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RESEARCH ARTICLE

Community engagement for the rapid elimination of malaria: the case of Kayin State, Myanmar [version 1; referees: 2 approved]

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Abstract

Background: Currently, malaria elimination efforts are ongoing in several locations across Southeast Asia, including in Kayin State (also known as Karen State), Myanmar . This paper describes the community engagement efforts for a pilot malaria elimination project, the challenges encountered and lessons learnt.
Methods: Between May 2013 and June 2015, a study on targeted malaria elimination (TME) that included mass drug administration was conducted in four villages (TPN, TOT, KNH, and HKT) of Kayin State. Community engagement efforts included workshops, meetings and house-to-house visits with community members. Exhibitions related to malaria and fun activities were organized for children. In addition, we provided primary care, small individual incentives and village-level incentives. This paper is based on our analysis of data extracted from meeting minutes, field notes, feedback sessions among staff and with community members as well as our own reflections.
Results: Average participation across three rounds of MDA were 84.4%, 57.4%, 88.6% and 59.3% for TPN, TOT, KNH and HKT, respectively. Community engagement was fraught with practical challenges such as seasonal tasks of the villagers. There were challenges in explaining difficult concepts like drug resistance and submicroscopic infection. Another was understanding and navigating the politics of these villages, which are located in politically contested areas. Managing expectations of villagers was difficult as they assumed that the community team must know everything related to health.
Conclusions: In the TME project, many different community engagement strategies were employed. We encountered many challenges which included logistical, scientific and political difficulties. An approach that is tailored to the local population is key.

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Introduction

Although malaria-related morbidity and mortality has declined, the spread of drug resistant parasites in the Greater Mekong Subregion (GMS) poses serious challenges to prevention and control efforts[1]. Multidrug resistant *Plasmodium falciparum*, the parasite that causes most of the deaths, is now established in the GMS[2].

To stop the spread of resistant *P.falciparum* strains, national malaria control programs have to focus on elimination rather than control. This includes establishing a malaria post in every village, in addition to other important interventions such as long lasting insecticide treated bednets[3–5]. Malaria posts are staffed by local villagers who have received training in diagnosis and treatment of malaria infections so that communities have ready and easy access to early diagnosis and treatment.

Mass drug administrations (MDA) of antimalarials are conducted to reduce the prevalence of asymptomatic infections, an important source of infections that are not addressed through passive case detection. MDA entails delivering a curative antimalarial dose to all individuals within a community, irrespective of malaria infection, to interrupt transmission. There is a direct, critical relationship between population coverage and outcome[6]. Antimalarials need to be administered at the same time to the entire community to have an impact on malaria transmission. Effective community engagement before and throughout the MDA programme is indispensable to reach high coverage. Community engagement is also necessary to inform the potential participants of the benefits and risks of MDA, to encourage active participation and good adherence to the medication and to gain community trust.

With some notable exceptions[7–9], there is a general lack of literature describing the various forms of engagement strategies in malaria elimination efforts, the people involved, how the activities are organized, and the strengths and challenges of these activities.

Currently, elimination efforts are ongoing in several locations across Southeast Asia, including in Kayin State (also known as Karen State), Myanmar, near the border with Thailand (ClinicalTrials.gov identifier: NCT01872702). This paper describes the community engagement efforts related to a Targeted Malaria Elimination (TME) project in four Kayin State villages, some of the challenges encountered and the lessons learnt. An inclusive definition of community engagement was adopted, ranging from one-to one-direct engagement targeted at key people such as village and religious leaders to the more indirect type of engagement with the wider community.

Methods

Setting

Between May 2013 and June 2015, a study on TME that included MDA was conducted in four villages of Kayin State (KNH, TOT, TPN and HKT) (Figure 1). In year one, two villages (TOT and KNH) underwent MDA and the other two served as 'control' villages (TPN and HKT). After nine months TPN and HKT underwent MDA, and TOT and KNH were 'controls'. The villages are located in contested areas of Eastern Kayin State, with varying

Figure 1. Map of the targeted malaria elimination villages.

degrees of official government control and several influential armed groups. There have been varying levels of armed conflict in Kayin State since 1949[10].

