

## **Article Title**

Facilitators and Barriers of Community-Level Quality Improvement for Maternal and Newborn Health in Tanzania

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## **Bios**

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## **Abstract**

A quality improvement intervention for maternal and newborn health was carried out in southern Tanzania at the community level. It sought to improve health-seeking behaviors and uptake of community-level maternal and newborn health practices. A process evaluation populated using data primarily from in-depth interviews and focus group discussions with the intervention's implementers was undertaken in four villages receiving the intervention to: evaluate the intervention's implementation; uncover facilitators and barriers of quality improvement; and highlight contextual factors that might have influenced implementation. Performance implementation scores were used to rank the villages. Identifying higher and lower performing villages highlighted key facilitators and barriers to community-level quality improvement related to: support from local leaders; motivation through use of local quality improvement data; and regular education around quality improvement and maternal and newborn health. These findings can be taken formatively in the design of similar interventions in the future.

## **Keywords**

Behavior change, quality of care, capacity and development, community-based programs, social participation, health seeking, program evaluation

Quality improvement is a widely used management approach that engages individuals from the bottom-up in strategizing to resolve problems within a process (Bloor, 1999; Petersen, 1999). When applied to healthcare, quality improvement methods are commonly used at the administrative and facility levels in high-income settings, but are becoming increasingly popular in low-income country settings also (International Society for Quality in Health Care, 2003; Leatherman, Ferris, Berwick, Omaswa, & Crisp, 2010; Smits, Leatherman, & Berwick, 2002; Umar, Litaker, & Terris, 2009). The literature on the evaluation of quality improvement initiatives draws on a variety of methods but also hails predominantly from higher-level health facilities in high-income country contexts (see examples (Duckers, Wagner, & Groenewegen, 2008; Dudgeon et al., 2009; Francois et al., 2003; Lee, Choi, Kang, Cho, & Chae, 2002; Pearson et al., 2005; Shortell et al., 1995)).

There is a paucity of literature available about the evaluation of quality improvement initiatives in low-income country settings, especially at the community level (see examples (du Mortier & Arpagaus, 2005; Sibley et al., 2014; Wallin et al., 2011)). In addition, there is also a dearth of data specifically around the implementation or processes of quality improvement initiatives in low-income country settings, which largely report on impact (see examples (Boucar et al., 2014; Bradley et al., 2008; Morris et al., 2009; Ngongo Bahati et al., 2010; Rawlins et al., 2013)). As such, there is also little reported about study designs that aim to capture the implementation of community-level quality improvement in these settings.

The Expanded Quality Management Using Information Power (EQUIP) intervention applied quality improvement methods at the district, health facility, and community levels in Tandahimba district in southern Tanzania from 2011–2014 (Hanson et al., 2014). The overall aim of EQUIP was to improve both the supply of and the demand for quality maternal and

newborn health services. At the district level, quality improvement methods were used to address administrative and resource-related barriers around the provision of maternal and newborn health care. At the health facility level, EQUIP aimed to improve the quality of maternal and newborn health services provided. Finally, at the community-level, quality improvement methods were centered around improving household-level maternal and newborn health practices and creating increased demand for services, primarily through the promotion of health facility delivery and birth preparedness.

We aimed to use a method that could be used to capture the complexity of community-level quality improvement and study its implementation in detail. Ultimately, EQUIP was a behavior change intervention that sought to build capacities in community members to use quality improvement to then help change the behaviors of other community members around maternal and newborn health. Therefore, to understand the perceptions and motivations for the behaviors of both those engaged in implementing quality improvement and those affected by their problem-solving strategies, the use of qualitative methods was essential (Pope, van Royen, & Baker, 2002). Process evaluations, which have the flexibility to draw from multiple data sources, both quantitative and qualitative, have been found by others to be a particularly useful study design for studying the implementation of quality improvement initiatives (Hulscher, Laurant, & Grol, 2003).

To study the implementation of community-level quality improvement in EQUIP, we developed a process evaluation framework adapted from Linnan and Steckler (2002) and Saunders, Evans, and Joshi (2005). The process evaluation used quantitative data around routine aspects of implementation. We then used qualitative data to gain important insights into the perspectives of implementers and targets of the quality improvement activities.

