results section, key differences in the findings by state, context and population group are shown in Table 2.

Discussion

The new NTDs road map promotes resilience, integration, multisectoral action and equity as the recovery pathway.⁴⁰

The coronavirus disease 2019 pandemic has shown the need for resilient health systems to reach the most remote and vulnerable communities. This can only be achieved through the full participation of these communities using methods that promote their interactions with research and health programmes.⁴¹

Implementation of the methods demonstrated that researchers, communities and programme implementers could interact and collectively identify existing and potential structures for equitable programme implementation using participatory visual methods. Programme implementers who were trained as researchers for this study had their capacities strengthened in conducting TWs and SM sessions, as well as their general research skills. They collected, collated, analysed and interpreted the data. The benefit of the programme implementers collecting and analysing data was that they could act immediately on findings. They informed programme implementation reforms in considering potential structures, such as shrines, for programme implementation, and their engagement with the community enabled them to have a more holistic and evidence-informed programme implementation approach. Therefore their involvement facilitated the ownership and sustainability of improved programme implementation. This engagement also fostered improved relationships between these stakeholders that can be extended to various programmes and contexts. The use of participatory methods was found to generate visual representations of structures that health programmes can engage with; however, it should be noted that these can change over time and need to be refreshed regularly.

Community access and navigating gatekeepers

Working alongside NTDs implementers and community leaders as co-researchers who had experience in accessing communities in a sensitive way was a benefit. This reflects other studies conducted in Australia that were led by local informants to provide the experiences of refugees about their neighbourhood⁴² and a study that was conducted in Burkina Faso to identify

ecological variability, where local, experienced coordinators were engaged.⁴³

Disaggregation for gendered and varied community views

The TWs in this study included community leaders and SM sessions consisted of other community members so that perspectives were not influenced by power and position. Similar approaches were used in other studies using SMs and TWs, e.g. in Vanuatu for the identification of mosquito breeding sites⁴⁴ and in KwaZulu-Natal to determine schistosomiasis risk factors related to water, sanitation and hygiene practices, where participants were disaggregated by gender and role.⁴⁵ In our study, disaggregating the SM provided room for gendered and varied community stratification group views, as evidenced in the findings. For example, women could identify *gidan mata* as potential structures due to the women's ability to freely discuss without the presence of men. In addition, village head's houses and worship centres were prominently identified among community leaders, whereas community members such as women in urban areas identified markets and health facilities and the youth identified the youth forum and viewing centres. It has been documented that non-diversity among research populations reduces innovation in research and in receiving quality care.⁴⁶ In Nigeria, individuals tend to speak more freely when in similar gender and age groups, due to socio-cultural norms.³⁸ Our study included disaggregation to overcome this challenge.

Limitations

Sociocultural factors related to the largely hegemonic communities might have influenced full participation and adequate information sharing by women in the TWs and younger participants in the SM. As we move from control to elimination, we must understand how to reach the most marginalised, such as people with disabilities (PWDs). Future studies should consider inviting PWDs as participants through public involvement and community engagement.

Conclusions

Participatory methods facilitated the visual representation of structures within the community that can be used for more effective MAM implementation among varied social groups. This allowed the respondents to identify and locate novel structures that can be engaged versus what is traditionally used. Irrespective of literacy levels, the methods were made accessible.

We were able to identify current and potential structures that could be engaged in the MAM process in NTDs programme implementation across several contexts. The methods facilitated the identification of structures that could ultimately promote equity in MAM delivery, taking into consideration the views of a diverse range of population groups. By promoting bottom-up approaches for the inclusion of community voices in programme design, the reality of how communities engage with

their structures was identified. This research shows the importance of taking into account the differing views of various population groups to ensure that all communities are reached by NTD programmes.

Authors' contributions: LL designed and implemented the study, analysed and interpreted the data and made major contributions to writing the manuscript and approval of the final version. TA, AO, DL, GK, NG and JY led the study design, co-implemented it, analysed and interpreted the data and made major contributions to writing the manuscript and approval of the final version. HW, MD, AF, MAK and OO collected, interpreted and analysed data and read and approved the final version. SI and RT made contributions to writing the manuscript and read the final version. LD and KO designed the study, supported the implementation, analysed and interpreted the data and made major contributions to writing the manuscript and approved the final version.

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Data availability: Data can be accessed using this link, <https://lstmed.sharepoint.com/sites/COUNTDOWNNigeria/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FCOUNTDOWNNigeria%2FShared%20Documents%2FExtension%2FIntegrated%20management%5F%20Case%20detection%20study%2FData%20Management&viewid=9bc7cf2%2De440%2D4b1f%2D84eb%2Dde530d07faf3>

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