The distance between KNH, the northernmost study village and TOT, the southernmost is roughly 100km. The two northernmost villages are easiest to access from the Thailand side of the border. Access to TOT, can be difficult during the rainy season. The Shoklo Malaria Research Unit (SMRU) in Mae Sot, Thailand served as the operational headquarters for this TME project.

Most villagers were of the Karen ethnic nationality and S'gaw Karen was the most commonly spoken language. Eastern Pwo Karen and Burmese were also spoken in the villages. The majority of villagers were Buddhists, though some were Christians and many simultaneously practice animism.

Villages were selected based on a screening process using high volume ultrasensitive real time PCR (uPCR)[11], and a set of eligibility criteria which included high prevalence of submicroscopic malaria (greater than 30% positive for malaria of which 10% was falciparum malaria) and importantly, if the villagers and village leaders expressed willingness to participate in the MDA.

While the region has been in conflict for over six decades, various armed groups are currently engaging in peace discussions with the Myanmar government and armed conflicts are much less frequent. The transportation infrastructure in this part of the Kayin State has long been neglected, with very few all-weather roads. Current development projects are changing this landscape.

These factors have made the region a challenging setting for malaria elimination campaigns[12]. Previous MDA campaigns for microfilariasis control were unsuccessful in this setting.

TME -related activities consisted of the establishment of a malaria post in each study community, a census to establish the potentially eligible population. 'Intervention' villages received three rounds of MDAs, the first and last MDA were preceded and followed by prevalence surveys of the entire community using a highly sensitive uPCR[11]. Malaria posts were established after the initial surveys, prior to MDA and were stocked with basic medical supplies and trained, paid staff. The three rounds of MDA were conducted one month apart, each round consisting of three daily doses of dihydroartemisinin-piperaquine combined with a single low dose primaquine on the first day of each round[4]. All four villages during the TME study periods were asked to participate in 3-monthly surveys to detect submicroscopic malaria by uPCR. Between surveys, villagers were asked to approach their malaria posts if they had fever. Quantitative surveys to study reasons for non participation revealed that the main reason was inadequate understading of the rationale for MDA[13].

Community engagement

The community engagement teams consisted of mainly local people (authors: LK, MMT, SN and SWT) and was led by a senior and respectable member of the Karen community (author: LK), supported by a central team (authors: DT and PYC). Having local and senior members from the Karen community was important so that engagement can be guided by adequate local knowledge and experience in the region, as well as access to target villages.

The following subsections describe the community engagement activities conducted for MDA in the KNH, TOT, TPN and HKT villages. These were based on meeting minutes, field notes, feedback sessions among staff and with community members as well as our own reflections.

Workshops. Two-day training workshops were held with village volunteers and community leaders, including village leaders, village administrative staff, monks, and those responsible for health in the village. These groups consisted of 20 to 50 people. Topics covered in the workshop included those related to malaria, such as drug resistance and treatment for malaria. Villagers were encouraged to visit the malaria posts within 24 hours of experiencing fever or other symptoms that could potentially indicate malaria infection. There were discussions on MDA, its rationale and the related procedures, the reasons for uPCR testing, blood draws, and why participation of the entire population is important. The malaria lifecycle, how malaria is transmitted, the drugs used in MDA, potential adverse events related to the drugs and how to handle them were discussed. A quiz was conducted before and after the workshop to gauge understanding and to reinforce the message. Efforts were made to encourage questions as it is not in the local culture to ask questions in public meetings. These workshops were important as they addressed the fears and misconceptions of the villagers. In addition, village engagement strategies were discussed to specifically address cultural and religious aspects of engagement.

Meetings. Meetings were held with groups of children, homemakers and youth groups. These meetings took place in village community halls, schools, temples and other places where groups of people routinely gather such as tea shops, farms and private homes.

In addition to these relatively formal meetings, the community engagement team regularly sought out ad hoc events with pre-existing social groups to talk about the TME project. One example for such spontaneous contact was a ladies social group at the TPN village who met at midday every day.