The objectives of this process evaluation were:

1. To understand the extent to which six process components (fidelity, completeness, exposure, reach, satisfaction, and recruitment) were carried out in each village as planned;
2. to describe contextual factors that might affect implementation of EQUIP; and foremost
3. to uncover the primary facilitators and barriers of the EQUIP intervention at the community level.

Here we present findings from a process evaluation of community-level quality improvement in four villages receiving the EQUIP intervention in southern Tanzania.

## **Methods**

### *Study Setting*

The EQUIP intervention took place from November 2011–April 2014 in Tandahimba district in southern Tanzania. Briefly, Tandahimba is a predominantly rural district with approximately 227,500 people (National Bureau of Statistics, 2013), where maternal and newborn mortality (712 deaths per 100,000 live births and 31 deaths per 1000 live births respectively) are higher than the national averages (Hanson, 2013; National Bureau of Statistics & ICF Macro, 2011).

The most common economic activity is farming of cashew nuts and the predominant ethnic group are the Makonde (Mkai & Mbogoro, 2004; The Planning Commission United Republic of Tanzania, 1997). The study setting has been described in greater detail elsewhere (Hanson et al., 2013).

### *Community-Level Intervention*

Within Tandahimba district, village leaders or community members from all 157 villages selected two volunteers to carry out quality improvement activities. Volunteers were responsible

for identifying key problems related to maternal and newborn health in their communities, developing strategies called “change ideas” to address those problems, tracking progress in whether the problem was successfully resolved by the change idea, and either developing alternative change ideas or moving on to address other problems. This process of creating, testing, and modifying change ideas is called the plan-do-study-act (PDSA) cycle, which has been previously applied in both industrial and health care settings (Deming, 1982; Langley, 2009). Volunteers met in two ways: First, they met every three months with volunteers from other teams at educational meetings called learning sessions. Second, volunteers also came together on a monthly basis to receive mentoring and coaching from their quality improvement team supervisor—called an extension worker—and to engage in peer learning, sharing data related to their progress and other experiences.

Representatives from health facility quality improvement teams were also present at these monthly meetings. As such, the primary volunteer activities of community-level quality improvement were: attending learning sessions; attending monthly meetings; and creating, implementing, testing, and monitoring change ideas using PDSA cycles. For more information, community-level quality improvement within EQUIP is described in greater detail elsewhere (Tancred et al., 2014).

### *Process Evaluation Methods*

We conducted a mixed methods process evaluation during the second year of the community level quality improvement intervention, November 2012–November 2013. Within this process evaluation, we specifically looked at fidelity, completeness, exposure, satisfaction, reach, recruitment, and context; the first six components are described in Table 1 with a summary of contextual data collected shown in Table 2. Although these components are commonly found in

process evaluations applied to vastly different interventions, each is populated by intervention-specific measures, making process evaluations a highly adaptable study design.

INSERT TABLE 1 ABOUT HERE

Individual measures were kept as objective as possible, being directly observable (e.g. number of meetings attended) or being able to be confirmed through triangulation across more than one quantitative or qualitative data source to the greatest extent possible. For example, within the component “Fidelity”, the measure, “village volunteers understand and can apply PDSA cycles” was confirmed through observation of volunteers at learning sessions or monthly meetings and also by having volunteers directly explain the PDSA cycle and how they apply it to their work during in-depth interviews.

INSERT TABLE 2 ABOUT HERE

The expected direction of the effects of contextual factors within each village on EQUIP implementation—and by extension, on intermediate outcomes linked to the EQUIP intervention such as birth preparedness and birth in a health facility—is highlighted in Table 2. Whether the contextual factor would have a hypothesized positive (+) or negative (-) effect is indicated. The number of symbols, to a maximum of three, indicates the strength of the effect. For example, the expected effect, “Villages whose volunteers are longstanding residents (more than 10 years) are likely to be better performers than those with volunteers who are newer residents” was given +++ in Village A, where both volunteers were born in the village and had remained there for their entire lives. However, in Village C, one volunteer had been in the village for seven years after getting married there, and the other had been in the village for approximately 10 years, so it was given only one +.

### *Sampling*



We studied implementation in four villages due to the logistical constraints of the large amount of data collection required for the process evaluation. These villages were selected to be diverse with regard to: level of nearest health facility (dispensary, health center, or hospital); distance to nearest health facility; distance to main roads; primary economic activities, predominant religion; and volunteer characteristics, namely the age, sex, and past volunteering experiences of the volunteers.

