

# Using adapted quality-improvement approaches to strengthen community-based health systems and improve care in high HIV-burden sub-Saharan African countries

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**Introduction:** Achieving long-term retention in HIV care is an important challenge for HIV management and achieving elimination of mother-to-child transmission. Sustainable, affordable strategies are required to achieve this, including strengthening of community-based interventions. Deployment of community-based health workers (CHWs) can improve health outcomes but there is a need to identify systems to support and maintain high-quality performance. Quality-improvement strategies have been successfully implemented to improve quality and coverage of healthcare in facilities and could provide a framework to support community-based interventions.

**Methods:** Four community-based quality-improvement projects from South Africa, Malawi and Mozambique are described. Community-based improvement teams linked to the facility-based health system participated in learning networks (modified Breakthrough Series), and used quality-improvement methods to improve process performance. Teams were guided by trained quality mentors who used local data to help nurses and CHWs identify gaps in service provision and test solutions. Learning network participants gathered at intervals to share progress and identify successful strategies for improvement.

**Results:** CHWs demonstrated understanding of quality-improvement concepts, tools and methods, and implemented quality-improvement projects successfully. Challenges of using quality-improvement approaches in community settings included adapting processes, particularly data reporting, to the education level and first language of community members.

**Conclusion:** Quality-improvement techniques can be implemented by CHWs to improve outcomes in community settings but these approaches require adaptation and additional mentoring support to be successful. More research is required to establish the effectiveness of this approach on processes and outcomes of care

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## Introduction

In many developing country settings, the use of community-based lay health workers can result in substantial health benefits for community members, including mothers and children [1]. Community-based health workers (CHWs) include many types of CHWs with a variety of skills deployed in different settings (village health workers, traditional birth attendants, lay counsellors, home-based carers, etc). CHWs can be broadly defined as members of a community, often chosen by the community, and working within their own community; they are supported by the health system, but have no professional training [2].

With increasing numbers of adults and children on long-term antiretroviral therapy (ART), more attention in the HIV epidemic will be focussed on the management of large numbers of patients on long-term treatment. High levels of treatment adherence are required over long periods if ART is to be effective, and many patients fail to achieve this [3]. Achieving good long-term retention in HIV care is a major challenge to the effective management of millions of people living with HIV globally, and, in particular, to achieving the goal of elimination of mother-to-child transmission [4]. The burden on health systems will increase significantly as higher HIV prevalence countries adopt the WHO Option B+ strategy for elimination of mother-to-child transmission [5], which entails lifelong ART for all HIV-infected mothers irrespective of their clinical or immunological status [6]. To achieve complete treatment coverage for existing and future patient populations and to cope with the increased demand for chronic HIV care, it is essential that countries develop sustainable and affordable strategies to better support the needs of these populations. In sub-Saharan Africa efforts to scale up HIV care are challenged by weak and fragmented health systems and severe shortages of skilled health workers, so that there is a need to build additional capacity for service delivery, particularly to the poorest and most vulnerable populations. Strengthening community-based interventions is an important strategy to support this need. Quality-improvement methods are being successfully used in low-income and middle-income countries [7] and have the potential to deliver sustained improvements in healthcare provision [8].