The community engagement activities were iterative. "Feedback meetings" were held by the team and village leaders with the goal of addressing queries from villagers about topics such as MDA-related rumours and adverse events. As the TME team consisted of healthcare providers, these small meetings also involved discussions about non-TME related everyday health problems, like seasonal illness and tiredness. Outsider groups were also asked to participate in the drug administrations and targeted with community engagement communications. These groups include armed forces, visitors, loggers or anyone who did not permanently stay in the village but visits it regularly.

House-to-house calls were made based on the census using house numbers. They were conducted seven days after MDA, and every two weeks for the entirety of the two-year project to take account of villager mobility and migrations, and to coincide with clinical case sessions at the malaria post. House calls were made by senior members of the team to people who declined to participate in the MDA in the evening when villagers had returned to their homes to talk about their concerns, worries and reasons why they would not or could not participate in the drug administration.

Exhibitions. Maps, posters created by staff and displays of artwork that children created during engagement activities were exhibited in the space were villagers waited during the drug administration (Figure 2). Topics covered included in these exhibits: impact of malaria, earlier spread of drug resistance to Africa such as chloroquine resistance; how malaria affects people, why uPCR is used versus rapid drug tests or microscopy, the MDA rationale, the Plasmodium lifecycle, how malaria transmits, drugs used and how blood samples are processed. Presentations were done using slide shows where possible, posters, drawings and discussions. In addition, locally available samples of antimalarial drugs, familiar to villagers were laid out and discussed.

Activities for children and young people. Activities with children included colouring competitions, singing and acting with topics that were related to the malaria such as the Plasmodium life cycle, the blood volumes needed and the uPCR survey. Colouring was found to be very popular as it was difficult to get colour pencils in these villages. Singing, chanting and acting was also popular as this was entertaining and pleasurable for both children and their parents.

Figure 2. A children's corner in a targeted malaria elimination village.

There were also spontaneous sessions of games and activities for children unrelated to malaria.

***Incentives and ancillary care*.** While not really an incentive, community members did see the malaria posts as a benefit of being part of the project. Furthermore, water catchment and distribution systems and public latrines were built in each of the study villages. In meetings with the village leaders, water supply was identified as a priority by all four villages. These village-level benefits help build trust and ownership without the coercive element of individual incentives.

Health education unrelated to MDA was provided by the TME community engagement team to villagers at their request, for example family planning, nutrition and vaccination. Youth and healthcare staff benefited from health education and capacity building. Some young people were offered nursing and midwifery training and attachment at the Shoklo Malaria Research Unit so they can go back to work in their own villages more efficiently. Small gifts such as food bundles and household items (e.g. instant noodles, cooking oil, soap) were also given to villagers during MDA visits. No individual monetary incentives were provided.

***General rapport building activities*.** The community engagement team members embedded themselves in the community and engaged in general rapport building activities, frequently joining in village religious ceremonies such as the wrist tying ceremony, as well as rice planting and harvesting. The teams were hosted by villagers in their homes during the intensive MDA and survey days. Social activities with villagers allowed the team to learn more deeply about the realities of village life, seasonal work and obligations, and villagers' priorities. This knowledge allowed us to plan community based events which were better attended when they did not conflict with villager commitments to their land, religious ceremonies or holidays.

Furthermore, these casual settings provided further opportunities to chat about the TME project, to hear villager comments and suggestions outside of formal settings or in front of the entire community. The makeup of the community engagement team allowed them to integrate themselves more deeply into normal villager life. Through these actions the team was not only able to gain deep insight into the communities, but they were also able to create a strong rapport with community members.

Results

Average participation across three rounds of MDA were 84.4%, 57.4%, 88.6% and 59.3% for TPN, TOT, KNH and HKT, respectively (Table 1).

This section describes the challenges and lessons learnt with regard to community engagement in TME.

Transportation and other logistical issues

Tak province, Thailand and Kayin state, Myanmar are separated by the river Moei (called Thaungyin River in Burmese language). Reaching the study villages requires crossing the river. KNH is

Table 1. Participation rates by village and month of mass drug administration.