### *Data Collection and Management*

We collected quantitative data from routinely kept records on volunteer activities. These included: learning session and meeting attendance; number of change ideas implemented in each village; number and percentage of targets reached through change ideas in each village; and numbers and percentages linked to process outcomes, for example, the percentage of women making birth preparations or giving birth in a health facility each month. Qualitative data were collected from semi-structured in-depth interviews with volunteers (10—including 8 original volunteers and two replacements), extension workers (2), mothers (12), health facility staff (4), village leaders (4), the overall district mentor (1), and EQUIP staff (3). Birth narratives with recently delivered mothers (23) and fathers (13) were also conducted. Birth narratives differed from in-depth interviews in that they were much less structured and allowed participants to discuss whatever aspects of their or their partner's experiences with pregnancy, childbirth, and newborn care were of most importance to them. To gather contextual data, we also carried out social and resource mapping in each village and conducted follow-up key informant interviews (3) with non-governmental and governmental representatives from health or development projects in the sampled villages.

For qualitative data, in-depth interviews or birth narratives typically lasted 30–60 minutes. From these, data were transcribed verbatim from audio files and translated by fluent English-Swahili speakers.

### *Analysis*

The process evaluation framework provided a basis for implementation scores. For each measure within the framework components, a score was assigned (Table 1). The weight given to each score was determined based on the importance of each measure according to the intervention’s design and quality improvement theory out of a maximum of four. For example, for the framework component “Completeness”, it was very important that all learning sessions were attended by at least one volunteer, and this measure was weighted to have a score out of four. It was less important that all monthly meetings between learning sessions were also attended by at least one volunteer, and this measure was weighted to have a score out of two. Assuming four learning sessions per year, if one learning session was missed, the score would be 3/4, if two were missed, it would be 2/4, if three were missed it would be 1/4, and if no learning sessions were attended, it would be 0/4. For monthly meeting attendance, assuming eight monthly meetings in a year, if all eight were attended, the score would be 2/2, but if only four meetings were attended, it would be 1/2. Using mixed methods to help triangulate findings across data sources as indicated above helped to make scores as accurate as possible. Scores for each component were added together for each village to generate a total score that reflected their performance implementing quality improvement.

Once scores were generated, they were used to rank the four villages according to their quality improvement performance, yielding two high-performing villages, and two low-performing villages. Using predominantly qualitative data collected to populate the process

evaluation framework, these villages were analyzed independently of one another for facilitators and barriers of the intervention in each. Overall facilitators of the intervention were those that were most prevalent in the high performing villages and which were lacking in the low-achieving villages, or that were found to be facilitators in all four villages. Overall barriers were those that were lacking in high-performing villages, that impeded implementation in low-performing villages, or that were highlighted in all four villages.

We validated the use of implementation scores alongside the process evaluation in the following ways: Because the process evaluation was tailor-made for the EQUIP intervention, each feature of implementation was explicitly drawn out according to the intervention's design. Therefore, these scores have a high degree of face validity. Consultation with a quality improvement expert about each of the measures within the process evaluation framework as well as an extensive review of quality improvement literature also ensured that we were focusing on the most crucial aspects of implementation—such as village volunteer-led change ideas, consistent testing of change ideas and use of PDSA cycles, regular learning session attendance, and regular reporting and use of local data. Additionally, accepted measures of community participation—for example measures of local management, local supervision, local resource mobilization, and so forth, to evaluate the extent to which this intervention was also community-led provided a reasonable degree of content validity (Bichmann, Rifkin, & Shrestha, 1989; Laverack, 2006; Laverack & Wallerstein, 2001; Lehman, 1999; S. Rifkin, 2013; S. B. Rifkin, Muller, & Bichmann, 1988; Samah & Aref, 2011).

For qualitative data, using NVivo 10 software, we coded translated scripts line-by-line to generate as many codes within each component as possible. A deductive thematic analysis was then undertaken using an initial coding framework that linked to seven components of the

process evaluation (the six indicated previously that were assigned scores: fidelity, completeness, exposure, reach, satisfaction, and recruitment, and also context), which were reduced to draw out key themes within each (Braun & Clarke, 2006). Quotations presented in the results that follow are representative of these themes.