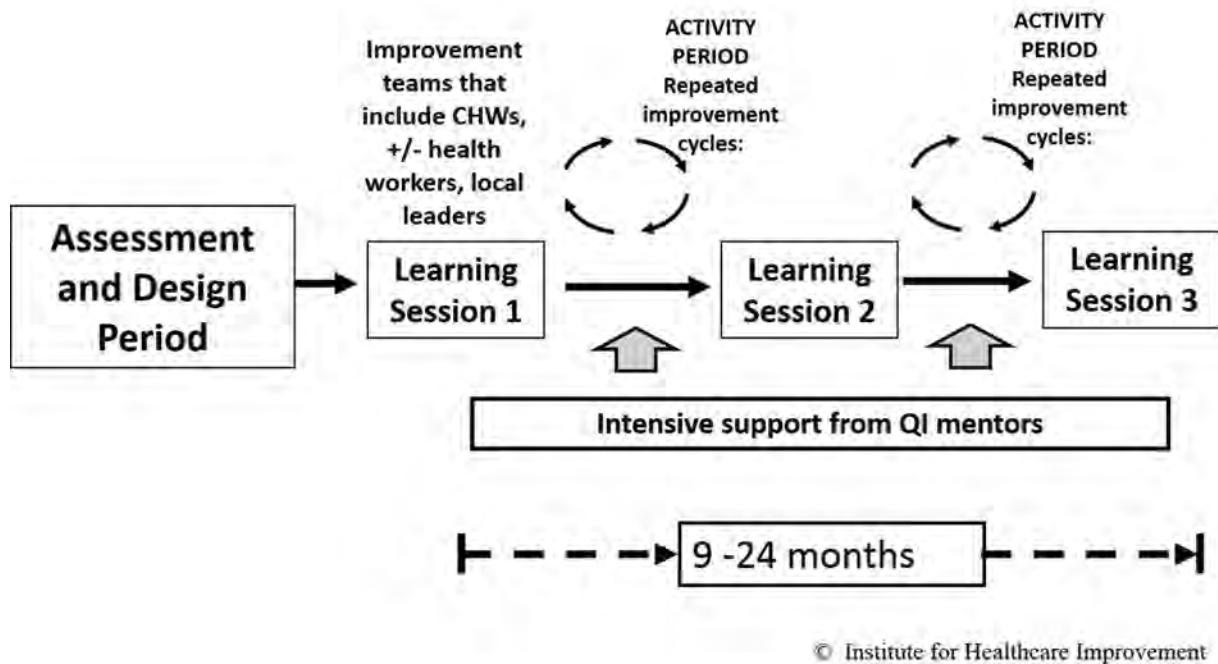
CHWs have a variety of functions in HIV care including HIV testing, home-based care, supplying ART and adherence support [9], and have been shown to successfully improve uptake of HIV-related services, including improving adherence [10] and retention in care [11–13]. It has also been shown that CHWs can provide cost-effective interventions to increase uptake of key maternal and child health interventions and reduce child mortality [14,15]. Appropriately trained CHWs have the potential to address barriers to preventive and curative

care, to bring care closer to communities, and provide accessible, appropriate services at household level [16]. Community-based services can improve continuity of service delivery and retention in care by improving linkages between communities and facility-based health services, and by being part of a team approach to care. However, if community-based services are to be effective, it is important that CHWs receive appropriate training, support and supervision [16]. The design of community-based programmes should include sustainable approaches that develop and maintain high quality performance by CHWs in households and communities.

Quality-improvement approaches, including the Institute for Healthcare Improvement's (IHI) Breakthrough Series (BTS) learning system described in this study [17], have been widely implemented to improve health systems at scale in higher income countries [18–20]. This methodology has also been successfully implemented in lower income countries to improve performance of HIV and non-HIV care at facility level [21,22]. However, little has been reported on how quality-improvement approaches could be implemented in community settings, primarily with nonprofessional health workers, to support and develop quality in community-based services. This study describes four cases in which quality-improvement methods have been adapted to community settings to strengthen coverage, quality of care and retention in care for HIV and maternal and child health programmes in three sub-Saharan African countries.

## Methods

All four projects were structured as a BTS collaborative, a peer-to-peer learning model designed to improve system performance through structured improvement activities tied to a knowledge-sharing network [17] (Fig. 1). Participants in the learning network gathered at predefined intervals in 'learning sessions' to share their progress and challenges, and to identify successful strategies for improvement. Learning networks were made up of CHWs and, in some cases, facility-based health professionals. In the intervals between learning sessions, teams were mentored to reflect on system performance data and design rapid cycle changes to test improvement ideas. In some examples, successful changes were then compiled into a 'change package' and shared with the participants within and beyond the learning networks. All the projects followed the basic principles of this approach but adapted the structure for use in a community setting, primarily through inclusion of community-based health workers (Table 1). In all but one of the projects, community-based improvement teams were formed into a learning network that were linked (e.g. through clinic supervisors or outreach health workers who interacted with the CHWs) to the