Village	TPN			TOT			KNH			HKT		
Month of MDA	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Total participants taking 0 dose	22	54	60	171	236	210	17	27	39	281	356	278
(%)	6.4	16.6	19.8	29.1	43.4	37.2	5.6	7.7	10.9	38.0	44.1	32.8
Total participants taking an incomplete treatment (1 or 2 doses out of 3)	7	7	0	13	69	19	22	7	3	4	30	27
(%)	2.0	2.2	0.0	2.2	12.7	3.4	7.2	2.0	0.8	0.5	3.7	3.2
Total participants taking a complete 3-dose treatment	317	264	243	404	239	336	265	316	315	455	422	543
(%)	91.6	81.2	80.2	68.7	43.9	59.5	87.2	90.3	88.2	61.5	52.2	64.0
Total population in the village during MDA round	**346**	**325**	**303**	**588**	**544**	**565**	**304**	**350**	**357**	**740**	**808**	**848**

easiest to access, while the most difficult to access village is TOT especially during the rainy season. Logistical issues include the absence of telecommunications facilities, absence of tarred roads, shops and facilities for the team to be based and frequent flashfloods. Finding accommodation for the research team was a challenge as was telecommunications. The study team lived with the villagers during intensive MDA and survey days. In villages without a phone network messages have to be hand delivered.

It is not possible to change the infrastructure of study villages hence more time than expected was needed to overcome logistical hurdles. It is essential to have a flexible schedule to suit the villagers' needs.

Timing and seasonality

In the early phase of the elimination project the team was not aware of the habits and seasonality tasks of the villagers. For example in the TOT village, the drug administration days clashed with the rice planting and mushroom collecting seasons, critical economic activities in the village.

It was not always possible to conduct the study activities at a time optimal for villagers. The timing of drug administrations and associated community engagement activities was dependent on many factors including the weather, local approvals and funding.

We found that it was important to involve schools and children in community engagement. The more children were involved in the engagement efforts, the better the overall participation in the MDA. For example, when we involved children in colouring contests and science drama, their friends and family members came to watch the activities, and were indirectly engaged. These activities were particularly well received during school holidays. In remote villages, activities for children such as colouring contests and science drama were popular as these activities were few and far between.

Difficult concepts and rumours

Most villagers had limited or no formal education and had not travelled beyond the neighbouring villages which made it challenging to explain difficult concepts like drug resistance and submicroscopic infection. For example, early attempts to describe submicroscopic infections relied on a "tip of the iceberg" metaphor. Malaria parasites are normally detected using microscopy or rapid diagnostic tests. However, many infections in these communities existed at very low parasitemia levels, levels that were too low to be detected through normal detection methods. This means that only the "tip of the iceberg" was seen. This metaphor had little resonance with villagers who had never been to a cold country, heard of icebergs and much less seen a floating iceberg. The metaphor was changed to describe a large rock in a river, with only the top showing above the water – a scenario that most villagers well understood.

Engagement efforts were also frequently burdened by fears about potential adverse events following participation in the MDA. This was compounded by rumours related to a former filariasis MDA programme led by a non-governmental organisation which was a mixed success in this area.

Communicating difficult concepts such as drug resistance was challenging even when language competency was not an issue. Karen language has limitations with regard to scientific and technical terms. Concepts like evolution, mutation, MDA and asymptomatic malaria are complicated to translate, and usually require a phrasing that mixes Karen, English, Thai or Burmese. We had to find context-specific ways to convey the meanings of these concepts and this sometimes meant using different terms or phrases in different study villages. For example 'malaria' in Karen is 'ta-nya-goh' which translates to "fever with chilling", but Karen people living in Thailand use specific term 'pa-zo-su' which means "poison from mosquito". Another common misunderstanding is not having enough blood 'thwee-t'pweh ba", which is often thought by local community members to lead to low blood pressure and anaemia and is associated with giving blood (as in blood screenings for malaria).

