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Title

Towards the scaling up an innovative Emergency Transportation System for maternal and newborn(m-mama): insights and recommendations from the pilot program in Shinyanga, Tanzania

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Abstract

Background: Despite efforts and investments, most maternal deaths occur in developing nations with little or no improvement. The common culprit is a delay in seeking and receiving appropriate care, which can be addressed through improved emergency transportation interventions. In this paper, we aim to document lessons learned and best practices for the scale-up of the m-mama program, introduced to address the second and third delays in Shinyanga region, Tanzania.

Method: A qualitative study was conducted from February to March 2022 using eight Key informant interviews (KII) with the national, regional, and council stakeholders. The interviews were audio-recorded, transcribed, and translated into English. Thematic analysis was conducted manually to identify key themes that address the objectives of this study.

Results: The emergency transport system first piloted in Shinyanga may be a scalable solution in addressing the second and third delays impacting maternal health in Tanzania. Lessons learned from implementing the m-mama program, and recommendations for scaling up the program nationally by the government stakeholders were grouped into three key themes: community engagement, emergency transportation system, and government engagement. For the sustainability of innovative community intervention, the local community should be involved in the development and implementation of the program to foster ownership, acceptance, and utilization of the program. A well-coordinated community-based emergency transportation system is vital, economically viable, and worthy of scaling-up. For this, strong leadership and advocacy in the government are necessary.

Conclusion: Community engagement, understanding the local context, and operating within the existing structure promotes ownership and utilization of these programs. An effective and coordinated emergency transportation system has the potential to address second and third delays and help to reduce maternal and neonatal mortality. The government's role in resource mobilization and distribution, community ownership, and involvement remain vital for scaling up the emergency transport system in limited-resourced areas.

Keywords: *Emergency transportation system, maternal mortality rate, newborn mortality*

Strengths and limitation of this study.

1. This study is the first in Tanzania to assess implementing a community-based emergency transport system aimed to address maternal and neonatal health challenges.
2. The study employed triangulation of participants who serve different roles and positions in the health care system to obtain a rich, robust, and comprehensive perspective on implementing m-mama.

3. As a cross-sectional study, it is limited to a snapshot information collection. It lacks prolonged engagement, which may challenge obtaining an insider perspective of the program implementation.
4. We did not collect baseline information for maternal and neonatal emergency and referral care indicators, which would have provided more insight into the initiative's effectiveness.
5. This study documents best lessons for scaling up and provides lessons to other regions and countries on the emergency transportation system to tackle the three delays in maternal health.

Background

Globally, maternal mortality declined by 38% between 2000 and 2017 (1). However, about 810 women lose their lives each day due to preventable maternal causes (2). While the global distribution in maternal mortality varies with regions and contexts, nine in ten deaths occur in low- and middle-income countries (LMICs), while sub-Saharan Africa accounts for two-thirds of all deaths (2,3). The risk of death due to pregnancy and childbirth complications in the region is between one to thirty-seven, attributed by health and socio-economic disadvantages (4,5). These include various factors delaying women from making decision to access and receiving antenatal care, safe childbirth, newborn care, and pre-existing medical conditions worsened by pregnancy (5–7).

In Tanzania, maternal mortality has remained persistently high, with 432 per 100,000 live births reported in 2014, but with a steady increase to 524 per 100,000 live births in 2017. Such unprecedented rate is unequal distribution between different regions, with the areas in the Lake zone, like Shinyanga region reporting the higher burden (8–10). The region reported higher maternal mortality rates of 635 per 100,000 live births, 449 and 417 per 100,000 live births between 2010, 2015, and 2017 respectively (11,12).

The three-delay model for seeking maternal care has been used to explain the underlying causes of maternal mortality (13–15). In this model, the first delay is from the household or personal level from the onset of symptoms at home to when the decision is made by either a woman, family, or both in seeking care. The second delay is attributed to factors impeding access to reaching health facilities, including available infrastructures and means of transport from when the decision to seek care is made. The third delay is a delay in receiving appropriate care at the facility level for various reasons, including the availability of skilled human resources, equipment, and referral system from admission until adequate treatment begins (13,16). Addressing such delays calls for tailored interventions that may need to be modified from one context to another.

The m-mama program is a comprehensive emergency transportation system to tackle the three delays. It began as a pilot intervention in 2013 in Mwanza and Shinyanga regions, aiming to address broad, systemic challenges through a coordinated horizontal program approach that extends from the community and lower-level health facilities to the hospital level. Analysis of the program implementation showed that the transportation system can potentially reduce maternal and neonatal deaths through public and private partnership arrangements by using digital technology. Evidence on lessons and best practices from such innovative approach has not been systematically reported for scaling up. This study, therefore, aimed to document lessons learned and best practices to scale up the m-mama program nationally and in other limited settings in LMIC.

Methods

Study design and setting

This qualitative study was conducted between in the Kahama and Kishapu districts of the Shinyanga region in the Northern Lake zone of Tanzania. The two districts are among the six program-implementation districts for the m-mama program in the region. Shinyanga region has a total population of 1,534,808 people, according to the 2012 national census (17). In comparison to the national maternal death ratio of 432 per 100,000 live births, Shinyanga reported a higher maternal mortality rates of 635 per 100,000 live births and 449 per 100,000 live births between 2010 and 2015(11). The total fertility rate for the Shinyanga region is 7.2, a higher rate above the national average which is at 5.2 per woman. Despite the high burden of maternal mortality in Shinyanga, the region had only 13 public ambulance vehicles used to transport emergency cases, which were not enough to cater for such fast-growing population.

The m-mama program was implemented in phases through close collaboration with the Ministry of Health (MoH) and the President's Office – Regional Administration and Local Government (PO-RALG), selected health facility governing bodies, development partners, and communities. Vodafone Foundation, Touch Foundation, Pathfinder International, and respective Regional and Council Health Management Teams were the key implementers of the m-mama program(18,19). Core to the m-mama program was an essential component known as the Emergency Transportation System (EmTs) and technical and operational support of the health system.

The EmTs was designed in concert with the Ministry of Health (MoH), the Reproductive and Child Health Services (RCHS) division, and the Regional Health Management Team (RHMT). The system was co-developed by Vodafone Foundation, Touch Foundation, Pathfinder, and D-Tree to address maternal and neonatal mortality by utilizing technology to remotely triage patients and dispatch an ambulance or community driver to transfer the patient to a health facility. It aimed to address the second delay in reaching care directly through addressing the transportation challenge. In addition, the program addressed the second and third delays through health systems strengthening and community education initiatives through Community Care Groups (CCG) to encourage women to seek healthcare and ensure women receive high-quality care upon reaching the appropriate health facility.

Pathfinder International provided technical and operational support, including establishing CCGs to influence community health-seeking behaviors and help improve the quality of MNCH care at Basic Emergency Obstetrics and Neonatal Care (BEmONC)(19). This was done in dispensaries, health centers, and hospital levels by building the capacity of health providers, providing equipment, and improving the detection and referral of high-risk and complicated pregnancies. Touch Foundation made clinical and structural capacity at the health centers and district hospital level to provide Comprehensive Emergency Obstetrics and Neonatal Care (CEmONC) services. Together, the activities supported a continuum of care for women to access MNCH services at all levels of the health care system.

The program worked in two phases to reduce maternal and neonatal morbidity and mortality by tackling the three delays leading to adverse outcomes by strengthening the health system and improving the capacity of healthcare workers(20). Onsite phase I implementation started in Sengerema District Council (DC) and Buchosa DC (previously referred to jointly as Sengerema DC) in 2014, followed by Shinyanga MC in 2016. It focused on proof of concept and identifying cost-effective maternal and neonatal mortality solutions. The program's first phase received funding from donors, including USAID Mission Tanzania, Vodafone Foundation, ELMA Foundation, and Swiss Re Foundation. Phase II of the program started in 2017, expanded m-mama into the entire Shinyanga region (six councils) with approximately 1.9 million population, and focused on the ownership and sustainability of the system by local government authorities. The second phase received funding from Vodafone Foundation, Elma Foundation, Grand Challenges Canada, and Touch Foundation.

Study population

The study population consisted of representatives from the national, regional, and district government stakeholders. This included members from the Directorate of Health, Nutrition, and Social welfare at PO-RALG, community-based coordinators, facility-based coordinators, and medical officers.

Sampling and recruitment of study participants

Participants were purposively recruited for the study based on their role in implementing the program. The recruitment process focused on getting ideas from the experts regarding implementing m-mama.

Data collection

Trained research assistants collected data through key-informant interviews (KIIs). Before data collection, the tools were pretested during validation training and used a standardized semi-structured interview for data collection. Written consent was obtained from all participants. Participants were asked about what worked well during implementation that should be replicated to scale up, the challenges and how they can be solved, and what was not implemented during the program that should be incorporated to ensure scale-up and success nationally. A total of eight KIIs were conducted in either English or Swahili based on the preferred language, and they were audio-recorded with the permission of the study participants. To maintain neutrality, researchers applied the principle of bracketing to ensure that pre-understanding information does not influence the data. For enhancement of reliability, field notes as a reflective diary were maintained and reviewed during the analysis. A private and quiet place was sought to ensure maximum privacy and clear recording.

Data Management and Analysis

The audio-recorded KIIs were transcribed verbatim. Transcription was done immediately within 24 hours of data collection to allow for any clarifications and assess data saturation. Two researchers reviewed the transcripts to confirm the quality and correctness of the

transcription in line with the audio. Following the thematic analysis, different codes were manually drawn from the data after re-reading several transcripts and were shared with the whole team before actual coding was done. The five stages in doing thematic analysis, as described by Braun and Clarke (2014), were adhered to establish meaningful patterns in the data. These include familiarization with the data, generating initial codes, searching for themes among codes, reviewing themes, and presenting the results. The coding also involved identifying the stock quotes used to illustrate the various themes of study interest.

Ethical Consideration

Ethical approval was granted by the Muhimbili University of Health and Allied Sciences Research and Ethics Committee (MUHAS-REC-11-2021-885). Permission to collect data from the Shinyanga region was given by the President's Office Regional and Local Government Authority and the office of the Regional Medical Officer in Shinyanga. Informed consent was obtained from participants before data collection. Participants were assured of privacy, confidentiality, and anonymity throughout the study. The data obtained from this program evaluation were kept as strictly confidential and accessible to only the named investigators and have been stored on password-protected computers.

Patient Public Involvement

Patients were not involved in this study; our participants were government officials working at the department of health at the national, regional, and district levels. As key players, they participated in the conception and blueprint of the program in their areas of jurisdiction. Findings from the program evaluation have been shared with them through formal dissemination.

Results

We conducted this study to document lessons learned and best practices for scaling up the m-mama program nationally and in other limited resources settings in LMICs. We learned that community engagement, smooth operation of the emergency transportation system, and government engagement are crucial in scaling up the m-mama program. One of the vital program strategies was to engage stakeholders at all levels of the program implementation to enable ownership of the program and lead to the success and attainment of the desired outcomes. Community engagement from planning through implementation was essential to promote the utilization of the program as members were aware of the available services. Working within the local context was also reported to smoothen the program's implementation. It was crucial to coordinate the program activities, particularly the EmTs. The collaboration between the government and partners was reported to play an essential role in securing adequate funds to provide sufficient compensation to drivers and community health care workers (CHWs). Coordination and supportive supervision of the program were highlighted as the government's responsibility.

Community engagement and ownership of the program.

Participants acknowledged that engaging the community, who are the program's beneficiaries from the beginning, helps in the successful implementation of the program. During the program's implementation, the community was let to own the program, was involved in every step of planning and worked closely with the district government. This succeeded in winning the community's dedication to implementing the program.

> *"In this program, the community-owned it, when you speak with dedicated drivers, you can hear from them their dedication, you will feel the ownership in them of the program."* - senior government officer

Understanding the local context and working within the existing structures is essential to smoothen the program's operation.

> *"We should work as much as possible within the district structures, the transport officers, the local police, local village leaders, etc., they know their village, they know their district, they know much better who owns cars and how to get contact with those people and try to recruit them. Working with the existing local structures is probably the best way to recruit drivers"* -medical officer, Shinyanga.

For the people to benefit and use the system they should be well informed on what the program is offering and how to access it. For example, educating the community about pregnancy danger signs enabled them to make a phone call and seek early medical care. Media platforms like television, community radio, and billboards play an important role in spreading awareness about the program. Toll-free numbers available 24 hours for reporting on maternal or neonatal emergencies were provided to pregnant women, and community health workers and were displayed in public areas at RCHs clinics and ward offices for easy and quick access.