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**Fig. 1. Breakthrough Series Model.**

facility-based health system. Using the basic structure of the quality-improvement model for improvement [23], common, clearly defined and time-bound goals were set across the learning networks. Improvement teams used local data to identify gaps in service provision and track progress, and used rapid plan-do-study-act (PDSA) cycles techniques to develop and test local solutions for their own communities. Team members were taught to use standard quality-improvement tools, for example, root cause analysis and process mapping analysis to identify gaps and bottle necks in service provision, as well as, PDSA for testing change ideas, and dashboard analysis [24]

## Results

### Nompilo project, KwaZulu Natal province, South Africa

A maternal and child health (MCH) improvement intervention was implemented utilizing modern quality-improvement science methods in one district, where CHWs were supported and supervised to deliver maternal and child health services in households, and improve linkages with primary healthcare clinics. The three aims of the project were to improve household caregiving practices, improve uptake of key facility-based services, and to develop clear referral pathways between the community and the primary healthcare clinic. At the project outset, participating CHWs were trained for 2 weeks using a WHO Integrated Community Case

Management training adapted for use in a high HIV prevalence area, to provide them with the technical skills required to undertake the recommended maternal and child health activities at household level.

After training, 15 improvement teams were established comprising groups of five CHWs, including one senior CHW who functioned as the team leader. Two members of each improvement team received a 3-day training in quality-improvement methods, this included use of standard quality-improvement tools as described earlier. Improvement teams met two weeks for a period of 15 months, starting with a 3-month lead-in phase to establish and train the improvement teams, followed by 12 months mentoring. All mentoring visits were facilitated by quality mentors, who were registered nurses employed by the project and experienced in the use of quality-improvement methods.

Key indicators used to direct the quality-improvement process are shown in Table 1 and these were incorporated into a simple register used by CHWs to collect performance indicators. CHWs were mentored to identify gaps in the collection and reporting of CHW-specific data and improve their reporting completeness and accuracy. Using composite dashboard indicators the quality mentors helped team members to identify gaps in the care they provided in the community, plan changes designed to overcome local barriers to care, ensure execution of those changes and monitor the effects of the actions on mothers and children under the CHW's care. Quarterly 'learning sessions' were facilitated by quality

**Table 1. Summary of QI Methods.**

Project	Site	Duration of intervention	Quality mentors	Improvement teams	Improvement meetings	Learning sessions	Target group for intervention	Target	Objective/outcome measures
Nompilo project	Ugu district, KZN, South Africa.	15 months	Registered nurses trained in QI methods employed by project	5 CHWs (including a team leader) based in communities	2 weekly	Quarterly with all CHW teams	Pregnant women, mothers and children in households served by participating CHWs	100% early ANC attendance (before 20 weeks), 100% ANC attendance four times, 100% attended postnatal care within 7 days, 100% HIV positive mothers whose babies had PCR at 6 weeks	% mothers who received visit(s) from a CHW during pregnancy and postnatal period. % mothers who attended ANC before 20 weeks, % mothers attended ANC four times, % mothers attended postnatal care within 7 days, % HIV positive mothers whose baby had a PCR at 6 weeks
ART clubs	Public health facilities in Cape Town Metro District (47 facilities)	Phase 1 (15 clinics) 18 months Phase 2 (remaining clinics) 18 months	Selected DOH managers and clinical staff trained in intervention model and QI methods by project co-ordinators from DOH, Medicin Sans Frontieres (MSF), and Institute for Healthcare Improvement (IHI)	Multidisciplinary teams including CHWs (lay counsellors) based at implementing clinics	Quality facilities met monthly with project co-ordinators. QI facilitators then each mentored a number of facilities	6 monthly	Patients stable on ART in participating clinics	To manage 30% of all patients on ART in participating facilities in ART clubs. (Phase 1: manage 10 000 patients in 333 ART clubs)	Number of ART clubs functioning. Number of patients receiving treatment in ART clubs. % patients retained in care
Safe Motherhood Task Forces	Malawi		QI mentor from the local district hospital	Safe Motherhood Task Force (TF) members (CHWs) based in villages served by the health facility	Task forces met monthly	3 monthly meetings with 15-20 Safe Motherhood TFs	Pregnant women and new mothers in the villages and in the health centre	Identify 100% of mothers and newborns 85% of mothers and newborns to access care at the right time and place	% pregnant women and newborn identified. % pregnant women and newborns who access care at the right place and time: % mothers who attended ANC before 13 weeks, % mothers attended ANC four times % mothers attended postnatal care within 7 days
Partnership for HIV Free Survival: Community demonstration project	39 villages in Gaza province Mozambique	12 months	Improvement coaches (nurses from 3 health facilities trained in QI)	Representatives of each community group, health facilities and local government	Monthly community improvement team meetings	quarterly	Pregnant women	90% of identified women tested for HIV	% pregnant women who received ANC care from facilities. % pregnant women who had an HIV test. % HIV positive women who initiated treatment