### *Ethics*

Ethics approval for this study was granted by the ethics review boards of the London School of Hygiene and Tropical Medicine, Ifakara Health Institute (Tanzania), and the Tanzanian National Institute for Medical Research.

Written informed consent was sought from all participants. Where participants were not literate, an informed consent sheet was read aloud with a literate witness present—the witness signed the form and the participant provided a thumbprint.

## **Results**

### *Implementation Scores*

Village implementation scores for each of the four villages were calculated (Table 3). Total scores ranged from 68 to 96 out of the possible 100. Three components explained much of the observed difference in scores: fidelity, completeness, and reach.

INSERT TABLE 3 ABOUT HERE

Scores for fidelity—the extent to which the intervention was implemented as planned—ranged from 37/41 for the highest performing village to 21/41 for the lowest performing village. Because quality improvement methods rely on insights from the ground-up, it was important that volunteers themselves generated the change ideas, and that volunteers felt a sense of responsibility and ownership for the intervention, which were features contributing most to differences in fidelity scores across villages. In the top-performing village, volunteers were very

confident that they were responsible for developing and implementing change ideas, and felt that it was critical that they—rather than individuals from outside their village—were responsible for the quality improvement work. Conversely, in the lowest performing village, these volunteers regularly described their work as doing assigned tasks, and although early on in the intervention they reported being responsible for developing change ideas, later on they felt that the work had become more prescriptive. As such, volunteer ownership of the intervention, that is, feeling a sense of responsibility and influence over both processes and outcomes (Lachapelle, 2008), seemed to resonate among those in high-performing villages, but to a lesser extent among volunteers in low-performing villages.

Scores for measures of completeness and reach also exposed differences between the villages, with the highest performing village scoring 12/12 for both completeness and reach, with the lowest performing village scoring 9/12 and 7/12 respectively. Much of the difference in reach was because of different percentages of health facility delivery and birth preparedness in each village, which were the key intermediate outcomes of the intervention. According to volunteer-collected data, more than 90% of women who had interacted with volunteers in the highest performing village were preparing delivery items and were going to a health facility for childbirth, compared to only around 60% of women in the lowest performing village.

### *Context*

Context can affect how an intervention itself might be implemented, and also affect the outcomes that the intervention targets (Victora et al., 2005). According to contextual factors alone (Table 2), it was hypothesized that Village A would perform at the highest level and Village D at the lowest, which was what we found. However, there appeared to be no difference in the expected

overall influence of context on EQUIP implementation in Villages B and C, where, by scoring the process evaluation framework, differences in implementation were observed.

### *Identified Facilitators and Barriers*

The three most important facilitators of community-level quality improvement that implementation scores helped to uncover were: 1. support from village leaders; 2. volunteers being motivated by improvements highlighted through routinely collected data; and 3. regular provision of education, leading to acquisition of knowledge and skills among volunteers.

#### *Support from village leaders.*

In the top two ranked villages, the village leaders occasionally attended learning sessions and monthly meetings with volunteers; they followed-up the volunteers' work, for example, by visiting households where pregnant women were said to have been given education; and they regularly asked for reports from the volunteers and reviewed their monthly data with them. Through the in-depth interviews, it was clear that the reinforcement of their roles by village leaders contributed to the volunteers in the two top ranked villages conducting their work so consistently and effectively. As such, their scores for fidelity and completeness ended up being markedly higher than the bottom ranked villages.

“Because the volunteers do visit pregnant women at home, the ones who haven't done preparation, I get the report so I go to visit her and I tell her to prepare things. Then I go to her husband and I explain the plan. I tell him the expecting dates and that you have to have this and this.” (Village Executive Officer)

Additionally, in these top two ranked villages, we learned that the village leaders had mobilized local resources to pay the volunteers a small incentive. That the village leaders took it

on their community to incentivize their EQUIP volunteers showed a very high level of receptiveness to the EQUIP intervention.