The Emergency Transportation System.

To ensure utilization and desired outcomes are attained, it is necessary to focus on the core of the program which is EmTs. Through the m-mama program, proper coordination of EmTs has shown the potential to prevent maternal and infant mortality. The use of community taxis in addition to ambulances has helped to improve maternal and child health services.

> *"If you look at the pace at which we have reduced maternal mortality and infant mortality under this m-mama program, everything is possible. We fail to do what we can to reduce it simply because we do not have the resources, just because we do not have proper transportation"* -Child Health Officer

Strengthening the transportation system must go hand in hand with strengthening the information and communication system as it plays a major part. The infrastructures need to be repaired and upgraded as required to improve access. The flow of information facilitates coordination.

> *"The coordination of the triage system, a call would be made to the receiving facility and it will be notified that we have an emergency of a certain kind you need to have*

tools in place to help the patient and the facility will have to get ready for that particular emergency. Unlike in the past when emergencies would go to the facilities unprepared" -facility-based coordinator

An emergency preparedness plan is necessary as emergencies are prone to occur at any given time, we need to develop and adopt the EmTs. It is crucial to have smooth coordination of the EmTs to prevent infant and maternal mortality. Coordination involves the availability of adequate resources, particularly funds, to reimburse the taxi drivers and other employed staff.

"*The things we have learned are that, just the coordination, which I said, the coordination of the emergency transport system, that if properly done, we can prevent maternal mortality. In the sense of coordination, there is one center that controls these transport systems,*" an officer reported

To offer services, there must be enough trained human resources. As there is currently a shortage of human resources for the healthcare industry, it is advised that dispatch centers designate specialized personnel whose job is to answer and coordinate calls. Additionally, the government must allocate more skilled human resources to the health sector to eliminate the need for referrals.

Government Engagement and Collaboration

Working with the appropriate stakeholders is required to have a smooth program implementation. Strong leadership and advocacy in the government are needed to help show other government officials how impactful the program can be. The main government implementors, PO-RALG, and the health ministry need to harmonize their understanding of the program.

"*We had to look for a government team that will believe in the system, that which could see the benefits of the program and would be willing to do as per the program requirements and who would commit both in terms of the financials paying the community drivers and proper allocation of resources through the RHMT and CHMT. Now, it's all about getting the belief in the system from both TAMISEMI and MoH stakeholders*." -District medical officer

Different government levels should be involved, from village to district level, in all processes, including planning. The government should fully commit to sustaining the program and set appropriate budgets. A senior regional government official stated,

"*We need to set adequate budgets, the government needs to think broadly, thinking broadly to increase budgets so that we can pay these drivers who help us survive. Without a budget to pay these drivers, we are doing nothing, the drivers will drop, we will go back there, we will be waiting for one car to go this way, we will be late, deaths will increase, and we will go back there."*

Running the program needs a lot of resources, particularly funds. The government oversees the program's management and maintenance and ensures that adequate funding is available and used effectively.

> *"The program reaching the community needs a lot of funds, things like hiring a PA system for public announcements, making announcements on community radios, you need to fund these,"* reported an officer

The government is in charge of ensuring the infrastructure is in good working order, including the roads that help prevent auto accidents, permit easy access to and from facilities, and lessen car damage. To manage all necessary operations, supplies like car maintenance and gas should be removed from the pool, and each department should have its transport officer and supplies. Funds should also be allocated to purchase ambulances equipped to facilitate referrals. Remuneration for the taxi drivers must be provided timely for enthusiasm and readiness to offer the service as required. As reported by a medical officer,

> "*Timely payment is critical for the sustainability of the program, if drivers are not paid on time as m-mama team was doing, they lose motivation and drop out*,"

It is recommended that the municipality should provide supportive oversight of CHWs, as well as its provision of health education and referral services. To identify problems and discover solutions, hold frequent meetings with stakeholders, including drivers, dispatchers, program focal persons, directors, RAS, and DMOs. Also, provide community leaders with communication tools like phones to help them connect with healthcare facilities as necessary.

Discussion

The m-mama program in Tanzania contributed to maternal mortality reduction. The program has illustrated that the involvement of the community, the government, and development partners are crucial for a functional system to reduce maternal and newborn mortality. Community engagement from conception to implementation is vital to promote usage and ownership of the program. The government is the primary coordinator of the program responsible for the mobilization of resources and coordination and supportive supervision. Effectively applied and aligned with the local context, the emergency transportation system can potentially reduce maternal and neonatal mortality. It is critical to operating within the existing structures to ensure the intervention runs smoothly.

Engaging the community from the inception of m-mama enabled the successful implementation of the program and will facilitate its smooth scale-up to other areas in the country. Community engagement has been emphasized in various initiatives, including section four of the Alma Ata declaration, which emphasized individuals' and community's engagement in processing affecting health needs and decisions. The section also declares that individuals have the right and duty to participate collectively in the planning and implementing programs for their health(21,22). Community commitment in Tanzania can be traced back as early as 2001 when communities, through their village councils with other stakeholders, participated

fully in building tricycles and engaging in social, economic activities to develop funds necessary to improve their means of communication(23). Promoting acceptability and usage of mother and neonatal health services requires community involvement from planning through implementation. The public should be fully informed of available services, involved, and allowed to voice their opinions. For maximum efficiency, it is crucial to understand the local context and work within the existing structures.

Similar programs in LMICs demonstrated similar outcomes when communities were fully involved(24–26). Such effects may be through improving health behaviors and outcomes, providing more acceptable, people-centered services, and empowering communities. Community-based health interventions enhance access and utilization of maternal and newborn services, ensuring that the services are organized to respond to their health needs, values, and preferences (27). Thus, the involvement of the communities from planning to implementation is crucial in promoting acceptance, utilization, and improved maternal and newborn health (28,29). Communities need to be further educated on the importance of decision-making and empowerment of women to take charge of their health and family at large. This will reduce the delays in seeking health care and enhance early detection of complications(30,31).

The government has a crucial role in maintaining the well-being of its citizen. From this study, the government is emphasized to be fully committed to scale-up the program and setting appropriate budgets for it. Strong governance provides suitable conditions to facilitate policies and financial commitments by the government authority, donors, and development partners. This is important to champion the country's maternal and newborn health targets country-wise and globally, ensuring continuous progress and equitably delivering the necessary care to end preventable maternal deaths. The government is in charge of supportive monitoring and central coordination.

To secure funding for the drivers' and CHWs' remuneration, health education provision, better transportation, and equipped CEmONC facilities with ambulances to expedite referrals. The provision of free maternal services in primary and secondary health facilities in Enugu state Nigeria succeeded through a joint fund between the local authority and the state government. This was an addition to other programs such as safe motherhood, family planning and integrated maternal and child health (32,33). Beyond policy, the government has a key role in providing supportive financial mechanisms and supportive supervision to ensure the quality of the services and achieve the national goals in maternal and newborn health.

A well-coordinated Emergency transportation system using community taxis can potentially reduce maternal and newborn mortality in a limited setting. Improved means of communication and physical infrastructures facilitate the utilization of the service. When EmTs are used in areas with few or no ambulances serve as an emergency preparedness plan to tackle the second and third delays. In LMICs, non-motorized vehicles, including bicycles, tricycles, modified tricycles, and canoes have been elaborated to provide emergency transport to facilities (23,34). Currently, ambulances and community taxis are used as means of transportation. The drivers are trained to triage patients, properly handle obstetrics emergencies, and offer communication to nearby facilities. With a limited number of ambulances, community taxes are vital in

ensuring timely access to health facilities and referrals in emergencies. While local taxis can help ease transportation, there is still a need for traditional ambulances fully equipped to offer emergency services. The availability and use of community taxes go along with improved communications in terms of phone calls and wireless communication, as seen in other countries. In rural Pakistan in 2012, community taxis were employed to address the ambulance gap after at least four drivers in each community underwent obstetric emergency training. The cost was kept affordable to simplify access, and drivers only requested fuel costs covered by the local community (35,36). Even with improved roads, some remote areas still have rough terrain roads, which makes transportation difficult. The climate and weather conditions also influence the quality of the streets, and different conditions, such as heavy rain, cause hindrances to transportation. The inflation of costing of fuel and maintenance of the vehicles are expected challenges to these interventions, and involved stakeholders need to set strategies to address them. Findings from this pilot study can inform the scaling up of the m-mama program in other districts with high burdens of maternal and neonatal morbidity and mortality in Tanzania and settings with similar contexts.

This study is the first in Tanzania to assess implementing a community-based emergency transport system aimed to address maternal and neonatal health challenges. The study employed triangulation of participants who serve different roles and positions in the health care system to obtain a rich, robust, and comprehensive perspective on implementing m-mama. As a cross-sectional study, it is limited to a snapshot information collection. It lacks prolonged engagement, which may challenge obtaining an insider perspective of the program implementation. Moreover, we did not collect baseline information for maternal and neonatal emergency and referral care indicators, which would have provided more insight into the initiative's effectiveness.

Conclusion and recommendations

Community engagement, comprehension of the local context, and operating within the existing structure promote ownership and utilization of the program. The government is the primary coordinator of the program, responsible for the mobilization and distribution of resources. An effective, applied, and coordinated emergency transportation system has the potential to tackle second and third delays and reduce maternal and neonatal mortality. Implementors should trade experiences to recognize best practices and better understand how to address anticipated difficulties.

Authors' contributions

Conceptualization: BS, BJN, LM, CM, LD, AT, WK; data cleaning and analysis: BJN, LM, Manuscript writing: BS, JEN, BJN, HPN, and CM; manuscript revision: BS, LM, BJN, JK, NP.

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Data Availability Statement

Data will be made available on reasonable request

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Conflicts of Interest

The authors declare no conflict of interest.

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Standards for Reporting Qualitative Research (SRQR)*

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	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Page 2
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Page 3
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Page 5
Purpose or research question - Purpose of the study and specific objectives or questions	Page 5
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Page 6
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Page 7/ Line 49/50
Context - Setting/site and salient contextual factors; rationale**	Page 6
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Page 7
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Page 8
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Page 7

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Page 7
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Page 7/8
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Page 6/7
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Page 7/8
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Page 7/ Line 38-41,50/51

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Page 8-11
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Page 8-11

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Page 10-12
Limitations - Trustworthiness and limitations of findings	Page 11-13

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Page 14/Line no. 10/11
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Page 13/Line 50-53

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:

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Title

Scaling Up an Innovative Emergency Transportation System (m-mama): Findings from a Qualitative Study Assessing the Pilot Program in Shinyanga, Tanzania.

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Abstract

Objective: To document lessons learned and best practices for scaling up health programs, drawing insights from the Innovative Emergency Transportation System (m-mama) in Shinyanga, Tanzania.

Design: Cross-sectional, qualitative research with the national, regional, and council stakeholders.

Setting: Shinyanga, in Tanzania.

Participants: District, regional, and national stakeholders involved in implementing the m-mama program.

Results: Lessons learned from implementing the m-mama program were grouped into four key themes: community engagement, emergency transportation system, government engagement, and challenges and constraints in technical implementation. For the sustainability of innovative community intervention, the local community should be involved in the development and implementation of the program to foster ownership, acceptance, and utilization of the program.

Conclusions: Community engagement, comprehension of the local context, and operating within the existing structure can promote ownership and utilization of this and similar programs. A practical, applied, and coordinated emergency transportation system has the potential to address second and third delays and help to reduce maternal and neonatal mortality. The government's role in resource mobilization and distribution, community ownership, and involvement remain vital for scaling up the emergency transport system in Tanzania and areas with similar contexts.

Keywords: *Emergency transportation system, maternal mortality rate, newborn mortality*

What is already known on this topic: -

Tanzania is among the countries with a persistently high maternal mortality rate, with the Lake zone regions leading. This study aims to extract the best lesson from the innovative and locally piloted m-mama program operated in these regions to prevent maternal and newborn mortality.

What the study adds: -

This paper has generated evidence that forms lessons learned in implementing the m-mama emergency transport system that can be scalable in other regions in Tanzania and lower-middle-income countries facing similar burdens and contexts of poor maternal health indicators driven by second and third delays.