We found that it was beneficial to check understanding such as introducing a quiz at the end of these sessions but courtesy suggests to announce such a quiz well in advance. Educational materials should be developed using variable approaches to achieve maximum versatility and to cater for sessions of various sizes, groups and locations. To minimize the problem of multiple translations and illiteracy, educational materials should have no text and consist of photos, hand drawn pictures and diagrams.

We learnt that the preparation, planning and delivery of community engagement requires time and resources. Only through adequate immersion in the culture and daily village life is it possible to build rapport with the villagers.

Politics and power

Kayin State has seen clashes between government armed forces and arm groups for decades, therefore it was essential to understand which armed groups were in control of the area at the time of the project. Officially, the central government may wish to give the impression to be in control. The reality on the ground was more complex.

Equally important was to understand who was responsible for existing healthcare and who had influence in the villages. A good example was the TOT village, where there was divided leadership – with two major political and armed groups having a presence in the community. The overall community was not cohesive and the different political and armed groups supported their own healthcare initiatives, resulting in a confusing healthcare situation with different focus and agendas and high turnover of healthcare providers. In order for community engagement to be effective, the team had to engage with all of these groups and learn to effectively address issues. The malaria post had to be established in a way that all community members would take ownership.

Expectations

Community engagement staff were perceived by villagers to be part of the TME medical team so the villagers expected that they must know everything related to health. Villagers often asked the team about everyday ailments, which the staff was unprepared to answer. We learnt that the community engagement team should

include trained health care providers. Although their remit was not to provide long term healthcare, the provision of basic medications for minor ailments signals good will. In villages with inadequate medical care, the team has to be able to treat healthcare problems or refer villagers to appropriate health care providers.

Unpredictability

There is no single set of operating procedures for community engagement. A major challenge was unpredictability which included misunderstandings by villagers and rumours about the objective of MDA. To be successful, community engagement teams must be flexible, mature and experienced, supportive of each other and resilient to work in difficult settings. Every team member of the TME project partook in community engagement one way or another.

Discussion

Community engagement activities

The activities conducted in relation to elimination, including the establishment of malaria posts and MDA, have similarities to campaigns described in the literature[9]. Many reported health education campaigns and used a variety of strategies. For example in Nicaragua and Indonesia, large-scale health education campaigns on malaria were incorporated in the MDA programme[7,14]. In Tanzania, articles for the general public were written in two local newspapers[15]. Our project provided small direct and indirect incentives to participants. MDA participants have been provided incentives that ranged from a lottery ticket and candy in Venezuela[16], to an advance for building a house in India[17]. Similar to other engagement strategies, our project involved existing community structures. One example is Aneityum Island in Vanuatu, where village volunteers were responsible for drug distribution[8]. The fact that the community engagment team was made up primarily of ethnic Karen people may also have influenced their acceptance in the communities, especially given the long history of conflict in Kayin State.

Challenges and lessons learnt

Some of the challenges we encountered did not differ from those reported in literature, such difficulty in understanding complex medical concepts and the fact that the community expects the community engagement team to provide general healthcare[18]. The lack of facilities such as telecommunication is also not unique to our setting[19]. Others were more specific to our context such as political fragmentation, inaccessibility and high mobility.

We echo others who advocate that a high level of flexibility, adaptability, and motivation is required by the community engagement team[20]. In addition, we think that some formative research and more creative methods such as science theatres could be used in addition to the more traditional methods of engagement[21,22].

Limitations and strengths

Our paper has several limitations. It is based on meeting minutes, field notes, feedback sessions and our own reflections rather than data systematically acquired. We also acknowledge that our work is not an extensive evaluation of our engagement activities. We were not able to assess the difference in the impact of the community engagement strategies that were employed. The MDA coverage was high in small villages (KNT and KNH) but not in the larger ones (TOT and TPN), and it was not possible to determine a direct relationship between community engagement and population coverage.

Our previous questionnaire survey study on community perceptions on MDA revealed that an important reason for non-particpation an inadequate understanding of the intervention[13]. We think that community engagement plays an important role in facilitating this understanding. We have learnt important lessons about community engagement from our rich field experience that may be applicable to similar MDA programmes.