mentors and were supported by health district managers with a responsibility for the CHW programme.

The BTS design, including improvement team meetings and peer-to-peer networking, engendered strong commitment from CHWs and interest in learning from each other. Attendance at mentoring meetings was very high (>70%) and was sustained over the entire project period. CHWs reported that although they had received training previously, they had never received support for implementation of new skills. Poor initial levels of knowledge and widespread misconceptions about MCH issues meant that considerable repetition of information was required to ensure that CHWs had appropriate knowledge and skills to undertake both quality-improvement and MCH activities. All materials and activities were undertaken in the local language (isiZulu).

Collection and analysis of data were unfamiliar to CHWs, and improvement teams required considerable support to provide accurate reports from their household visits. As a result, the skilled quality mentors had to continuously adapt their approach to the performance of the CHWs. In addition, CHWs found it difficult to use the information collected from their visits to guide their work in the community, but these problems improved over the intervention period until improvement teams were able to conduct improvement meetings themselves, present their own data and plan their work in the community. CHWs expressed improved confidence over the intervention period. Other challenges included a lack of a formal connection of the CHW teams to the clinic teams which may have contributed to poor relationships between some clinics and CHWs. At times this resulted in clinic staff undermining the roles of CHWs in community care and as a link between clinic and community.

### **Antiretroviral therapy clubs project, Cape Town metro district, Western Cape province, South Africa**

This project builds on the ART Adherence Club Model which was developed by Médecins Sans Frontières (MSF) in the largest ART site in Cape Town, and was demonstrated to be an effective strategy for managing large numbers of stable patients on life-long ART [25]. Adherent, clinically stable patients were managed in groups of approximately 30 club members by CHWs trained as peer educators who functioned as club facilitators. These club facilitators conducted weight checks and a basic symptom screen and referred symptomatic members to a clinician in the facility assigned to the clubs, who provided oversight of the CHWs. Two months of prepacked medication was issued by the CHW. Most ART clubs were based at health facilities but some were in community settings, for example, in libraries. The ART club model dramatically reduced the time patients spent at the clinic, from a whole day to half an hour [25], and task shifting to CHWs

provided adequate support to keep club patients in care while freeing clinicians to manage ill patients. Monthly initiations on ART in MSF's high-volume pilot site thus increased as more of the stable ART patients were managed in clubs. Club patients were more likely to remain in care compared with those who qualified for clubs but remained in mainstream care (97% versus 85% over 40 months) [26] and club participants were also 67% less likely to experience virologic rebound, indicating better adherence.

For this spread project, the IHI BTS collaborative approach was utilized in a two-phased approach to rapidly spread the package of changes in MSF's ART Adherence Club Model to all public health ART clinics in the Cape Town metro district. The 14 highest volume facilities were included in the first phase to learn how to establish clubs in their facilities, with the remaining 23 facilities being included in the second phase. Processes and tools for running the clubs (including clubs registers and data) were refined and adapted in the first phase and then standardized for scale up in the second phase.