How the study might affect research practice/ policy: -

Owing to its effectiveness, the m-mama program is being scaled to five other regions in Tanzania. Documenting the best lessons for scaling up provides lessons to other regions and countries on the emergency transportation system to tackle the three delays in maternal health.

Background

Globally, maternal mortality declined by 38% between 2000 and 2017 (1). However, about 810 women die each day due to preventable maternal causes (2). While the global distribution in maternal mortality varies with regions and contexts, nine in ten deaths occur in low- and middle-income countries (LMICs), and Sub-Saharan Africa (SSA) accounts for two-thirds of all deaths (2,3). The risk of death due to pregnancy and childbirth complications in SSA is between one and thirty-seven, attributed to health and socio-economic disadvantages (4,5). These include various factors delaying women from making decisions to access and receiving antenatal care, safe childbirth, newborn care, and pre-existing medical conditions worsened by pregnancy(5–7).

In Tanzania, maternal mortality has remained persistently high, with 432 per 100,000 live births reported in 2014 but a steady increase to 524 per 100,000 live births in 2017. Such an unprecedented rate is unequally distributed between different regions, with the areas in the Lake zone, like the Shinyanga region, reporting a higher burden (8–10). The region reported higher maternal mortality rates of 635 per 100,000 live births, 449 and 417 per 100,000 live births between 2010, 2015, and 2017 respectively (11,12).

The three-delay model for seeking maternal care has been used to explain the underlying causes of maternal mortality(13–15). In this model, the first delay is from the household or personal level from the onset of symptoms at home to when the decision is made by either a woman, family, or both in seeking care. The second delay is attributed to factors impeding access to health facilities, including available infrastructures and means of transport from when the decision to seek care is made. The third delay is receiving appropriate care at the facility level, including the availability of skilled human resources, equipment, and referral system from admission until adequate treatment begins (13,16). Addressing such delays calls for tailored interventions that may need to be modified from one context to another.

The m-mama program is a comprehensive emergency transportation system tackling the three delays. It began as a pilot intervention in 2013 in Mwanza and Shinyanga regions, aiming to address broad, systemic challenges through a coordinated horizontal program approach that extends from the community and lower-level health facilities to the hospital level. Analysis of the program implementation showed that the transportation system could potentially reduce maternal and neonatal deaths through public and private partnership arrangements using digital technology(17–19). Evidence on lessons and best practices from such innovative approaches has not been systematically reported for scaling up. This study, therefore, aimed to document lessons learned and best practices to scale up the m-mama program nationally and in other limited settings in LMIC.

Methods

Study design and setting

This qualitative study was conducted between February and March 2022 in Kahama and Kishapu districts of the Shinyanga region in the Northern Lake zone of Tanzania. The two districts are among the six program-implementation districts for the m-mama program in the region. The two districts were chosen purposefully to represent the program implementation districts' rural and urban or semi-urban settings. Kahama municipality represented the semi-urban setting and had a supervisory role over two rural districts (Msalala and Ushetu) where the program was implemented. Kishapu district was selected to represent the rural setting. Shinyanga region has a total population of 1,534,808 people, according to the 2012 national census (20).

In comparison to the national maternal death ratio of 432 per 100,000 live births, Shinyanga reported a higher maternal mortality rate of 635 per 100,000 live births and 449 per 100,000 live births between 2010 and 2015(11). The total fertility rate for the Shinyanga region is 7.2, a higher rate than the national average of 5.2 per woman. Despite the high burden of maternal mortality in Shinyanga, the region had only thirteen public ambulance vehicles used to transport emergency cases, not enough to cater to such fast-growing population.

Description of the m-mama program

The m-mama program was implemented in two phases through close collaboration with the Ministry of Health (MoH) and the President's Office – Regional Administration and Local Government (PO-RALG), selected health facility governing bodies, development partners, and communities. Vodafone Foundation, Touch Foundation, Pathfinder International, and respective Regional and Council Health Management Teams (RHMT) were the key implementers of the m-mama program(21,22). Core to the m-mama program was an essential component known as the Emergency Transportation System (EmTs) and technical and operational support of the health system. The EmTs were designed in concert with the MoH, the Reproductive and Child Health Services (RCHS) division, and the RHMT. The system utilized technology to remotely triage patients and dispatch an ambulance or community driver to transfer them to health facility. It aimed to address the second delay in reaching care directly , addressing the transportation challenge. The programs addressed the second and third delays through health systems strengthening and community education initiatives through Community Care Groups (CCG) to encourage women to seek healthcare and ensure women receive high-quality care upon reaching the appropriate health facility. Pathfinder International provided technical and operational support, including establishing CCGs to influence community health-seeking behaviors and help improve the quality of MNCH care at Basic Emergency Obstetrics and Neonatal Care (BEmONC)(22). This was done in dispensaries, health centers, and hospital levels by building the capacity of health providers, providing equipment, and improving the detection and referral of high-risk and complicated pregnancies. Touch Foundation made clinical and structural capacity at the health centers and district hospital level to provide Comprehensive Emergency Obstetrics and Neonatal Care (CEmONC) services. Together, the activities supported a continuum of care for women to access MNCH services at all levels of the health care system.

The program worked in two phases strengthening the health system and improving the capacity of healthcare workers(23). Onsite phase I implementation started in Sengerema District Council (D.C.) and Buchosa DC (previously referred to jointly as Sengerema DC) in 2014, followed by Shinyanga MC in 2016. It focused on proof of concept and identifying cost-effective maternal and neonatal mortality solutions. Phase II of the program started in 2017, expanded m-mama into the entire Shinyanga region with approximately 1.9 million population, and focused on the ownership and sustainability of the system by local government authorities.

Study population

The study population consisted of eight representatives from the national, regional, and district government stakeholders. The sample size was determined based on understanding of the program implementation to the government stakeholders included in this study. This included members from the Directorate of Health, Nutrition, and Social Welfare at PO-RALG, community-based coordinators, facility-based coordinators, and medical officers. Facility-based coordinators oversee health program activities at facilities, while community-based coordinators, selected from community health workers, manage activities at the community level, including raising awareness about the m-mama program.

Sampling and recruitment of study participants

Participants were recruited using purposeful selection to obtain information-rich individuals based on their involvement during the program's implementation. The recruitment process focused on getting ideas from the experts regarding implementing m-mama(24).

Data collection

Trained research assistants collected data through key-informant interviews (KIIs). Before data collection, the tools were pretested during validation training and a standardized semi-structured interview for data collection. The interview guide has been added as supplemental file one. The interview guide has been attached as supplemental file. Participants were asked about what worked well during implementation that should be replicated to scale up, the challenges and how they can be solved, and what was not implemented during the program that should be incorporated to ensure scale-up and success nationally. A total of eight KIIs were conducted in either English or Swahili based on the preferred language, and they were audio-recorded with the permission of the study participants. To maintain neutrality, researchers applied the principle of bracketing to ensure that pre-understanding information does not influence the data(25). The program was evaluated by a team of researchers who were not part of the program. Field notes as a reflective diary were maintained and reviewed during the analysis to enhance reliability. A private and quiet place was sought to ensure maximum privacy and clear recording.

Data Management and Analysis

The audio-recorded KIIs were transcribed verbatim. Transcription was done immediately within 24 hours of data collection to allow for any clarifications and assess data saturation. Despite the pre-determination of the sample size, data saturation was reached. Two researchers

reviewed the transcripts to confirm the quality and correctness of the transcription in line with the audio. Following the thematic analysis, codes were manually drawn from the data after re-reading several transcripts and were shared with the whole team before actual coding was done. The five stages in doing thematic analysis, as described by Braun and Clarke (2014), were adhered to establish meaningful patterns in the data. These include familiarization with the data, generating initial codes, searching for themes among codes, reviewing themes, and presenting the results. The coding also involved identifying the stock quotes used to illustrate the various themes of study interest.

Ethical Consideration

Ethical approval was granted by the Muhimbili University of Health and Allied Sciences Research and Ethics Committee (MUHAS-REC-11-2021-885). Permission to collect data from the Shinyanga region was given by the PO-RALG Authority and the office of the Regional Medical Officer in Shinyanga. Informed consent was obtained from participants before data collection. Participants were assured of privacy, confidentiality, and anonymity throughout the study. The data obtained from this program evaluation were kept strictly confidential and accessible to only the named investigators and have been stored on password-protected computers.

Conceptual Framework

The conceptual framework designed for scaling up the m-mama program nationally exhibits a robust alignment with the Consolidated Framework for Implementation Research (CFIR), a well-established and comprehensive framework in the domain of implementation science(26,27). CFIR provides a structured approach to understanding the intricate factors that influence the successful implementation of interventions within complex healthcare settings. This alignment is crucial for a deeper understanding of the m-mama program's potential to be effectively implemented and scaled nationally. The alignment with the CFIR framework offers a structured lens through which to analyze the various components of the conceptual framework for scaling up the m-mama program. By considering the inner setting, intervention characteristics, and outer setting factors within the CFIR framework, stakeholders can comprehensively identify contextual factors, barriers, and facilitators influencing successful implementation and scaling. It provides a foundation for strategic decision-making and targeted interventions to enhance the program’s effectiveness and maximize its impact nationally on maternal and neonatal health.

The first pillar of the conceptual framework, community engagement, aligns with CFIR's emphasis on the inner setting. In the context of m-mama, community engagement is central to the program's success. The emergency transportation system aligns with CFIR's consideration of intervention characteristics. This framework component correlates with CFIR's focus on intervention characteristics, such as adaptability, complexity, and relative advantage. The third pillar, government engagement, resonates with the outer setting and the process components within CFIR. Advocating for government involvement and policies is akin to addressing the

outer setting and recognizing the external environment's influence on the implementation process.

Results

We conducted this study to document lessons learned and best practices for scaling up the m-mama program nationally and in other limited-resource settings in LMICs. We learned that community engagement, smooth operation of the emergency transportation system, and government engagement are crucial in scaling up the m-mama program. The program's implementation also faced various challenges and employed different solutions to solve them. One of the vital program strategies was to engage stakeholders at all levels of the program implementation to enable ownership of the program and lead to the success and attainment of the desired outcomes. Community engagement from planning through implementation was essential to promote the utilization of the program as members were aware of the available services. Working within the local context was also reported to smoothen the program's implementation. It was crucial to coordinate the program activities, particularly the EmTs. The collaboration between the government and partners was reported to play an essential role in securing adequate funds to provide sufficient compensation to drivers and community health care workers (CHWs). Coordination and supportive supervision of the program were highlighted as the government's responsibility. Implementing the emergency transportation system should also include improving health service provision in the healthcare facilities and infrastructures.

Community engagement and ownership of the program.

The involvement of the local community is akin to understanding the inner setting within CFIR, encompassing the role of individuals and the prevailing culture within the community. Recognizing community engagement as a determinant aligns with CFIR's acknowledgment of how community involvement significantly influences the effectiveness of implementation within this inner setting. Participants acknowledged that engaging the community, who are the program's beneficiaries from the beginning, helps in the successful implementation of the program. During the program's implementation, the community owned the program and was involved in every step, working closely with the district government. This succeeded in winning the community's dedication to implementing the program. One participant stated,

> *"In this program, the community-owned it, when you speak with dedicated drivers, you can hear from them their dedication, you will feel the ownership in them of the program."*

Understanding the local context and working within the existing structures is essential to smoothen the program's operation.

> *"We should work as much as possible within the district structures, the transport officers, the local police, local village leaders, etc., they know their village, they know their district, they know much better who owns cars and how to get contact with those*

people and try to recruit them. Working with the existing local structures is probably the best way to recruit drivers," -medical Officer.

For the people to benefit and use the system, they should be well informed on what the program offers and how to access it. For example, educating the community about pregnancy danger signs enabled them to call and seek early medical care. Media platforms like television, community radio, and billboards are important in spreading awareness about the program. Toll-free numbers available 24 hours for reporting on maternal or neonatal emergencies were provided to pregnant women and community health workers and were displayed in public areas at RCHs clinics and ward offices for easy and quick access.

Operationalization of the Emergency Transportation System.

Establishing a robust emergency transportation system is critical to the m-mama program. The need to tailor the transportation system to suit the community's specific needs corresponds with CFIR's concept of intervention adaptation, highlighting the importance of aligning interventions with the unique characteristics of the target population. Focusing on the program's core, EmTs are necessary to ensure utilization and desired outcomes are attained. Through the m-mama program, proper coordination of EmTs has shown the potential to prevent maternal and infant mortality. The use of community taxis, in addition to ambulances, has helped to improve maternal and child health services. One participant reported.