Conclusions

In the TME project, many different community engagement strategies were employed. We encountered many logistical, scientific and political challenges. We think that an approach that is tailored to the local population, meeting their local needs and understanding their local problems, is most effective not only to improve coverage and maximise success of the MDA programme, but also to promote goodwill and trust. Such a program will inherently need to draw on local expertise and the ability of the community engagement team to be able to adapt to regular feedback.

Data availability

Due to ethical and security considerations, the data that supports the findings in this study can be accessed only through the Data Access Committee at Mahidol Oxford Tropical Medicine Research Unit (MORU). The data sharing policy can be found here: http://www.tropmedres.ac/data-sharing. The application form for datasets under the custodianship of MORU Tropical Network can be found as a Supplementary File.

Ethical approval

This study is has been approved by the Oxford Tropical Research Ethics Committee (ref: 1017-13) and the Tak Province Community Ethics Advisory Board.

Competing interests

The authors declare no competing interests.

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Supplementary material

Supplementary File 1: Application form for datasets under the custodianship of Mahidol Oxford Tropical Medicine Research Unit (MORU) Tropical Network.

Click here to access the data.

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General Comments

1. The paper is significant for several reasons. First, it provides a solid example of how to report the process and outcomes of community engagement (CE) strategies in global health and global development. Despite an improved appreciation of community engagement overall, there are still very few examples of competent reports of CE strategies in the literature. This has limited the empirical footprint of CE and hampered important learning for funders, implementation partners, researchers and a wide range of review panels. Second, although only partially successful in this case, the paper makes an important effort to link CE activities with relevant outcomes of interest - i.e., participation rates in MDA. “Partial success”, in this case, has a great deal to do with the lack of well-developed models or comparators, so although there are points that could certainly be elaborated and clarified, the paper provides a concrete example that can be constructively critiqued and built upon, which is a fundamentally important contribution to the literature in itself. Third, malaria elimination has become a dominant focus in malaria research and intervention. Funders and implementation partners have recognized the importance of CE as a key element of MDA and other elimination strategies, but still struggle to understand the unique value proposition of CE and how best to integrate it into their investments. This paper contributes to a growing body of knowledge that will help to address these important upstream challenges in global health.

2. A key strength of the paper lies in how explicitly it attempts to account for the elements of the CE process. There are important gaps (see below), but overall the paper provides a vivid and useful account of what was done, if slightly less detail about the rationales, outcomes and implications.

3. A weakness of the paper, as suggested above, is the relative lack of attention to the rationales for the various decisions about CE mechanisms - i.e., why, precisely, were the various approaches selected - and to the outcomes and implications of each of these decisions/activities/mechanisms. One of the important gaps in the CE literature is program theory, i.e., coherent accounts of configurations of context + mechanisms + outcomes that can provide us with a better understanding of how CE actually works in any specific context of application. The paper succeeds, in my view, by virtue of providing a relatively rich description of the CE activities, but further elaboration on the rationales, outcomes and implications, in addition to description of some of the activities/mechanisms, would have made the paper much stronger. (See detailed comments, below)

4. Another weakness of the paper, which might be easily remedied, is that the discussion section is very limited and does not deal very effectively with the findings reported in the paper. If there is any scope of revision of the paper, I would suggest that some of the detailed comments, below, might provide a useful guide for what informed readers might find most helpful in terms of elaboration. Since each of these points arises from a comment on something in the paper it should be feasible, and not onerous, for the authors to simply expand the discussion section of the paper to share some of their thoughts and reflections more explicitly on these, and perhaps other, points.

Specific Comments

1. **Page 3, column 1, 5th paragraph: "An inclusive definition of community engagement was adopted…"**

   This is a good example of how the framing and reporting of CE is limited primarily to CE *mechanisms* or *activities*. It would have been extremely helpful, especially at the outset of the paper, to have some elaboration of the goals and rationales lying behind these definitions. This would also have provided some conceptual space for the authors to report on other relevant observations.