“First of all, to motivate these volunteers, I have decided to give them allowances every year...we give them an allowance of 50,000 [Tanzanian shillings, ~32 USD], and each one will get 25,000 [Tanzanian shillings, ~16 USD].” (Village Executive Officer)

Volunteers were provided with a small transportation allowance to attend learning sessions and meetings from EQUIP. However, volunteers in the bottom two ranked villages were not receiving an *additional* allowance from their village. They were not receiving much local support in general, and as such, these villages also scored very low for local resources being mobilized for EQUIP activities. In-depth interviews with volunteers in these lower-performing villages highlighted that they were demotivated because they felt their work was not sufficiently recognized. It is important to note that in these villages, data was used to a limited extent, intermediate outcomes were not being achieved well, and volunteers were less inclined to see the benefit that the intervention could potentially bring to their village. As such, personal incentives became more important motivators in these villages than elsewhere, and as they were not receiving as many personal incentives—and were aware that other volunteers were—the lack of a local allowance became a barrier. “A person sees it is better to stay and sell buns and cashew nuts than to visit a pregnant woman in this project; the issue of allowance needs emphasis.” (Volunteer)

Furthermore, there were also issues around transportation. In the second-ranked village, the village executive officer recognized that the volunteers would benefit from access to a bicycle, and so volunteers here were able to use the bicycle to carry out their EQUIP activities.

“We gave bicycles [to the EQUIP volunteers], which we bought for the village development.”

(Village Executive Officer)

In-depth interviews with volunteers in the lowest performing village helped to reveal that this community was too large to carry out EQUIP activities without assistance in transport. Here, volunteers did not receive any kind of local support to assist them with transportation, as such, many pregnant women did not receive a household educational visit as per the change ideas volunteers had created in this village.

“You can just walk to the households, but you might visit [pregnant women] and they are not around; I might go and not find her. So I go down again to the end of the village to find her, but I might not succeed. But with a bicycle, it isn’t a lie, it can make us more successful and [our work] becomes easier.” (Volunteer)

*Volunteer motivation through local data.*

Another key facilitator we observed in villages with high implementation scores was that the volunteers were highly motivated by using their own data to track improvements in their communities that they had helped to facilitate through their own change ideas. Implementation scores highlighted where volunteers were regularly using and applying local data. In the villages where data were not consistently collected and used, volunteers did not express as much of an interest in improving outcomes when they could not visualize the impact that they had on them. Process data indicated that more women in the top two ranked communities were delivering in health facilities and making birth preparations, and data from in-depth interviews confirmed that volunteers were highly motivated by observing improvements indicated by their data.

“We know that it is volunteering work, but the situation is tight. I am not ready to leave it, but if you find others, they tell you the work has no success. But me and my fellow, we



are ready to do this work because it is successful and the results are positive; the community has been educated.” (Volunteer)

### *Education.*

Finally, another key facilitator was the provision of education. In the villages where volunteers reported developing their skills and knowledge levels—which were also assessed during in-depth interviews where volunteers were asked to describe PDSA cycles or to draw mock graphs of their data, for example—these villages generally scored higher in terms of implementation overall. Findings from in-depth interviews suggest that volunteers felt that by being given education, it was their responsibility to pass it on to others. Volunteers and extension workers noted that they helped to educate people in their communities and were happy to see that community members were applying this knowledge. “Education...I like it because it is being improved often; we are being updated so that we can educate community members.” (Volunteer)

“The community receives the project positively—mostly pregnant women and their partners. Is it quite different than the situation before the project started its activities. The education they acquired is used effectively. The issue of early delivery preparations was very difficult for many pregnant women; they used to think that it benefits other people like the doctor—they didn’t know that it is for their own benefit. But we have seen a lot of changes, we don’t have any problem reminding them about the same issue of delivering at health facilities; they have a greater understanding now.” (Extension worker)

## **Discussion**

Using an adapted approach to process evaluation within quality improvement that incorporated the use of implementation scores, we have highlighted the extent to which process components

(fidelity, completeness, exposure, reach, satisfaction, and recruitment) were carried out in the EQUIP intervention as planned. We identified key facilitators and barriers of community-level quality improvement. Finally, we assessed contextual factors that might have affected implementation.

Commonly, qualitative data from interviews or focus group discussions are used to uncover facilitators and barriers of an intervention (Bohren et al., 2014; Heaman et al., 2014; Paul, Gemzell-Danielsson, Kiggundu, Namugenyi, & Klingberg-Allvin, 2014). When evaluating similar interventions, systematic literature reviews and meta-analysis are also used to deduce facilitators and barriers of these as a whole (Ingram et al., 2012; Nair et al., 2014; Solomons & Spross, 2011). However, as there are very few examples of community-level quality improvement, relying on secondary data from systematic reviews was not an option.