In each phase, three learning sessions were conducted at 6 monthly intervals and attended by multidisciplinary teams from the health facilities comprising the facility manager, one or two clinicians, and the club facilitator (CHW), as well as HIV programme and district health managers. CHWs from the MSF pilot project were key presenters at the first learning session helping participants understand how the clubs function, build confidence in the BTS model and the commitment to support the intervention. Learning sessions were later used to share progress and successful changes, and to train club facilitators on how to use standardized registers and other tools.

During the first phase, a new role was created for a cadre of interested programme managers and clinicians from the health system who were selected to act as quality mentors for the CHW facilitators and supporting clinical staff, each quality mentor supporting a few facilities. Monthly meetings were held for the quality mentors to build their capacity to use quality-improvement methods and to discuss barriers to implementation, share successful changes, give input on the development of tools and processes.

Within 3 years, ART clubs were integrated into the ART programme becoming standard of care across the metro district (population 3.7 million), providing chronic care for nearly a quarter of all ART patients in the region within a further 6 months, equivalent to 27 613 patients in 1053 clubs by June 2014. To prevent any further increase in ART clinic load, targets for club enrolments were then set to keep pace with or exceed new patient enrolments in the ART clinics (average 880 patients/month).

### Safe motherhood task forces, Malawi

The “Safe Motherhood Task Forces” is a project developed to accelerate improvement in maternal and newborn child health outcomes through a community-based quality-improvement collaborative approach. This project was built upon previous experience using community-based women’s groups to improve maternal and newborn child health through quality-improvement methods and tools [22]. The preceding project identified a need for a community-based structure to link previous successful activities that empowered women in the community with reliable care in the facilities.

This project used an adaptation of the IHI ‘BTS’ and focused quality-improvement activities on using data for decision making and testing local ideas for improving care and coverage. MaiKhanda Trust, a local nongovernment organization, provided technical support for the Task Forces.

Each Task Force was led by a group village headman and included 10–15 CHWs, each of whom represented one to two villages (village = ~100 people) and two or three health surveillance assistants (HSAs) who were outreach health workers from the local clinic with basic clinical skills. The design of the Task Forces meant that villagers were directly linked to clinical staff from the local clinic through a structure that was led by traditional authority heads. The goal of the Task Forces was to create effective linkages and communication between health facilities and communities with the aim of increasing antenatal clinic (ANC) attendance and delivery by skilled birth attendants at the facility.

In the villages, Task Force members identified new pregnancies, ensured that local pregnant mothers attended ANC, received skilled delivery at the correct location, and ensured that newborns were taken to clinic within 7 days for screening. In the clinic, staff gathered information on new ANC clinic bookings and high-risk

pregnant women, and HSAs then alerted the CHWs at monthly Task Force meetings. The CHWs presented monthly data reports on these activities to their fellow Task Force members (Fig. 2).

Using an adapted BTS model, the CHWs participated in learning networks located within the community and at the health centre. Multiple Task Forces within each clinic catchment area met independently every month to share progress and challenges within their groups, and to allow CHWs to exchange information about pregnant women and newborns with HSAs. In addition, a representative from each Task Force in the catchment area met with other Task Force representatives and healthcare providers at the local health centre every 3 months. At these meetings, Task Force members and clinic staff were given a structured opportunity to discuss challenges and successes, and learn from each other. At the same time, the health centre quality-improvement team shared the health-centre goals for the next 3 months and highlighted the Task Forces role in supporting these aims. MaiKhanda Trust facilitated cross-visits between successful and less-successful Task Forces to promote peer-to-peer learning.

Based on the improvement data analysis from one district in Malawi, MaiKhanda has compiled a change package highlighting effective changes implemented at the pilot site that are being scaled up to four more districts within the central region of Malawi.