2. **Page 4, column 1, 2nd sentence: "Previous MDA campaigns for micro-filariasis control were unsuccessful in this setting."**

   Why? Were the failures the result of poor design? Poor execution? Or contextual features of the region, etc.?

3. **Page 4, column 1, 2nd paragraph, final sentence: "Quantitative surveys to study reasons for non-participation revealed that the main reason was inadequate understanding of the rationale for MDA**."

   What are the implications of this finding? Does CE need to focus more on the provision of information? More on measuring understanding? Etc.

4. **Page 4, column 1, last line: "…fears and misconceptions…"**

   What were these fears and misconceptions? How were they addressed? What are the broader lessons for CE?

5. **Page 4, column 2, 3rd full paragraph, 1st sentence: "The community engagement activities were iterative."**

   In what sense? What insights were derived from the activities? How were these insights utilized to revise/refine approaches? Etc.

6. **Page 4, column 2, 4th full paragraph, last sentence: "…concerns, worries and reasons why they would not or could not participate in the MDA."**

   What were these concerns, worries and reasons? What are the implications for CE? Are we looking at the right outcome measures? Etc.

7. **Page 4, column 2, 5th full paragraph, first sentence: "Exhibitions"**

   What is the intended purpose of these exhibitions? The paper describes them, but does not link them back into an explicit goal(s) or rationale(s) or outcome(s).

8. **Page 4, 2nd column, last sentence: "Singing, chanting and acting was (sic) also popular as this (sic) was entertaining and pleasurable for both children and their parents.**

   Again, what was the intended purpose of these activities? How should the pleasure of children and parents be interpreted in term of the operating logic of the CE strategy?

9. **Page 5, 1st full paragraph, last sentence: "This knowledge allowed us to plan community based events which were better attended when they did not conflict with villager commitments to their land, religious ceremonies or holidays."**

   Again, what were these insights? How, specifically, were they addressed—i.e., what kinds of revisions and refinements to the design of the CE strategy did these insights lead to?

10. **Page 6, 1st paragraph, second last sentence: "The study team lived with the villagers during intensive MDA and survey days."**

    Although I understand this point both from a cultural and pragmatic perspective, given the locations of the study, this seems like quite a profound point in terms of our understanding of "engagement". What did the workers learn? What were the hosts experiences? Even if these aren't reported in a comprehensive way, are their key insights or lessons that might help readers gain better understanding of CE, especially the relational aspects?

11. **Page 6, column 2, 4th full paragraph, last 2 sentences: "Officially, the central government may wish to give the impression to be in control (sic). The reality on the ground was more complex?**

    In what way(s)? What were the implications for the design and conduct of the CE strategy?

12. **Page 6, column 2, 5th full paragraph, first sentence: "Equally important was to understand who was responsible for existing healthcare and who had influence in the villages?**

    Why?

13. **Page 6, column 2, 5th full paragraph, last sentence: "The malaria post had to be established in a way that all community members would take ownership."**

    "Ownership is a commonly used term. Unfortunately, the possible meaning(s) is not self-evident here and seems quite important in terms of the overall goals of the CE strategy.

14. **Page 7, first paragraph, line 3: "…signals good will…"**

What are the implications of signaling good will here? Is this an explicit goal of CE, is it an instrumental goal? Or an end itself for CE?

15. **Page 7, column 1, 4th full paragraph, last sentence: "…we think that some formative research and more creative methods such as science theatres could be used in addition to the more traditional methods of engagement."**

    Why, what goals would these serve? What outcomes would they produce?

Recommendations

As I hope my specific comments make clear, there are some missed opportunities in the paper to provide some elaboration on several quite important issues. However, given the current state of the literature I think the paper represents an solid and important attempt to build our understanding of CE, especially in such an important global health context—MDAs in malaria elimination—and therefore I would recommend indexing the paper.