There were advantages to using a process evaluation with implementation scores to unpack facilitators and barriers of the EQUIP intervention at the community-level. First, the process evaluation relied on multiple sources of data including quantitative process data, qualitative data (from in-depth interviews, focus group discussions, key informant interviews, and birth narratives), contextual data, and others. These data were triangulated to uncover facilitators and barriers in a more methodologically rigorous way than could be achieved through qualitative methods alone, which often focus on *perceived* facilitators and barriers, thus increasing the trustworthiness of our results. Second, using implementation scores allowed for a more objective measure of performance of each of the four sampled villages within the EQUIP intervention, and as such, enabled us to investigate which factors were present in higher performing villages (facilitators) and which were present in lower performing villages (barriers).

We assessed facilitators and barriers within community-level quality improvement with the intention of informing forthcoming interventions. The results from our process evaluation can be viewed as important formative evidence that might guide the design of future community-based quality improvement interventions. Our results indicate that village leaders should be included as implementers of similar interventions alongside volunteers, as their role as facilitators of EQUIP was invaluable. Furthermore, volunteers should be continuously encouraged to collect and utilize data around their change ideas, not only so that they can modify change ideas that do not appear to be working, but also because physically seeing improvement was a potent motivator of their work. Finally, providing ongoing and regular education around quality improvement and maternal and newborn health to quality improvement teams should be upheld. Provision of bicycles and more generous allowances to volunteers might also be important considerations, which villages might be able to provide directly, rather than external funders.

Process evaluations have been used to evaluate the implementation of other community-based interventions, including within maternal and newborn health (Dynes et al., 2011; McPherson et al., 2010; Rath et al., 2010). However, there is still a notable gap in the literature around complex behavior change interventions like EQUIP, with many interventions reporting only on impact and not on process (Butterfoss, 2006; Michie, Fixsen, Grimshaw, & Eccles, 2009; Workgroup for Intervention Development and Evaluation Research, 2009). As such, there is under-reporting of process data, despite its potential to provide valuable implementation insights. Furthermore, as much of the literature around process evaluations within quality improvement interventions comes from the health facility level in high-income countries, their emphasis tends to be around organizational culture and technical capacities (van Harten,

Casparie, & Fisscher, 2000). These methods fail to capture what is important or even relevant at the community level. Therefore, this article does not only provide a description of an alternate methodology for process evaluation for quality improvement and/or community-based interventions, but also reports process data to contribute to the small evidence base that currently exists.

A key limitation of the use of a process evaluation using implementation scores was the lack of rigorous measures of reliability. Measures of internal consistency such as Cronbach's alpha were not appropriate measures of reliability given this type of evaluation, where each section of the process evaluation measured a different construct (Ritter, 2010). Rather, we provided a measure of inter-rater reliability. Supervisors of village volunteers, the overall district mentor, and EQUIP staff were asked to rank the villages according to their performance, and all agreed on the highest performing village (Village A) and the lowest performing village (Village D), with the suggestion that the other two villages (Villages B and C) would then fall in either position with intermediate rankings. These rankings were consistent with the implementation scores. An additional limitation was that a small number of villages were researched, meaning that the study does not give a complete picture of the potential utility of the methods applied. This type of intensive evaluation might also be restrictive in other settings or within other interventions. Additionally, data were collected throughout the second year of implementation and it is possible that different results might have been obtained with different timing.

## **Conclusion**

Overall, the use of a mixed methods process evaluation that was analyzed with implementation scores was a helpful way of explicitly drawing out higher and lower performing villages, and

may be replicated elsewhere. This method increased the ease with which facilitators and barriers of community-level quality improvement could be uncovered. The results can feed into the formative stages of similar interventions in the future.