"...This project contributed a lot to reducing the causes due to delays in getting services from the community to facilities and low-level to high-level facilities. When you look at the data from Shinyanga, there is a drop in maternal deaths. Because we attended MPDSR meeting, and you can see that after analysis, the deaths and complications due to lack of transport reduced compared to what the situation before the project."

"If you look at the pace at which we have reduced maternal mortality and infant mortality under this m-mama program, everything is possible. We fail to do what we can to reduce it simply because we do not have the resources, just because we do not have proper transportation" -Medical Officer

Strengthening the transportation system must go hand in hand with enhancing the information and communication system, as it plays a significant part. The infrastructure need to be repaired and upgraded as required to improve access. The flow of information facilitates coordination.

"The coordination of the triage system, a call would be made to the receiving facility and it will be notified that we have an emergency of a certain kind you need to have tools in place to help the patient and the facility will have to get ready for that particular emergency. Unlike in the past when emergencies would go to the facilities unprepared" -facility-based coordinator

An emergency preparedness plan is necessary as emergencies are prone to occur at any given time; there is, therefore, a need to develop and adopt the EmTs. It is crucial to have smooth coordination of the EmTs to prevent infant and maternal mortality. Coordination involves the availability of adequate resources, particularly funds, to reimburse the taxi drivers and other employed staff.

> "*The things we have learned are that, just the coordination, which I said, the coordination of the emergency transport system, that if properly done, we can prevent maternal mortality. In the sense of coordination, there is one center that controls these transport systems,*" an officer reported

To offer services, there must be enough trained human resources. As there is currently a shortage of human resources for the healthcare industry, it is advised that dispatch centers designate specialized personnel whose job is to answer and coordinate calls. Additionally, the government must allocate more skilled human resources to the health sector to eliminate the need for referrals.

Government Engagement and Collaboration

Working with the appropriate stakeholders is required to have a smooth program implementation. Emphasizing policy development and advocacy aligns with CFIR's focus on implementation, encompassing policy-related factors and engagement with external stakeholders. This alignment underscores the significance of engaging with the broader environment and streamlining policies for effective scaling and sustainability of the m-mama program. Strong leadership and advocacy in the government are needed to help show other government officials how impactful the program can be. The main government implementors, PO-RALG, and the health ministry need to harmonize their understanding of the program.

> "*We had to look for a government team that will believe in the system, that which could see the benefits of the program and would be willing to do as per the program requirements and who would commit both in terms of the financials paying the community drivers and proper allocation of resources through the RHMT and CHMT. Now, it's all about getting the belief in the system from both TAMISEMI and MoH stakeholders*." - Medical Officer

Different government levels should be involved in all processes, including planning, from village to district. The government should fully commit to sustaining the program and set appropriate budgets. A government official stated,

> "*We need to set adequate budgets; the government needs to think broadly to increase budgets so that we can pay these drivers who help us survive. Without a budget to pay these drivers, we are doing nothing. The drivers will drop, we will go back there, we will be waiting for one car to go this way, we will be late, deaths will increase, and we will go back there."*

Running the program needs a lot of resources, particularly funds. The government oversees the program's management and maintenance and ensures adequate funding is available and used effectively.

> *"The program reaching the community needs a lot of funds, things like hiring a P.A. system for public announcements, making announcements on community radios, you need to fund these,"* reported an officer

The government is in charge of ensuring the infrastructure is in good working order, including the roads that help prevent auto accidents, permit easy access to and from facilities, and lessen car damage. To manage all necessary operations, supplies like car maintenance and gas should be removed from the pool, and each department should have its transport officer and supplies. Funds should also be allocated to purchase ambulances equipped to facilitate referrals. Remuneration for the taxi drivers must be provided timely for enthusiasm and readiness to offer the service as required. As reported by a medical officer,

> "*Timely payment is critical for the sustainability of the program, if drivers are not paid on time as m-mama team was doing, they lose motivation and drop out*,"

It is recommended that the municipality should provide supportive oversight of CHWs, as well as its provision of health education and referral services. To identify problems and discover solutions, hold frequent meetings with stakeholders, including drivers, dispatchers, program focal persons, directors, RAS, and DMOs. Also, provide community leaders with communication tools like phones to help them connect with healthcare facilities as necessary.

Challenges and constraints in technical implementation of the program.

The program's implementation faced several challenges at the level of the facilities, the emergency transportation systems, and physical infrastructures. The healthcare facilities faced a shortage of human resources and supplies. A shortage of human resources was also reported as a challenge during the program's implementation. This was attributed to the transfer of staff to other areas, creating a vacuum of skilled service provision and understaffing, attributed to work overload. It was recommended that more staff need to be hired to the facilities and ensure adequate service provision.

> *"There is also understaffing in both health facilities and at the dispatch centre. The dispatch centre needs to have a healthcare worker 24/7. The same healthcare workers are supposed to worked in both the dispatch center and the facility,"* -Medical Officer reported.

> *"Training of BEmONC was provided in many health facilities, however, CEmONC cannot be trained to everyone… so if someone who was trained is transferred and comes someone who was not trained, you find that the services provided might not be sufficient"* reported by one facility coordinator.

The EmTs faced challenges regarding availability and durability of the ambulances and community taxis.

> *"Challenges of using ambulances- first of all, they are few and do not fit the purpose, second, breakdown ambulances need repairs which are not timely, third the ambulance could be handling another emergency when it is needed. Sometimes you may find an ambulance is unavailable because it has transported the patient to another region, that's why we need a backup transportation system."-reported one participant*

In certain areas within the Shinyanga region, poor roads pose significant challenges, especially during the rainy seasons. Due to their small size, the local community taxis often struggle to navigate these poorly maintained roads. To address this issue, a dual approach has been adopted. In some parts, villagers have been encouraged to engage in road repair initiatives actively, fostering a strong sense of community involvement and ownership. In other areas, the services of a professional contractor have been enlisted to undertake the necessary road repairs.

> *"When ambulances are not working you opt to go for community taxis. The challenge with community taxis is that they are not four-wheel drive like land cruisers when the roads are rough especially during the rainy season, they fail to transport the patients effectively,"* a District Medical Officer reported.

To optimize the impact of the healthcare program established in government facilities, the government must increase its financial support by allocating additional funds for equipment procurement and hiring trained healthcare providers. The program's success is attributed to active community engagement and ownership, exemplified by the community's initiative in road repairs. Encouraging and sustaining this sense of community involvement is vital. The government should explore and leverage local resources to enhance program implementation and scalability, creating a more efficient and autonomous healthcare system that benefits the entire community.

Discussion

In this study, we aimed to document the lessons learned and best practices for scaling up the m-mama health programs in Shinyanga, Tanzania. Community engagement from conception to implementation is vital to promote usage and ownership of the program. The government is the primary coordinator of the program responsible for the mobilization of resources and coordination and supportive supervision. Effectively applied and aligned with the local context, the emergency transportation system can potentially reduce maternal and neonatal mortality. Operating within the existing structures is critical to ensure the intervention runs smoothly.

Engaging the community from the inception of m-mama enabled the successful implementation of the program and will facilitate its smooth scale-up to other areas in the country. Community engagement has been emphasized in various initiatives, including section four of the Alma Ata declaration, which emphasized individuals' and community's engagement in processing affecting health needs and decisions. The section also declares that individuals have the right and duty to participate collectively in the planning and implementing programs for their health(28,29). Community commitment in Tanzania can be traced back as early as 2001 when communities, through their village councils with other stakeholders, participated fully in building tricycles and engaging in socio-economic activities to develop funds necessary to improve their means of communication(30). Promoting acceptability and usage of mother

and neonatal health services requires community involvement from planning through implementation. The public should be fully informed of available services, involved, and allowed to voice their opinions. For maximum efficiency, it is crucial to understand the local context and work within the existing structures.

Similar programs in LMICs demonstrated similar outcomes when communities were fully involved(31–33). Such effects may be through improving health behaviors and outcomes, providing more acceptable, people-centered services, and empowering communities. Community-based health interventions enhance access and utilization of maternal and newborn services, ensuring that the services are organized to respond to their health needs, values, and preferences (34). Thus, the involvement of the communities from planning to implementation is crucial in promoting acceptance, utilization, and improved maternal and newborn health (35,36). Community awareness and empowerment are important for community members to participate in decision-making in complementing scaleup efforts (37,38).

The government has a crucial role in maintaining its citizens well-being. From this study, the government is emphasized to be fully committed to scale-up the program and setting appropriate budgets for it. Strong governance provides suitable conditions to facilitate policies and financial commitments by the government authority, donors, and development partners. This is important to champion the country's maternal and newborn health targets country-wise, ensuring continuous progress and equitably delivering necessary care to end preventable maternal deaths. The government is in charge of supportive monitoring and central coordination.

To secure funding for the drivers' and CHWs' remuneration, health education provision, better transportation, and equipped CEmONC facilities with ambulances to expedite referrals. Free maternal services in Enugu state, Nigeria's primary and secondary health facilities succeeded through a joint fund between the local authority and the state government. This was an addition to other programs such as safe motherhood, family planning, and integrated maternal and child health (39,40). Beyond policy, the government has a key role in providing supportive financial mechanisms and supportive supervision to ensure the quality of the services and achieve the national goals in maternal and newborn health.

A well-coordinated Emergency transportation system using community taxis can potentially reduce maternal and newborn mortality in a limited setting. Improved means of communication and physical infrastructures facilitate the utilization of the service. When EmTs are used in areas with few or no ambulances serve as an emergency preparedness plan to tackle the second and third delays. In LMICs, non-motorized vehicles, including bicycles, tricycles, modified tricycles, and canoes, have been elaborated to provide emergency transport to facilities (30,41). Currently, ambulances and community taxis are used as means of transportation. The drivers are trained to triage patients, properly handle obstetrics emergencies, and offer communication to nearby facilities. With limited ambulances, community taxes are vital in ensuring timely access to health facilities and emergency referrals. While local taxis can help ease transportation, there is still a need for traditional ambulances fully equipped to offer emergency services. The availability and use of community taxes go along with improved communications

in terms of phone calls and wireless communication, as seen in other countries. In rural Pakistan in 2012, community taxis were employed to address the ambulance gap after at least four drivers in each community underwent obstetric emergency training. The cost was kept affordable to simplify access, and drivers only requested fuel costs covered by the local community (42,43). Even with improved roads, some remote areas still have rough terrain roads, which makes transportation difficult. The climate and weather conditions also influence the quality of the streets, and different conditions, such as heavy rain, cause hindrances to transportation. The inflation of fuel and maintenance of the vehicles are expected challenges to these interventions, and involved stakeholders need to set strategies to address them. Findings from this pilot study can inform the scaling up of the m-mama program in other districts with high burdens of maternal and neonatal morbidity and mortality in Tanzania and settings with similar contexts.

Strengths and Limitations

The study employed triangulation of participants who serve different roles and positions in the health care system to obtain a rich, robust, and comprehensive perspective on implementing m-mama. As a cross-sectional study, it is limited to a snapshot information collection. It lacks prolonged engagement, which may challenge obtaining an insider perspective of the program implementation. Moreover, we did not collect baseline information for maternal and neonatal emergency and referral care indicators, which would have provided more insight into the initiative's effectiveness.

Conclusion and recommendations

Community engagement, comprehension of the local context, and operating within the existing structure promote ownership and utilization of the program. The government is the primary coordinator of the program, responsible for the mobilization and distribution of resources. An effective, applied, and coordinated emergency transportation system has the potential to tackle second and third delays and reduce maternal and neonatal mortality. Implementors should trade experiences to recognize best practices and better understand how to address anticipated difficulties.

Authors' contributions

Conceptualization: BS, BJN, LM, CM, LD, AT, WK; data cleaning and analysis: BJN, LM, Manuscript writing: BS, JEN, BJN, HPN, and CM; manuscript revision: JEN, LM, BJN, JK, NP, BS.

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Data Availability Statement

The dataset contains identifying qualitative information and therefore cannot be publicly available. However, data will be made available on a reasonable request. Request to access

data can be made to the Chairperson, institutional review board, Muhimbili University of Health and Allied Science, drp@muhas.ac.tz.

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Conflicts of Interest

The authors declare no conflict of interest.