In terms of what revisions are necessary, I think this sits somewhere between minor revisions and major revisions. One approach, as I have outlined above, would be for the authors to pick up on some, or all, of my detailed comments, above and incorporate them into a more robust discussion section. As it stands, the discussion is extremely lean and focuses primarily on other work. Some or most of this other work would make more sense as *background* and would make way for the authors to provide more detailed reflection on their findings and experiences. There are probably 4-5 main themes in my specific comments and these might offer a useful framing for the kinds of insights and elaboration that would have most value for an informed reader.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Referee Expertise: Community engagement; global health; global health ethics; research ethics; qualitative research methods

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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This article provides a useful and interesting account of community engagement for a malaria elimination programme involving mass drug administration. The article describes the community engagement activities, the challenges and some of the steps taken to overcome these challenges. Honest reports of community engagement are a valuable resource for other practitioners. This article reports engagement in a particularly challenging context with geographical, social and political difficulties, so highlights some of the complications in engagement. The detailed account of engagement activities also provides useful ideas and learning for other engagement practitioners (e.g. the use of a quiz to check understanding), and there are nice examples of making engagement culturally appropriate (e.g. using of a rock rather than iceberg metaphor to describe malaria levels). I also welcome inclusion of an article that is based on team reflections rather than additional data collection; reflection is an essential part of good research and engagement practice, and useful lessons can be missed without openness to this kind of article.

A few areas might be suggested to further deepen the analysis:

It would be interesting to learn more about variations between the villages, and about whether particular engagement strategies were more effective in some contexts than others. The authors note that it was not possible to determine a relationship between engagement and coverage or to assess the impact of different activities. However, additional descriptions of any variation in activities between sites and reasons for this might be helpful, together with reflections on potential reasons for variations in coverage and effectiveness of CE. For example, the surveys suggested that people did not participate due to inadequate understanding of MDA, indicating limitations of the CE. It would be interesting to reflect on the extent to which this involves limited implementation of CE (e.g. due to geographical barriers), or ineffectiveness of CE that was conducted (e.g. due to problems with translation), and how these constrains varied between villages. Some aspects of variation are indicated, but could perhaps be brought together more explicitly.

The authors and engagement team are described as local. Local is a word that can be interpreted in different ways, so it would be interesting to reflect on their position and to give more detail on their relationship to communities. Were they local in the sense of coming from these communities, or from the region, and were they considered as local by the communities? Relationships may be affected by similarity or difference in terms of social status, education, etc., as well as residence or place of birth.

Another area for further reflection relates to the idea of engagement as a two-way process that involves seeking feedback from communities. The focus of engagement appears to have been on informing communities about MDA to promote high coverage. It may be useful to say more about any aims or strategies around eliciting community feedback on the intervention, and the effects of such strategies.

While the article is well written, occasionally suggestions are made about what approach should be taken

when it is not fully clear what was actually done or what challenges arose (e.g. in relation to education materials and unpredictability in the results section). It may might be useful to clearly separate lessons and recommendations from descriptions of what happened. It may also be useful to summarise key lessons in a box in the discussion or conclusions – there are valuable suggestions and a box would help to ensure that lessons are seen by busy readers. To support learning, it would also be helpful to have a little more explanation and detail on some of the points mentioned in the results, for example, establishing a malaria post in a way that enabled ownership – ownership is a common requirement and challenge, so it would be interesting to know how it was achieved.

Some lessons are fairly standard recommendations for engagement with development interventions and widely advocated, such as the need for adequate time and flexibility. Do the authors have any reflections on why these essential resources and features of engagement approaches are not always followed, or on potential constraints to adoption of this advice? What systems or approaches can help to ensure, for example, that teams are flexible?

Consideration of other literature in the discussion section notes other CE programmes that have followed a similar approach. It would be useful to extend consideration of the literature to see whether other articles have reflected on the strengths and weaknesses of the different CE activities (such as individual or community compensation), to draw out wider lessons on advantages and challenges.

These comments do not affect the value or conclusions of the article; they are areas of further interest for the authors to consider rather than requirements for re-writing. I would like to thank the authors for the opportunity to review this interesting article and for their contribution to the learning on engagement.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: MLW and MORU are both partners in the Global Health Bioethics Network, and I collaborate with some of the article authors through this network.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.