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## Tables

**Table I. Simplified Process Evaluation Framework Measures and Associated Implementation Scores**

Framework component	Description within the context of EQUIP	Measure	Score	Data source(s)
Fidelity	The extent to which the intervention was implemented as planned	Village volunteers self-identify new knowledge or skills in quality improvement and maternal/newborn health they have acquired	/4	In-depth interviews with volunteers
		Village volunteers understand and can apply PDSA cycles	/4	In-depth interviews with volunteers, extension workers, and EQUIP staff
		Change ideas generated by village volunteers	/4	In-depth interviews with volunteers
		Change ideas implemented by volunteers	/4	In-depth interviews with volunteers
		Local resources are mobilised to implement change ideas	/2	In-depth interviews with volunteers and village executive officers
		Data for each change idea is collected consistently and correctly	/4	In-depth interviews with volunteers
		Real-time data is used by volunteers to influence change ideas	/4	In-depth interviews with volunteers
		Village volunteers feel enabled by EQUIP	/4	In-depth interviews with volunteers
		Extension worker feels a sense of ownership of the intervention	/1	In-depth interviews with extension workers
		Village volunteers feel a sense of ownership of the intervention	/4	In-depth interviews with volunteers
		Village volunteers aware of health facility quality improvement teams' activities	/2	In-depth interviews with volunteers
		Referral health facility quality improvement teams aware of community quality improvement teams' activities	/2	In-depth interviews with health facility staff
		Community- and health facility quality improvement team members describe a positive interaction between them	/2	In-depth interviews with volunteers and health

				facility staff
<b>TOTAL</b>			<b>/41</b>	
Completeness	The extent to which the intervention was distributed (i.e. the number of activities carried out)	100% of learning sessions attended by at least one village volunteer	/4	EQUIP process data, in-depth interviews with volunteers
		At least one village volunteer has attended 100% of monthly meetings	/2	EQUIP process data, in-depth interviews with volunteers
		Village volunteers regularly submit reports (at least once/month) and engage with their extension worker	/2	EQUIP process data, in-depth interviews with volunteers and extension workers
		Change ideas implemented consistently	/4	EQUIP process data, in-depth interviews with volunteers and extension workers
<b>TOTAL</b>			<b>/12</b>	
Exposure (dose received)	The extent to which intervention implementers (village volunteers and extension workers) and targets (community members) actively engage with or are receptive to the intervention	Village volunteers are receptive to the EQUIP intervention	/2	In-depth interviews with volunteers
		Community members (leaders and pregnant women and their husbands) are receptive to village volunteers	/2	In-depth interviews with recently delivered women, birth narratives with mothers and fathers
		Village volunteers have made contact with their broader community (e.g. Invited to speak at community meetings)	/2	In-depth interviews with volunteers and village executive officers
<b>TOTAL</b>			<b>/6</b>	
Reach	The proportion of intended targets	Percentage of women delivering in a health facility since intervention start	/4	Process data from volunteer record books

	of change ideas			and EQUIP record books
	actually receiving the intervention	Percentage of women preparing all delivery items since intervention start	/4	Process data from volunteer record books and EQUIP record books
		A selection of recently delivered women can identify both village volunteers in their community	/2	In-depth interviews with recently delivered women, birth narratives with mothers
		A selection of recently delivered women are aware of EQUIP activities (can name at least 1) in their village	/2	In-depth interviews with recently delivered women, birth narratives with mothers
<b>TOTAL</b>			<b>/12</b>	
Satisfaction	The extent to which implementers (village volunteers and extension workers) and targets of change ideas (community members) are satisfied with the intervention	Both village volunteers express a high level of satisfaction in their role	/2	In-depth interviews with volunteers
		Both village volunteers perceive their role to be valuable	/2	In-depth interviews with volunteers
		Village volunteers identify benefits of the intervention (either no harms mentioned, or benefits must outweigh or outnumber harms)	/2	In-depth interviews with volunteers
		Extension worker indicates a high level of satisfaction in his/her role	/1	In-depth interviews with extension workers
		Extension worker perceives his/her role to be valuable	/2	In-depth interviews with extension workers
		Extension worker can identify benefits of the intervention (either no harms mentioned, or benefits must outweigh or outnumber harms)	/1	In-depth interviews with extension workers
		The selection of recently delivered women indicate a high level of satisfaction with the intervention in their village	/2	In-depth interviews with recently delivered women, birth narratives with mothers
		The selection of recently delivered women can identify at least one positive change in their village	/2	In-depth interviews with recently delivered women, birth narratives with