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End line Evaluation of the m-mama program on Strengthening Health Systems to Reduce Maternal Mortality and Morbidity in Shinyanga Region, Tanzania

Key stakeholders (District officers and CHMT, regional officers and RHMT)

The m-mama program, (formerly known as Mobilizing Maternal Health) began in 2013 and sought to address broad, systemic challenges in regards to maternal health, morbidity and mortality through a coordinated horizontal program approach that extends from the community, lower-level health facilities up to the hospital level.

This is the end-line evaluation of the m-mama program that focuses on strengthening health systems to reduce maternal and newborn morbidity and mortality in Shinyanga region. It is conducted in Shinyanga region to assess the implementation and sustainability of the program since its initial phase in 2013.

Interview no:	
Age:	Facility:
Role/Title:	District:
Sex:	
Type of the facility (BEmONC/ CEmONC)	

Please provide a description in detail on the implementation of the m-mama program

1. For how long has this district been involved in the collaboration with the m-mama partners in implementing the Emergency Transportation System
2. How are the government ambulances integrated in the emergency transportation services to supplement the services provided by the m-mama program?
    - Involvement of the RHMT and CHMT
    - Challenges in collaboration between the government and the m-mama program
3. How is the community linked with the district emergency referral and transport system?
    - Number and functioning of the Community taxi
    - Retention of community drivers

4. Can you comment on the quality of the Emergency transportation system and referral system for maternal and neonatal health services in your district/region?
5. How is the referral system before and after Emergency Transportation system?
    - Number of referrals for BEmONC, CEmONC and Neonatal ICU
    - Triaging system
    - Outcome after referral
6. How are the BEmONC and CEmONC trainings provided in this region/district?
    - Total number and frequency of training
    - Type of trainings provided
    - Type of health care providers trained
7. How are the neonatal intensive care trainings provided?
    - Total number and frequency of training
    - Type of trainings provided
    - Type of health care providers trained
8. Please explain how equipment procurement for BEmONC, CEmONC and Neonatal Intensive care units is conducted.
    - Enquire also about number of infrastructures built
    - Adequacy and timely procurement of equipment
    - Challenges in the procurement process
9. How is the formation of community care groups done?
    - Number of CCG formed
    - Functioning of CCG
    - Supervision and support provided and frequency of supervision
10. How is the participation of government stakeholders in planning and project implementation?
    - Fund allocation from government
    - Supportive supervisions
    - Utilization of government policies and strategies
    - Continuity of project services and institutional memory of the program services, passing of information and introduction of the project to new staff.
11. How are supportive supervisions on the m-mama program done?
    - Frequency of supervisions, are they timely?
    - Who conducts the supervisions?

- How is the feedback system?

12. What is the effectiveness of the m-mama project/program in improving the Emergency Referral System?
13. What successes has the program experienced in implementing the mobile based referral system components?
    - Emergence referral and transportation system
    - Infrastructures and training (BEmONC, CEmONC and Neonatal Intensive care)
    - Community engagement and education

14. What were the challenges faced during implementation and sustainability of the emergence referral and transportation system?
    - Emergence referral and transportation system
    - Infrastructures and training (BEmONC, CEmONC and Neonatal Intensive care)
    - Community engagement and education

15. What can be done to improve program implementation and sustainability?
    - Emergence referral and transportation system
    - Infrastructures and training (BEmONC, CEmONC and Neonatal Intensive care)
    - Community engagement and education

16. What can be done to scale up the program to national level?

Tathmini ya Mwisho wa programu ya m-mama kuhusu Kuimarisha Mifumo ya Afya ili Kupunguza Vifo na Maradhi ya Wajawazito Mkoani Shinyanga, Tanzania.

Mwongozo wa mahojiano kwa wadau wa serikali (Maofisa wa wilaya na mkoa, CHMT na RHMT)

Mpango wa m-mama, (zamani ulijulikana kama Uhamasishaji wa Afya ya Mama (Mobilizing maternal Health - MMH) ulianza mnamo mwaka 2013 na ulitafuta kushughulikia kwa upana changamoto za kimfumo zinazohusiana na afya, magonjwa na vifo vya akina mama. Mpango huu ulifanyika kupitia njia iliyoratibiwa ya mpango mlalo kuanzia ngazi ya jamii, vituo vya afya mpaka kufikia ngazi ya hospitali.

Utafiti huu ni wa kufanya tathmini ya mwisho ya mpango wa m-mama ambao unazingatia kuimarisha mifumo ya afya ili kupunguza magonjwa na vifo vya akina mama na watoto wachanga katika mkoa wa Shinyanga. Utafiti huu unafanywa katika mkoa wa Shinyanga kutathmini utekelezaji na uendelevu wa mpango huo tangu awamu yake ya kwanza mnamo mwaka 2013.

Interview ID no:	
Umri:	Kituo:
Cheo:	Wilaya:
Jinsia:	
Shirika/Mdau:	

Tafadhali toa maelezo kwa kina juu ya utekelezaji wa programu ya m-mama

1. Ni kwa muda gani sasa wilaya hii imehusika katika kushirikiana na wadau wa m-mama kwenye utekelezaji wa Mfumo wa Usafiri wa Dharura?
2. Je! Ambulensi (usafiri wa dharura) za serikali zimejumuishwa / zinahusika vipi katika huduma za usafirishaji wa dharura ili kuongeza upatikanaji wa huduma zinazotolewa na programu hii?
    - Ushirikishwaji wa RHMT na CHMT
    - Changamoto katika ushirikiano wa serikali na wafanyakazi wa programu ya m-mama
3. Jamii imehusishwa vipi na mfumo wa usafirishaji wa dharura wa wilaya?
    - Idadi na utendaji wa huduma za taxi kutoka ngazi ya jamii
    - Utendaji endelevu wa madereva ngazi ya jamii

4. Tafadhali toa maoni yako juu ya ubora wa mfumo wa usafirishaji wa Dharura na mfumo wa rufaa kwa huduma za afya ya mama na watoto wachanga katika wilaya / mkoa wako?
5. Je! Mfumo wa rufaa ulikuaje kabla na ukoje baada ya kuanzishwa kwa mfumo wa Usafiri wa Dharura
    - Idadi ya rufaa kwa BEmONC, CEmONC na ICU ya watoto wachanga
    - Mfumo wa kutoa vipaumbele vya matibabu
    - Matokeo baada ya rufaa
6. Je, mafunzo ya kutoa matibabu ya watoto wachanga mahututi, pamoja na mafunzo ya BEmONC na CEmONC hutolewa vipi?
    - Jumla ya idadi na mzunguko (hufanyika kila baada ya muda gani) wa mafunzo
    - Aina ya mafunzo yaliyotolewa
    - Aina ya watoa huduma ya afya waliopata mafunzo hayo
7. Tafadhali fafanua jinsi ununuzi wa vifaa vya kutoa huduma za BEmONC, CEmONC na matibabu ya Watoto wachanga mahututi.
    - Uliza pia kuhusu idadi ya miundombinu iliyojengwa
    - Utoshelevu na ununuzi wa vifaa kwa wakati
    - Changamoto katika mchakato wa ununuzi
8. Tafadhali eleza namna namna ugavi wa vifaa vya BEmONC, CEmONC na matibabu ya Watoto wachanga mahututi ulivyofanyika
    - Eleza kuhusu ufanisi wa ugavi wa vifaa kwa wakati
    - Changamoto katika mfumo wa ugavi
9. Uundaji wa vikundi vya utunzaji jamii ulifanyikaje?
    - Idadi ya vikundi vya utunzaji jamii vilivyoundwa
    - Mchakato wa Ajira na mafunzo ya wawezeshaji na wasimamizi wa vikundi hivyo unavyofanyika
    - Utendaji kazi na uendelevu wa vikundi vya utunzaji jamii (CCG)
    - Usimamizi na msaada unaotolewa Pamoja na mzunguko wa usimamizi
10. Je! Ushiriki wa wadau wa serikali ukoje katika mchakato wa upangaji na katika shughuli za mradi?
    - Mgawo wa fedha kutoka serikalini
    - Usimamizi maalumu Pamoja na mzunguko na idadi ya usimamizi uliofanyika

- Matumizi ya sera na mikakati ya serikali kwenye kutoa huduma
- Mwendelezo wa huduma za mradi na kumbukumbu ya huduma zilizotolewa na programu kwa taasisi husika, kufikisha habari na utambulishaji wa mradi kwa wafanyikazi wapya.

11. Je! Usimamizi saidizi wa shughuli za mpango wa m-mama ulifanyikaje?
    - Mzunguko wa usimamizi, je, ni kwa wakati unaofaa?
    - Nani anayehusika kwenye usimamizi huu?
    - Mfumo wa kutoa mrejesho na maoni baada ya usimamizi ulikuwaje?
12. Je! Ni nini ufanisi wa mradi / mpango wa m-mama katika kuboresha Mfumo wa Rufaa na usafirishwaji wa Dharura?
13. Je! Programu hii imepata Mafanikio yapi katika kutekeleza vipengele vya mfumo wa rufaa rununu (simu ya mkononi)?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na matibabu ya watoto wachanga mahututi)
    - Ushiriki na Elimu kwa jamii
14. Je! Ni vitu gani tumejifunza (lessons learned) na taratibu gani bora (best practices) tumejifunza katika utekelezaji wa mpango wa m-mama?
15. Je! Kulikuwa na changamoto zipi katika utekelezaji na uendelevu wa mpango wa m-mama?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na matibabu ya watoto wachanga mahututi)
    - Ushiriki wa jamii na elimu
16. Je! Tunawezaje kuendeleza matokeo ya mpango huu wa m-mama au kuuendeleza kutokana na ushirikiano wa serikali ulivyo (sustainability)?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na matibabu ya watoto wachanga mahututi)
    - Ushiriki wa jamii na elimu
17. Nini kifanyike kuboresha utekelezaji wa programu hii?
    - Mfumo wa rufaa na usafirishaji

- Miundombinu na mafunzo (BEmONC, CEmONC na utunzaji wa kina wa watoto wachanga)
- Ushiriki wa jamii na elimu

18. Ni nini kifanyike ili kuendeleza mpango huu kwa kiwango cha kitaifa (scale up)?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na utunzaji wa kina wa watoto wachanga)
    - Ushiriki wa jamii na elimu
19. Unafahamu miradi yoyote katika mkoa huu wa Shinyanga ambayo inafanya kazi/inatoa huduma ili kupunguza maradhi na vifo vya kina mama (itaje)?

Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Page 1, Line 5-6
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Page 2
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Page 4
Purpose or research question - Purpose of the study and specific objectives or questions	Page 4
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Page 5/ Line 8-9
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Page 7 / Line 3-9
Context - Setting/site and salient contextual factors; rationale**	Page 5/ Line 8-17
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Page 6/ Line 41-45
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Page 7/ Line 31-40
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Page 6/Line 8-9

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Page 6/ Line 50-54
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Page 8
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Page 7/ Line 13-15
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Page 7/ Line 18-26
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Page 7/ Line 3-9

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Page 8-12
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Page 8-12

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Page 12-14
Limitations - Trustworthiness and limitations of findings	Page 14/ Line 36-45

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Page 15/Line 36
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Page 15/ 10-11

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
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Lessons learned and best practices in scaling up an emergency transportation system to tackle maternal and neonatal mortality: a qualitative study of key stakeholders in Shinyanga, Tanzania

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Abstract

Objective: This study aimed to document lessons learned and best practices for scaling up an innovative emergency transportation system, drawing insights from the m-mama program implemented in Shinyanga, Tanzania. The m-mama pilot program was implemented in phases from 2014 to 2016 in two districts and later scaled up to include all districts in Shinyanga region in 2017. The program employed an emergency transportation system and technical and operational support of the health system to address the three delays leading to maternal and neonatal mortality.

Design: Cross-sectional, qualitative research with key healthcare system stakeholders from the national, regional, and district levels.

Setting: The study was conducted in Kahama and Kishapu districts in Shinyanga, Tanzania. The two districts were selected purposefully to represent the program implementation districts' rural and urban or semi-urban settings.

Participants: District, regional, and national stakeholders involved in implementing the m-mama pilot program in Shinyanga were interviewed between February and March 2022.

Results: Lessons learned from implementing the m-mama program were grouped into four key themes: community engagement, emergency transportation system, government engagement, and challenges and constraints in technical implementation. Stakeholder engagement and collaboration at all levels, community involvement in implementation, adherence to local contexts, and effective government partnerships were identified as key drivers for program success. Coordination, supervision, and infrastructure enhancement were crucial in implementing the emergency transportation system.