### Partnership for HIV-Free survival community demonstration project, Gaza project, Mozambique

The Partnership for HIV-Free Survival (PHFS), a consortium of six high HIV burden countries, aims to improve prevention of mother-to-child transmission care for HIV-infected mothers and their infants through optimal implementation of the prevention of mother-to-child transmission and infant feeding guidance included in *WHO 2013 Consolidated Guideline on The Use of Antiretroviral Drugs for Treating & Preventing HIV Infection Guidelines* [28]. In coordination with PHFS, the United States Agency for International Development Applying Science to Strengthen and Improve Systems Project used a community health system strengthening model in 39 villages linked to three health facilities in Gaza Province of Mozambique to use modern quality-improvement science to increase the number of HIV-infected pregnant women attending ANC care. The model connects the formal health structure (health facility) with a network of existing community groups to mobilize these groups and increase their capacity to work as a system to effectively reach all households in a community.



Fig. 2. Task force members display color-coded data collection tool during monthly meeting at the health centre.

In Gaza province, the existing village health committee served as the community-based improvement team, and

coordinated the village's health-improvement activities. The community infrastructure of existing groups was mapped to identify key groups who should also be engaged in the community health system; one representative from each of the existing groups not already represented on the village health committee was invited to join the community-based improvement team, which also included any *activistas* (CHWs) in the village.

Nurses from three health facilities were trained to serve as quality mentors. In February 2014, the quality mentors conducted a 3-day orientation for leaders from the 39 community-based improvement teams on the importance of identifying pregnant women and linking them to facility services as early as possible, as well as providing basic quality-improvement training such as formation and role of quality-improvement teams, data collection, etc. After the training, the improvement teams met monthly, whereas the community groups tended to meet weekly or every other week. At the same time, each of the three health facilities established a facility community quality-improvement team whose members included a member from each community-based improvement team, the nurse (quality mentor) from the facility, and the CHWs linked to the facility. For example, the Licilo health facility has two CHWs and serves 15 villages, so the Licilo facility community quality-improvement team includes a representative from each of the 15 villages and the two CHWs, and the nurse.

The community-based improvement team aimed to increase the number of pregnant women identified in each village and receiving ANC, including HIV testing. These improvement teams engaged their members to reach out to their constituencies to identify pregnant women and encourage them to go to the facility for ANC and discussed strategies for getting pregnant women in the village into ANC such as different messaging and approaches with mother-in-laws, and community and religious leaders who may have influence over women's care-seeking behaviour. At the monthly health facility community quality-improvement team meetings, data from each village were reported, analysed and strategies being tested were discussed. The Gaza province convened workshops every 3–4 months to share learning among representatives from all 39 villages and the three health facilities. Some of the lessons learned include better communication between communities and facilities and community data systems.

## Discussion

Utilizing community-based workers is a key strategy to improve retention in care of HIV-positive mothers and

children, and to improve linkages between communities and health facilities. Sustainable processes and systems to support CHWs in this role are crucial to ensure delivery of quality services in communities and households. The projects described in this study show that quality-improvement principles can be implemented in a community setting with active participation of CHWs to lead quality-improvement activities. Modern quality-improvement methods and approaches such as the BTS approach can provide a sustainable framework to support and develop the roles of CHWs in promoting improvement efforts in a range of health service improvement efforts such as adherence to ART and retention in HIV care, or increasing ANC visit attendance. However, lessons learned from all four projects emphasized that quality mentor's intensive coaching visits are essential and, that quality-improvement tools and activities need to be adapted to address the challenges of working in a community setting (Table 2).

In all the projects described, improvement teams included community-based workers, either exclusively (Nompilo) or in conjunction with other health workers and local leaders. Key community stakeholders, for example, chiefs/headmen, can have a strong influence on the acceptability of community-based approaches and should be either directly or indirectly involved in the setting up of improvement teams. In the Safe Motherhood Task Force project such community leaders led the improvement teams, thereby providing direct linkage to community leadership structures. Representatives of formal health facilities should also be represented in community-based improvement teams or closely linked to them, to improve continuity of care between community-based and facility-based services. Developing such linkages was a challenge, particularly in the Nompilo project, and should be specifically addressed in the design of community-based quality-improvement projects. These projects demonstrate that CHWs can function