				mothers
		The selection of recently delivered women can identify benefits of the intervention	/2	In-depth interviews with recently delivered women, birth narratives with mothers
<b>TOTAL</b>			<b>/16</b>	
Recruitment	Procedures used to attract and sustain participants	Both village volunteers are from the village they are active in	/2	In-depth interviews with volunteers
		Village volunteers are satisfied with the selection process	/2	In-depth interviews with volunteers
		Extension worker is from a community that he/she supervises	/1	In-depth interviews with extension workers
		Extension worker is satisfied with his/her selection process	/1	In-depth interviews with extension workers
		Village volunteers have previous community involvement	/2	In-depth interviews with volunteers
		Extension worker has had previous community involvement	/1	In-depth interviews with extension workers
		Village volunteers can identify at least two incentives to sustain their involvement	/2	In-depth interviews with volunteers
		Extension worker can identify at least two incentives to sustain his or her involvement	/2	In-depth interviews with extension workers
<b>TOTAL</b>			<b>/13</b>	
<b>OVERALL TOTAL</b>			<b>/100</b>	

**Table 2. Hypothesized Influence of Contextual Factors on Each of the Four Villages in the Process Evaluation**

Contextual Factor	Comment	Data source	Expected effect of contextual factor on EQUIP implementation	Hypothesized influence of contextual factor in each village			
				Village A	Village B	Village C	Village D
Volunteer features	How long they have been residents of the village	In-depth interviews with volunteers	Villages whose volunteers are longstanding residents (more than 10 years) are likely to be better performers than those with volunteers who are newer residents	+++	++	+	++
	Past experience volunteering	In-depth interviews with volunteers	Villages whose volunteers have past volunteering experience likely to be better performers than those with volunteers lacking past experience	++	+	+	+
	Maternal and newborn health	In-depth interviews with volunteers	Villages whose volunteers have pre-existing maternal and newborn health knowledge/skills likely to be better performers than those with volunteers lacking such knowledge/skills	++	+	+	+
	Quality improvement skills and knowledge previously held	In-depth interviews with volunteers	Villages whose volunteers have pre-existing quality improvement knowledge/skills likely to be better performers than those with volunteers lacking such knowledge/skills	--	--	--	--
Volunteer turnover	Why it happened (if at all) and how it was dealt with	In-depth interviews with volunteers, extension workers, and village executive officers	Villages <i>without</i> volunteer turnover likely to be better performers	+	+	-	-

Location	Distance from main road and health facilities	In-depth interviews with village executive officers	Villages closer to main roads and health facilities (especially higher-level health facilities like health centres and the district hospital) will be better performers than villages further from main roads and health facilities	++	+	+	+++
	Condition of roads	In-depth interviews with village executive officers	Villages with better roads likely to be better performers than villages with poorer quality roads	+++	++	+++	-
Socio-economic factors	General condition of the majority of housing (thatched roofs or corrugated iron mud or brick), primary economic activities, water source, location to markets or trading centres, and so fourth	Social and resource mapping, in-depth interviews with village executive officers	Villages that generally have better socioeconomic conditions will be better performers than villages with poorer socioeconomic conditions	+	++	++	+++
Interaction with closest health facility	Indicate the closest health facility and how staff interact with EQUIP volunteers, if at all	In-depth interviews with volunteers, village executive officers, and referral health facility staff	Villages whose volunteers interact with health facility staff from local health facilities will be better performers than those who do not interact with health facility staff	++	++	+++	-
Other contextual factors	Other health and social development activities happening in the village	In-depth interviews with village executive officers, key	Villages in which there are other social development and/or maternal and newborn health initiatives will be better performers than villages who lack additional initiatives	++	++	+++	++

		informant interviews with non- governmental organisation and government staff indicated as active in each village					
Total expected effect of contextual factors				+16	+12	+12	+9

**Table 3. Overall Ranking of Villages Based on Implementation**

**Scores**

Village	Fidelity	Completeness	Exposure	Reach	Satisfaction	Recruitment	Total
A	37/41	12/12	6/6	12/12	16/16	13/13	96/100
B	33/41	12/12	6/6	9/12	16/16	12/13	88/100
C	29/41	10/12	6/6	8/12	16/16	10/13	79/100
D	21/41	9/12	6/6	7/12	13/16	12/13	68/100