Conclusions: Facilitating community involvement, understanding the local context, and adapting to existing structures can enhance program ownership and utilization. The government serves as the central coordinator, overseeing resource mobilization and distribution. A well-executed and coordinated emergency transportation system holds promise in addressing delays and curbing maternal and neonatal mortality. Collaborative knowledge-sharing among implementors is essential for identifying best practices and gaining insights into practical strategies for addressing anticipated challenges.

Keywords: Emergency transportation system, maternal mortality rate, newborn mortality

Strengths and limitations of this study

- The study involved key participants from all healthcare system levels to obtain a rich, robust, and comprehensive perspective on implementing the m-mama program.
- As a cross-sectional study, it is limited to a snapshot information collection.
- The study lacks prolonged engagement, which may challenge obtaining an insider perspective of the program implementation.

- Baseline information for maternal and neonatal emergency and referral care indicators was not collected, which would have provided more insight into the initiative's effectiveness.

INTRODUCTION

Globally, maternal mortality declined by 38% between 2000 and 2017 (1). However, about 810 women die each day due to preventable maternal causes (2). While the global distribution in maternal mortality varies with regions and contexts, nine in ten deaths occur in low- and middle-income countries (LMICs), and Sub-Saharan Africa (SSA) accounts for two-thirds of all deaths (2,3). The risk of death due to pregnancy and childbirth complications in SSA is between one and thirty-seven, attributed to health and socio-economic disadvantages (4,5). These include various factors delaying women from making decisions to access and receiving antenatal care, safe childbirth, newborn care, and pre-existing medical conditions worsened by pregnancy(5–7).

In Tanzania, maternal mortality has remained persistently high, with 432 per 100,000 live births reported in 2014 but a steady increase to 524 per 100,000 live births in 2017. Such an unprecedented rate is unequally distributed between different regions, with the areas in the Lake zone, like the Shinyanga region, reporting a higher burden (8–10). The region reported higher maternal mortality rates of 635 per 100,000 live births, 449 and 417 per 100,000 live births between 2010, 2015, and 2017 respectively (11,12).

The three-delay model for seeking maternal care has been used to explain the underlying causes of maternal mortality(13–15). In this model, the first delay is from the household or personal level, from the onset of symptoms at home to when the decision to seek care is made by either a woman, family, or both. The second delay is attributed to factors impeding access to health facilities, including available infrastructures and means of transport from when the decision to seek care is made. The third delay is receiving appropriate care at the facility level, including the availability of skilled human resources, equipment, and referral system from admission until adequate treatment begins (13,16). Addressing such delays calls for tailored interventions that may need to be modified from one context to another.

The m-mama program is a comprehensive emergency transportation system tackling the three delays. It began as a pilot intervention in 2013 in Mwanza and Shinyanga regions, aiming to address broad, systemic challenges through a coordinated horizontal program approach that extends from the community and lower-level health facilities to the hospital level. Analysis of the program implementation showed that the transportation system could potentially reduce maternal and neonatal deaths through public and private partnership arrangements using digital technology(17–19). Evidence on lessons and best practices from such innovative approaches has not been systematically reported for scaling up. This study therefore aimed to document lessons learned and best practices with respect to the scaling up of the m-mama program.

METHODS

Study design and setting

This qualitative study was conducted between February and March 2022 in the Kahama and Kishapu districts of the Shinyanga region in the Northern Lake zone of Tanzania. The two districts are among the six program-implementation districts for the m-mama program in the region. The two districts were chosen purposefully to represent the program implementation districts' rural and urban or semi-urban settings. Kahama municipality represented the semi-urban setting and had a supervisory role over two rural districts (Msalala and Ushetu) where the program was implemented. Kishapu district was selected to represent the rural setting as it had an established dispatch center. Shinyanga region has a total population of 1,534,808 people, according to the 2012 national census (20).

In comparison to the national maternal death ratio of 432 per 100,000 live births, Shinyanga reported a higher maternal mortality rate of 635 per 100,000 live births and 449 per 100,000 live births between 2010 and 2015(11). The total fertility rate for the Shinyanga region is 7.2, a higher rate than the national average of 5.2 per woman. Despite the high burden of maternal mortality in Shinyanga, the region had only thirteen public ambulance vehicles used to transport emergency cases, not enough to cater to such a fast-growing population.

Description of the m-mama program

The m-mama program was implemented in two phases through close collaboration with the Ministry of Health (MoH) and the President's Office – Regional Administration and Local Government (PO-RALG), selected health facility governing bodies, development partners, and communities. Vodafone Foundation, Touch Foundation, Pathfinder International, and respective Regional and Council Health Management Teams (RHMT) were the key implementers of the m-mama program (21,22). At the core of the m-mama program was an essential component known as the Emergency Transportation System (EmTs) and technical and operational support of the health system. The EmTs was designed in collaboration with the MoH, the Reproductive and Child Health Services (RCHS) division, and the RHMT. The system utilized technology to remotely triage patients and dispatch an ambulance or community driver to transfer them to the health facility. It aimed to address the second delay in reaching care directly, addressing the transportation challenge. The programs addressed the second and third delays through health systems strengthening and community education initiatives. Community Care Groups (CCGs) were encouraged encourage women to seek healthcare and ensure women receive high-quality care upon reaching the appropriate health facility. Pathfinder International provided technical and operational support, including establishing CCGs to influence community health-seeking behaviors and help improve the quality of MNCH care at Basic Emergency Obstetrics and Neonatal Care (BEmONC)(22). This was done in dispensaries, health centers, and hospital levels by building the capacity of health providers, providing equipment, and improving the detection and referral of high-risk and

complicated pregnancies. Touch Foundation made clinical and structural capacity at the health centers and district hospital level to provide Comprehensive Emergency Obstetrics and Neonatal Care (CEmONC) services. Together, the activities supported a continuum of care for women to access MNCH services at all levels of the health care system.

The program worked in two phases to strengthen the health system and improve the capacity of healthcare workers(23). Onsite phase I implementation started in Sengerema District Council (D.C.) and Buchosa DC (previously referred to jointly as Sengerema DC) in 2014, followed by Shinyanga MC in 2016. It focused on proof of concept and identifying cost-effective maternal and neonatal mortality solutions. Phase II of the program started in 2017, expanded m-mama into the entire Shinyanga region with a population of approximately 1.9 million, and focused on the ownership and sustainability of the system by local government authorities.

Study population

The study population consisted of eight representatives from the national, regional, and district government stakeholders. The sample size was determined based on an understanding of the program implementation to the government stakeholders included in this study. This included members from the Directorate of Health, Nutrition, and Social Welfare at PO-RALG, community-based coordinators, facility-based coordinators, and medical officers. Facility-based coordinators oversee health program activities at facilities, while community-based coordinators, selected from community health workers, manage activities at the community level, including raising awareness about the m-mama program.

Sampling and recruitment of study participants

Participants were recruited using purposeful selection to obtain information-rich individuals based on their involvement during the program's implementation. The recruitment process focused on getting ideas from the experts regarding implementing m-mama(24).

Data collection

Trained research assistants collected data through key-informant interviews (KIIs). Before data collection, the tools were pretested during validation training and a standardized semi-structured interview for data collection. The interview guide is provided as a **supplemental file**. Participants were asked about what worked well during implementation that should be replicated to scale up, the challenges and how they can be solved, and what was not implemented during the program that should be incorporated to ensure scale-up and success nationally. A total of eight KIIs were conducted in either English or Swahili based on the preferred language, and they were audio-recorded with the permission of the study participants. To maintain neutrality, researchers applied the principle of bracketing to ensure that pre-understanding information does not influence the data(25). The program was evaluated by a team of researchers who were not part of the program. Field notes as a reflective diary were maintained and reviewed during the analysis to enhance reliability. A private and quiet place was sought to ensure maximum privacy and clear recording.

Data management and analysis

The audio-recorded KIIs were transcribed verbatim. Transcription was done immediately within 24 hours of data collection to allow for any clarifications and assess data saturation. Despite the pre-determination of the sample size, data saturation was reached. Two researchers reviewed the transcripts to confirm the quality and correctness of the transcription in line with the audio. Following the thematic analysis, codes were manually drawn from the data after re-reading several transcripts and were shared with the whole team before actual coding was done. The five stages in doing thematic analysis, as described by Braun and Clarke (2014), were adhered to establish meaningful patterns in the data. These include familiarization with the data, generating initial codes, searching for themes among codes, reviewing themes, and presenting the results. The coding also involved identifying the stock quotes used to illustrate the various themes of study interest.

Ethical consideration

Ethical approval was granted by the Muhimbili University of Health and Allied Sciences Research and Ethics Committee (MUHAS-REC-11-2021-885). Permission to collect data from the Shinyanga region was given by the PO-RALG Authority and the office of the Regional Medical Officer in Shinyanga. Informed consent was obtained from participants before data collection. Participants were assured of privacy, confidentiality, and anonymity throughout the study. The data obtained from this program evaluation were kept strictly confidential and accessible to only the named investigators and have been stored on password-protected computers.

Conceptual framework

The conceptual framework designed for scaling up the m-mama program nationally exhibits a robust alignment with the Consolidated Framework for Implementation Research (CFIR), a well-established and comprehensive framework in the domain of implementation science(26,27). CFIR provides a structured approach to understanding the intricate factors that influence the successful implementation of interventions within complex healthcare settings. This alignment is crucial for a deeper understanding of the m-mama program's potential to be effectively implemented and scaled nationally. The alignment with the CFIR framework offers a structured lens through which to analyze the various components of the conceptual framework for scaling up the m-mama program. By considering the inner setting, intervention characteristics, and outer setting factors within the CFIR framework, stakeholders can comprehensively identify contextual factors, barriers, and facilitators influencing successful implementation and scaling. It provides a foundation for strategic decision-making and targeted interventions to enhance the program's effectiveness and maximize its impact nationally on maternal and neonatal health.

The first pillar of the conceptual framework, community engagement, aligns with CFIR's emphasis on the inner setting. In the context of m-mama, community engagement is central to the program's success. The emergency transportation system aligns with CFIR's consideration

of intervention characteristics. This framework component correlates with CFIR's focus on intervention characteristics, such as adaptability, complexity, and relative advantage. The third pillar, government engagement, resonates with the outer setting and the process components within CFIR. Advocating for government involvement and policies is akin to addressing the outer setting and recognizing the external environment's influence on the implementation process.

Patient public involvement

Patients were not involved in this study; our participants were government officials working at the Department of Health at the national, regional, and district levels. As key players, they participated in the conception and blueprint of the program in their areas of jurisdiction. Findings from the program evaluation have been shared with them through formal dissemination.

RESULTS

We conducted this study to document lessons learned and best practices for scaling up the m-mama program nationally and in other limited-resource settings in LMICs. We learned that community engagement, smooth operation of the emergency transportation system, and government engagement are crucial in scaling up the m-mama program. The program's implementation also faced various challenges and employed different solutions to solve them. One of the vital program strategies was to engage stakeholders at all levels of the program implementation to enable ownership of the program and lead to the success and attainment of the desired outcomes. Community engagement from planning through implementation was essential to promote the utilization of the program as members were aware of the available services. Working within the local context was also reported to smoothen the program's implementation. It was crucial to coordinate the program activities, particularly the EmTs. The collaboration between the government and partners was reported to play an essential role in securing adequate funds to provide sufficient compensation to drivers and community health care workers (CHWs). Coordination and supportive supervision of the program were highlighted as the government's responsibility. Implementing the emergency transportation system should also include improving health service provision in the healthcare facilities and infrastructures.

Community engagement and ownership of the program

The involvement of the local community is akin to understanding the inner setting within CFIR, encompassing the role of individuals and the prevailing culture within the community. Recognizing community engagement as a determinant aligns with CFIR's acknowledgment of how community involvement significantly influences the effectiveness of implementation within this inner setting. Participants acknowledged that engaging the community, who are the program's beneficiaries from the beginning, helps in the successful implementation of the program. During the program's implementation, the community owned the program and was

involved in every step, working closely with the district government. This succeeded in winning the community's dedication to implementing the program. One participant stated,

> *"In this program, the community-owned it, when you speak with dedicated drivers, you can hear from them their dedication, you will feel the ownership in them of the program."*

Understanding the local context and working within the existing structures is essential to smoothen the program's operation.