**Table 2. Adaptations of key elements of the Breakthrough Series (BTS) for use in communities.**

Key element of BTS	Community adaptation
Team participants	Community Health Workers Local chiefs (TF)
Learning Sessions	Outreach Nurses (TF, PHFS, Nompilo) Within community settings (Nompilo, TF, PHFS) At health facilities (TF)
Learning Materials and communication	Materials and activities conducted in the local language (TF, Nompilo, PHFS)
Activity Period	Additional repetition of information and mentoring support required to account for low literacy All mentoring done face-to-face
Interface with Health System	Inclusion of clinic staff on improvement teams (TF, PHFS, ART Clubs)
Activity Period Mentoring	Quarterly learning sessions at local clinic (TF) Health System Quality Mentors (Clubs, TF)
Data Systems	External (NGO) Quality Mentors (Nompilo, PHFS) Runcharts replaced by RYG dashboard indicators (TF, PHFS)
Motivation	Pictures and examples from farming Refreshments provided for LS (TF) T-shirts for CHWs (TF)
Confidentiality	Improvement strategies applied to all women, not just HIV+ women (PHFS).

well within quality-improvement teams. Fostering a team approach to providing HIV services, that includes community-based workers as integral and valued members of the team, is crucial if community-based approaches are to be successful in improving retention in HIV care.

A key challenge that was identified is that quality-improvement processes may need to be adapted to the educational level of the participants. Techniques may have to be simplified for use with CHWs, and CHWs may require additional support and mentoring to participate effectively in quality improvement. In particular, collection and presentation of CHW level data will require tools tailored to the objectives of the intervention, and improvement teams will need additional support to collect complete and accurate data, and to make use of data for planning their activities. In two projects, simple dashboard indicators were used, and graphs avoided, to make the information more accessible for CHWs. In addition, CHWs may not be able to communicate well other than in their first language, and if multidisciplinary teams use another language to communicate, this could exclude CHWs from effective participation in quality-improvement processes.

Therefore, as community-based initiatives are being explored and scaled up, skilled facilitators will be required to assess the quality-improvement performance of CHWs and adapt activities to address any shortfalls in CHW skills and the contextual needs of the community. Quality improvement is inherently complex and context specific, and improvement interventions are repeatedly modified in response to feedback, with the result that both the interventions and outcomes are relatively unstable. Navigation of this adaptive design requires the presence of skilled facilitators.

The CHWs are volunteers or receive only a small stipend, and require nonfinancial incentives to be effective and to sustain their interest in the work. All projects reported that the CHWs derived deep satisfaction and pride in their work. The Nompilo project reported high rates of participation in quality-improvement activities, and in the Safe Motherhood Task Force project membership was regarded as an honour by the participants, bestowing status in the villages. The quality-improvement approach which provides data-driven metrics, and peer support and learning, is well suited to internal motivation which is an essential component of volunteerism. Once established, community structures such as women's groups are reported to have high rates of sustainability, even without external support [27].

The experience of the ART clubs shows that structured quality-improvement approaches such as BTS can also be used to rapidly scale up interventions that have been shown to be effective. This is a link in the chain of implementation

that is frequently missing. Many interventions are developed and tested on a small scale but the challenge is to find cost-effective mechanisms to effectively scale up such interventions. Quality improvement could provide a structured and sustainable framework for scale up.

Logistics are a particular challenge working in communities; peer-to-peer learning requires face-to-face meetings across different improvement teams in different areas. Distances between communities in low-income countries are often very long and transport poor. In addition, community-based workers may be volunteers and have inadequate resources to travel for meetings or learning sessions, and require additional support to do so. This may limit the usefulness of this approach on a large scale.

More experience and research is required to establish the long-term effectiveness of using quality-improvement methods to improve CHWs' performance and to show its replicability in different settings and in performing different roles. Likewise, more experience of implementing community-based quality-improvement interventions will inform the development of appropriate quality-improvement tools that are tailored to the particular needs of CHWs.

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## Conflicts of interest

There are no conflicts of interest.

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