> *"We should work as much as possible within the district structures, the transport officers, the local police, local village leaders, etc., they know their village, they know their district, they know much better who owns cars and how to get contact with those people and try to recruit them. Working with the existing local structures is probably the best way to recruit drivers,"* - Medical Officer

For the people to benefit and use the system, they should be well informed on what the program offers and how to access it. For example, educating the community about pregnancy danger signs enabled them to call and seek early medical care. Media platforms like television, community radio, and billboards are important in spreading awareness about the program. Toll-free numbers available 24 hours for reporting on maternal or neonatal emergencies were provided to pregnant women and community health workers and were displayed in public areas at RCHs clinics and ward offices for easy and quick access.

Operationalization of the Emergency Transportation System

Establishing a robust emergency transportation system is critical to the m-mama program. The need to tailor the transportation system to suit the community's specific needs corresponds with CFIR's concept of intervention adaptation, highlighting the importance of aligning interventions with the unique characteristics of the target population. Focusing on the program's core, EmTs are necessary to ensure utilization and desired outcomes are attained. Through the m-mama program, proper coordination of EmTs has shown the potential to prevent maternal and infant mortality. The use of community taxis, in addition to ambulances, has helped to improve maternal and child health services. One participant reported.

> *"...This project contributed a lot to reducing the causes due to delays in getting services from the community to facilities and low-level to high-level facilities. When you look at the data from Shinyanga, there is a drop in maternal deaths. Because we attended MPDSR meeting, and you can see that after analysis, the deaths and complications due to lack of transport reduced compared to what the situation before the project."*

> *"If you look at the pace at which we have reduced maternal mortality and infant mortality under this m-mama program, everything is possible. We fail to do what we*

can to reduce it simply because we do not have the resources, just because we do not have proper transportation" -Medical Officer

Strengthening the transportation system must go hand in hand with enhancing the information and communication system, as it plays a significant part. The infrastructure need to be repaired and upgraded as required to improve access. The flow of information facilitates coordination.

> *"The coordination of the triage system, a call would be made to the receiving facility and it will be notified that we have an emergency of a certain kind you need to have tools in place to help the patient and the facility will have to get ready for that particular emergency. Unlike in the past when emergencies would go to the facilities unprepared*" -facility-based coordinator

An emergency preparedness plan is necessary as emergencies are prone to occur at any given time; there is, therefore, a need to develop and adopt the EmTs. It is crucial to have smooth coordination of the EmTs to prevent infant and maternal mortality. Coordination involves the availability of adequate resources, particularly funds, to reimburse the taxi drivers and other employed staff.

> "*The things we have learned are that, just the coordination, which I said, the coordination of the emergency transport system, that if properly done, we can prevent maternal mortality. In the sense of coordination, there is one center that controls these transport systems,*" an officer reported.

To offer services, there must be enough trained human resources. As there is currently a shortage of human resources for the healthcare industry, it is advised that dispatch centers designate specialized personnel whose job is to answer and coordinate calls. Additionally, the government must allocate more skilled human resources to the health sector to eliminate the need for referrals.

Government engagement and collaboration

Working with the appropriate stakeholders is required to have a smooth program implementation. Emphasizing policy development and advocacy aligns with CFIR's focus on implementation, encompassing policy-related factors and engagement with external stakeholders. This alignment underscores the significance of engaging with the broader environment and streamlining policies for effective scaling and sustainability of the m-mama program. Strong leadership and advocacy in the government are needed to help show other government officials how impactful the program can be. The main government implementors, PO-RALG, and the health ministry need to harmonize their understanding of the program.

> "*We had to look for a government team that will believe in the system, that which could see the benefits of the program and would be willing to do as per the program requirements and who would commit both in terms of the financials paying the community drivers and proper allocation of resources through the RHMT and*

CHMT. Now, it's all about getting the belief in the system from both TAMISEMI and MoH stakeholders." - Medical Officer

Different government levels should be involved in all processes, including planning, from village to district. The government should fully commit to sustaining the program and set appropriate budgets. A government official stated,

"*We need to set adequate budgets; the government needs to think broadly to increase budgets so that we can pay these drivers who help us survive. Without a budget to pay these drivers, we are doing nothing. The drivers will drop, we will go back there, we will be waiting for one car to go this way, we will be late, deaths will increase, and we will go back there."*

Running the program needs a lot of resources, particularly funds. The government oversees the program's management and maintenance and ensures adequate funding is available and used effectively.

"The program reaching the community needs a lot of funds, things like hiring a P.A. system for public announcements, making announcements on community radios, you need to fund these," reported an officer.

The government is in charge of ensuring the infrastructure is in good working order, including the roads that help prevent auto accidents, permit easy access to and from facilities, and lessen car damage. To manage all necessary operations, supplies like car maintenance and gas should be removed from the pool, and each department should have its transport officer and supplies. Funds should also be allocated to purchase ambulances equipped to facilitate referrals. Remuneration for the taxi drivers must be provided timely for enthusiasm and readiness to offer the service as required. As reported by a medical officer,

"*Timely payment is critical for the sustainability of the program, if drivers are not paid on time as m-mama team was doing, they lose motivation and drop out*,"

It is recommended that the municipality should provide supportive oversight of CHWs, as well as its provision of health education and referral services. To identify problems and discover solutions, hold frequent meetings with stakeholders, including drivers, dispatchers, program focal persons, directors, RAS, and DMOs. Also, provide community leaders with communication tools like phones to help them connect with healthcare facilities as necessary.

Challenges and constraints in technical implementation of the program

The program's implementation faced several challenges at the level of the facilities, the emergency transportation systems, and physical infrastructures. The healthcare facilities faced a shortage of human resources and supplies. A shortage of human resources was also reported as a challenge during the program's implementation. This was attributed to the transfer of staff to other areas, creating a vacuum of skilled service provision and understaffing, attributed to

work overload. It was recommended that more staff need to be hired to the facilities and ensure adequate service provision.

> *"There is also understaffing in both health facilities and at the dispatch centre. The dispatch centre needs to have a healthcare worker 24/7. The same healthcare workers are supposed to worked in both the dispatch center and the facility,"* -Medical Officer reported.

> *"Training of BEmONC was provided in many health facilities, however, CEmONC cannot be trained to everyone… so if someone who was trained is transferred and comes someone who was not trained, you find that the services provided might not be sufficient"* reported one facility coordinator.

The EmTs faced challenges regarding availability and durability of the ambulances and community taxis.

> *"Challenges of using ambulances- first of all, they are few and do not fit the purpose, second, breakdown ambulances need repairs which are not timely, third the ambulance could be handling another emergency when it is needed. Sometimes you may find an ambulance is unavailable because it has transported the patient to another region, that's why we need a backup transportation system."* reported one participant.

In certain areas within the Shinyanga region, poor roads pose significant challenges, especially during the rainy seasons. Due to their small size, the local community taxis often struggle to navigate these poorly maintained roads. To address this issue, a dual approach has been adopted. In some parts, villagers have been encouraged to engage in road repair initiatives actively, fostering a strong sense of community involvement and ownership. In other areas, the services of a professional contractor have been enlisted to undertake the necessary road repairs.

> *"When ambulances are not working you opt to go for community taxis. The challenge with community taxis is that they are not four-wheel drive like land cruisers when the roads are rough especially during the rainy season, they fail to transport the patients effectively,"* a District Medical Officer reported.

To optimize the impact of the healthcare program established in government facilities, the government must increase its financial support by allocating additional funds for equipment procurement and hiring trained healthcare providers. The program's success is attributed to active community engagement and ownership, exemplified by the community's initiative in road repairs. Encouraging and sustaining this sense of community involvement is vital. The government should explore and leverage local resources to enhance program implementation and scalability, creating a more efficient and autonomous healthcare system that benefits the entire community.

DISCUSSION

In this study, we aimed to document the lessons learned and best practices for scaling up the m-mama health programs in Shinyanga, Tanzania. Community engagement from conception to implementation is vital to promote usage and ownership of the program. The government is the primary coordinator of the program responsible for the mobilization of resources and coordination and supportive supervision. Effectively applied and aligned with the local

context, the emergency transportation system can potentially reduce maternal and neonatal mortality. Operating within the existing structures is critical to ensure the intervention runs smoothly.

Engaging the community from the inception of m-mama enabled the successful implementation of the program and will facilitate its smooth scale-up to other areas in the country. Community engagement has been emphasized in various initiatives, including section four of the Alma Ata declaration, which emphasized individuals' and community's engagement in processing affecting health needs and decisions. The section also declares that individuals have the right and duty to participate collectively in the planning and implementing programs for their health(28,29). Community commitment in Tanzania can be traced back as early as 2001 when communities, through their village councils with other stakeholders, participated fully in building tricycles and engaging in socio-economic activities to develop funds necessary to improve their means of communication(30). Promoting acceptability and usage of mother and neonatal health services requires community involvement from planning through implementation. The public should be fully informed of available services, involved, and allowed to voice their opinions. For maximum efficiency, it is crucial to understand the local context and work within the existing structures.

Similar programs in LMICs demonstrated similar outcomes when communities were fully involved(31–33). Such effects may be through improving health behaviors and outcomes, providing more acceptable, people-centered services, and empowering communities. Community-based health interventions enhance access and utilization of maternal and newborn services, ensuring that the services are organized to respond to their health needs, values, and preferences (34). Thus, the involvement of the communities from planning to implementation is crucial in promoting acceptance, utilization, and improved maternal and newborn health (35,36). Community awareness and empowerment are important for community members to participate in decision-making in complementing scaleup efforts (37,38).

The government has a crucial role in maintaining its citizens well-being. From this study, the government is emphasized to be fully committed to scale-up the program and setting appropriate budgets for it. Strong governance provides suitable conditions to facilitate policies and financial commitments by the government authority, donors, and development partners. This is important to champion the country's maternal and newborn health targets country-wise, ensuring continuous progress and equitably delivering necessary care to end preventable maternal deaths. The government is in charge of supportive monitoring and central coordination.

To secure funding for the drivers' and CHWs' remuneration, health education provision, better transportation, and equipped CEmONC facilities with ambulances to expedite referrals. Free maternal services in Enugu state, Nigeria's primary and secondary health facilities succeeded through a joint fund between the local authority and the state government. This was an addition to other programs such as safe motherhood, family planning, and integrated maternal and child health (39,40). Beyond policy, the government has a key role in providing

supportive financial mechanisms and supportive supervision to ensure the quality of the services and achieve the national goals in maternal and newborn health.

A well-coordinated Emergency transportation system using community taxis can potentially reduce maternal and newborn mortality in a limited setting. Improved means of communication and physical infrastructures facilitate the utilization of the service. When EmTs are used in areas with few or no ambulances serve as an emergency preparedness plan to tackle the second and third delays. In LMICs, non-motorized vehicles, including bicycles, tricycles, modified tricycles, and canoes, have been elaborated to provide emergency transport to facilities (30,41). Currently, ambulances and community taxis are used as means of transportation. The drivers are trained to triage patients, properly handle obstetrics emergencies, and offer communication to nearby facilities. With limited ambulances, community taxes are vital in ensuring timely access to health facilities and emergency referrals. While local taxis can help ease transportation, there is still a need for traditional ambulances fully equipped to offer emergency services. The availability and use of community taxes go along with improved communications in terms of phone calls and wireless communication, as seen in other countries. In rural Pakistan in 2012, community taxis were employed to address the ambulance gap after at least four drivers in each community underwent obstetric emergency training. The cost was kept affordable to simplify access, and drivers only requested fuel costs covered by the local community (42,43). Even with improved roads, some remote areas still have rough terrain roads, which makes transportation difficult. The climate and weather conditions also influence the quality of the streets, and different conditions, such as heavy rain, cause hindrances to transportation. The inflation of fuel and maintenance of the vehicles are expected challenges to these interventions, and involved stakeholders need to set strategies to address them. Findings from this pilot study can inform the scaling up of the m-mama program in other districts with high burdens of maternal and neonatal morbidity and mortality in Tanzania and settings with similar contexts. The study employed triangulation of participants who serve different roles and positions in the health care system to obtain a rich, robust, and comprehensive perspective on implementing m-mama. As a cross-sectional study, it is limited to a snapshot information collection. It lacks prolonged engagement, which may challenge obtaining an insider perspective of the program implementation. Moreover, we did not collect baseline information for maternal and neonatal emergency and referral care indicators, which would have provided more insight into the initiative's effectiveness.

CONCLUSION

Community engagement, comprehension of the local context, and operating within the existing structure promote ownership and utilization of the program. The government is the primary coordinator of the program and is responsible for the mobilization and distribution of resources. An effective, applied, and coordinated emergency transportation system has the potential to tackle second and third delays and reduce maternal and neonatal mortality. Implementors should trade experiences to recognize best practices and better understand how to address anticipated difficulties.

Contributors

Conceptualization: BS, JEN, BJN, LM, CM, LD, AT, WK; data cleaning and analysis: BJN, LM Manuscript writing: BS, JEN, BJN, HPN, and CM; manuscript revision: JEN, LM, BJN, JK, NK, BS.

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Data availability statement

The dataset contains identifying qualitative information and therefore cannot be publicly available. However, data will be made available on a reasonable request. Request to access data can be made to the Chairperson, institutional review board, Muhimbili University of Health and Allied Science, drp@muhas.ac.tz.

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Competing interests

The authors declare no competing interests.

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End line Evaluation of the m-mama program on Strengthening Health Systems to Reduce Maternal Mortality and Morbidity in Shinyanga Region, Tanzania

Key stakeholders (District officers and CHMT, regional officers and RHMT)

The m-mama program, (formerly known as Mobilizing Maternal Health) began in 2013 and sought to address broad, systemic challenges in regards to maternal health, morbidity and mortality through a coordinated horizontal program approach that extends from the community, lower-level health facilities up to the hospital level.

This is the end-line evaluation of the m-mama program that focuses on strengthening health systems to reduce maternal and newborn morbidity and mortality in Shinyanga region. It is conducted in Shinyanga region to assess the implementation and sustainability of the program since its initial phase in 2013.

Interview no:	
Age:	Facility:
Role/Title:	District:
Sex:	
Type of the facility (BEmONC/ CEmONC)	

Please provide a description in detail on the implementation of the m-mama program

1. For how long has this district been involved in the collaboration with the m-mama partners in implementing the Emergency Transportation System
2. How are the government ambulances integrated in the emergency transportation services to supplement the services provided by the m-mama program?
    - Involvement of the RHMT and CHMT
    - Challenges in collaboration between the government and the m-mama program
3. How is the community linked with the district emergency referral and transport system?
    - Number and functioning of the Community taxi
    - Retention of community drivers

4. Can you comment on the quality of the Emergency transportation system and referral system for maternal and neonatal health services in your district/region?
5. How is the referral system before and after Emergency Transportation system?
    - Number of referrals for BEmONC, CEmONC and Neonatal ICU
    - Triaging system
    - Outcome after referral
6. How are the BEmONC and CEmONC trainings provided in this region/district?
    - Total number and frequency of training
    - Type of trainings provided
    - Type of health care providers trained
7. How are the neonatal intensive care trainings provided?
    - Total number and frequency of training
    - Type of trainings provided
    - Type of health care providers trained
8. Please explain how equipment procurement for BEmONC, CEmONC and Neonatal Intensive care units is conducted.
    - Enquire also about number of infrastructures built
    - Adequacy and timely procurement of equipment
    - Challenges in the procurement process
9. How is the formation of community care groups done?
    - Number of CCG formed
    - Functioning of CCG
    - Supervision and support provided and frequency of supervision
10. How is the participation of government stakeholders in planning and project implementation?
    - Fund allocation from government
    - Supportive supervisions
    - Utilization of government policies and strategies
    - Continuity of project services and institutional memory of the program services, passing of information and introduction of the project to new staff.
11. How are supportive supervisions on the m-mama program done?
    - Frequency of supervisions, are they timely?
    - Who conducts the supervisions?

- How is the feedback system?

12. What is the effectiveness of the m-mama project/program in improving the Emergency Referral System?
13. What successes has the program experienced in implementing the mobile based referral system components?
    - Emergence referral and transportation system
    - Infrastructures and training (BEmONC, CEmONC and Neonatal Intensive care)
    - Community engagement and education

14. What were the challenges faced during implementation and sustainability of the emergence referral and transportation system?
    - Emergence referral and transportation system
    - Infrastructures and training (BEmONC, CEmONC and Neonatal Intensive care)
    - Community engagement and education

15. What can be done to improve program implementation and sustainability?
    - Emergence referral and transportation system
    - Infrastructures and training (BEmONC, CEmONC and Neonatal Intensive care)
    - Community engagement and education

16. What can be done to scale up the program to national level?

Tathmini ya Mwisho wa programu ya m-mama kuhusu Kuimarisha Mifumo ya Afya ili Kupunguza Vifo na Maradhi ya Wajawazito Mkoani Shinyanga, Tanzania.

Mwongozo wa mahojiano kwa wadau wa serikali (Maofisa wa wilaya na mkoa, CHMT na RHMT)

Mpango wa m-mama, (zamani ulijulikana kama Uhamasishaji wa Afya ya Mama (Mobilizing maternal Health - MMH) ulianza mnamo mwaka 2013 na ulitafuta kushughulikia kwa upana changamoto za kimfumo zinazohusiana na afya, magonjwa na vifo vya akina mama. Mpango huu ulifanyika kupitia njia iliyoratibiwa ya mpango mlalo kuanzia ngazi ya jamii, vituo vya afya mpaka kufikia ngazi ya hospitali.

Utafiti huu ni wa kufanya tathmini ya mwisho ya mpango wa m-mama ambao unazingatia kuimarisha mifumo ya afya ili kupunguza magonjwa na vifo vya akina mama na watoto wachanga katika mkoa wa Shinyanga. Utafiti huu unafanywa katika mkoa wa Shinyanga kutathmini utekelezaji na uendelevu wa mpango huo tangu awamu yake ya kwanza mnamo mwaka 2013.

Interview ID no:	
Umri:	Kituo:
Cheo:	Wilaya:
Jinsia:	
Shirika/Mdau:	

Tafadhali toa maelezo kwa kina juu ya utekelezaji wa programu ya m-mama

1. Ni kwa muda gani sasa wilaya hii imehusika katika kushirikiana na wadau wa m-mama kwenye utekelezaji wa Mfumo wa Usafiri wa Dharura?
2. Je! Ambulensi (usafiri wa dharura) za serikali zimejumuishwa / zinahusika vipi katika huduma za usafirishaji wa dharura ili kuongeza upatikanaji wa huduma zinazotolewa na programu hii?
    - Ushirikishwaji wa RHMT na CHMT
    - Changamoto katika ushirikiano wa serikali na wafanyakazi wa programu ya m-mama
3. Jamii imehusishwa vipi na mfumo wa usafirishaji wa dharura wa wilaya?
    - Idadi na utendaji wa huduma za taxi kutoka ngazi ya jamii
    - Utendaji endelevu wa madereva ngazi ya jamii

4. Tafadhali toa maoni yako juu ya ubora wa mfumo wa usafirishaji wa Dharura na mfumo wa rufaa kwa huduma za afya ya mama na watoto wachanga katika wilaya / mkoa wako?
5. Je! Mfumo wa rufaa ulikuaje kabla na ukoje baada ya kuanzishwa kwa mfumo wa Usafiri wa Dharura
    - Idadi ya rufaa kwa BEmONC, CEmONC na ICU ya watoto wachanga
    - Mfumo wa kutoa vipaumbele vya matibabu
    - Matokeo baada ya rufaa
6. Je, mafunzo ya kutoa matibabu ya watoto wachanga mahututi, pamoja na mafunzo ya BEmONC na CEmONC hutolewa vipi?
    - Jumla ya idadi na mzunguko (hufanyika kila baada ya muda gani) wa mafunzo
    - Aina ya mafunzo yaliyotolewa
    - Aina ya watoa huduma ya afya waliopata mafunzo hayo
7. Tafadhali fafanua jinsi ununuzi wa vifaa vya kutoa huduma za BEmONC, CEmONC na matibabu ya Watoto wachanga mahututi.
    - Uliza pia kuhusu idadi ya miundombinu iliyojengwa
    - Utoshelevu na ununuzi wa vifaa kwa wakati
    - Changamoto katika mchakato wa ununuzi
8. Tafadhali eleza namna namna ugavi wa vifaa vya BEmONC, CEmONC na matibabu ya Watoto wachanga mahututi ulivyofanyika
    - Eleza kuhusu ufanisi wa ugavi wa vifaa kwa wakati
    - Changamoto katika mfumo wa ugavi
9. Uundaji wa vikundi vya utunzaji jamii ulifanyikaje?
    - Idadi ya vikundi vya utunzaji jamii vilivyoundwa
    - Mchakato wa Ajira na mafunzo ya wawezeshaji na wasimamizi wa vikundi hivyo unavyofanyika
    - Utendaji kazi na uendelevu wa vikundi vya utunzaji jamii (CCG)
    - Usimamizi na msaada unaotolewa Pamoja na mzunguko wa usimamizi
10. Je! Ushiriki wa wadau wa serikali ukoje katika mchakato wa upangaji na katika shughuli za mradi?
    - Mgawo wa fedha kutoka serikalini
    - Usimamizi maalumu Pamoja na mzunguko na idadi ya usimamizi uliofanyika

- Matumizi ya sera na mikakati ya serikali kwenye kutoa huduma
- Mwendelezo wa huduma za mradi na kumbukumbu ya huduma zilizotolewa na programu kwa taasisi husika, kufikisha habari na utambulishaji wa mradi kwa wafanyikazi wapya.

11. Je! Usimamizi saidizi wa shughuli za mpango wa m-mama ulifanyikaje?
    - Mzunguko wa usimamizi, je, ni kwa wakati unaofaa?
    - Nani anayehusika kwenye usimamizi huu?
    - Mfumo wa kutoa mrejesho na maoni baada ya usimamizi ulikuwaje?
12. Je! Ni nini ufanisi wa mradi / mpango wa m-mama katika kuboresha Mfumo wa Rufaa na usafirishwaji wa Dharura?
13. Je! Programu hii imepata Mafanikio yapi katika kutekeleza vipengele vya mfumo wa rufaa rununu (simu ya mkononi)?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na matibabu ya watoto wachanga mahututi)
    - Ushiriki na Elimu kwa jamii
14. Je! Ni vitu gani tumejifunza (lessons learned) na taratibu gani bora (best practices) tumejifunza katika utekelezaji wa mpango wa m-mama?
15. Je! Kulikuwa na changamoto zipi katika utekelezaji na uendelevu wa mpango wa m-mama?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na matibabu ya watoto wachanga mahututi)
    - Ushiriki wa jamii na elimu
16. Je! Tunawezaje kuendeleza matokeo ya mpango huu wa m-mama au kuuendeleza kutokana na ushirikiano wa serikali ulivyo (sustainability)?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na matibabu ya watoto wachanga mahututi)
    - Ushiriki wa jamii na elimu
17. Nini kifanyike kuboresha utekelezaji wa programu hii?
    - Mfumo wa rufaa na usafirishaji

- Miundombinu na mafunzo (BEmONC, CEmONC na utunzaji wa kina wa watoto wachanga)
- Ushiriki wa jamii na elimu

18. Ni nini kifanyike ili kuendeleza mpango huu kwa kiwango cha kitaifa (scale up)?
    - Mfumo wa rufaa na usafirishaji
    - Miundombinu na mafunzo (BEmONC, CEmONC na utunzaji wa kina wa watoto wachanga)
    - Ushiriki wa jamii na elimu
19. Unafahamu miradi yoyote katika mkoa huu wa Shinyanga ambayo inafanya kazi/inatoa huduma ili kupunguza maradhi na vifo vya kina mama (itaje)?

Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Page 1, Line 5-6
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Page 2
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Page 4
Purpose or research question - Purpose of the study and specific objectives or questions	Page 4
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Page 5/ Line 8-9
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Page 7 / Line 3-9
Context - Setting/site and salient contextual factors; rationale**	Page 5/ Line 8-17
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Page 6/ Line 41-45
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Page 7/ Line 31-40
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Page 6/Line 8-9

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Page 6/ Line 50-54
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Page 8
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Page 7/ Line 13-15
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Page 7/ Line 18-26
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Page 7/ Line 3-9

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Page 8-12
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Page 8-12

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Page 12-14
Limitations - Trustworthiness and limitations of findings	Page 14/ Line 36-45

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Page 15/Line 36
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Page 15/ 10-11

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
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