Communities as the Cornerstone of Primary Health Care: Learning, Policy, and Practice

Guest Editors: Charlotte E. Warren, PhD, MEd; Ben Bellows, PhD; Rachel Marcus, MSc; Jordan Downey, MPH; Sarah Kennedy, MPH; Nazo Kureshy, MSc
# Table of Contents

2021 | Volume 9 | Supplement 1

## EDITORIALS

**Strength in Diversity: Integrating Community in Primary Health Care to Advance Universal Health Coverage**

This supplement highlights a systems approach that recognizes the communities' roles and their interactions with other health system actors to accelerate outcomes and reflect the diversity of the community health ecosystem. Several cross-cutting priorities emerge from the articles, namely coverage, community health financing, policy change, institutionalization, resilience, accountability, community engagement, and whole-of-society efforts.

Charlotte E. Warren, Ben Bellows, Rachel Marcus, Jordan Downey, Sarah Kennedy, Nazo Kureshy


https://doi.org/10.9745/GHSP-D-21-00125

## VIEWPOINTS

**The Untold Story of Community Mobilizers Re-engaging a Disengaged Community During the Endemic Era of India’s Polio Eradication Program**

Although India’s polio eradication program began with a flourish in 1995, gradually, the community disengaged from the program as misinformation about the vaccine spread. Vaccination teams faced abuse and even physical aggression. What caused this break in communication? CORE Group Polio Project’s mobilizers had to delve deep to uncover untold stories of why communities were disengaged from the government’s polio eradication efforts.

Roma Solomon

Glob Health Sci Pract. 2021;9(Suppl 1):S6-S8

https://doi.org/10.9745/GHSP-D-20-00425

## COMMENTARIES

**Mind the Global Community Health Funding Gap**

Community health workers play a critical role in providing both essential health services and pandemic response. Community health demonstrates a strong return on investment, but funding for this sector is limited and fragmented. Understanding the underlying costs of a community health system is crucial for both planning and policy; the data demonstrate a strong investment case.

Angela Gichaga, Lizah Masis, Amit Chandra, Dan Palazuelos, Nelly Wakaba


https://doi.org/10.9745/GHSP-D-20-00517
Liberia’s Community Health Assistant Program: Scale, Quality, and Resilience

Liberia’s community health program went from concept to nationwide scale in 4 years due to the Liberian Government’s vision and its partnership with implementing organizations and donors. The next community health policy will tackle the unfinished agenda related to quality, resilience, and sustainability. Liberia’s experience offers valuable lessons for innovating, and institutionalizing a compensated, effective cadre of community health assistants.

Jessica Healey, S. Olasford Wiah, Jannie M. Horace, Dianah B. Majekodunmi, Derry S. Duokie
https://doi.org/10.9745/GHSP-D-20-00509

Institutionalizing Community Health Services in Kenya: A Policy and Practice Journey

The process of institutionalizing community health services in Kenya required strong leadership by the Ministry of Health, effective coordination and support of stakeholders, and alignment of community health with the political priorities at the national and decentralized government levels to facilitate adequate prioritization and financing of the community health strategy.

Salim Hussein, Lilian Otiso, Maureen Kimani, Agatha Oлага, John Wanyungu, Daniel Kavoo, Rose Njiraini, Sila Kimanzi, Robinson Karuga
https://doi.org/10.9745/GHSP-D-20-00430

ORIGIANL ARTICLES

The Community Health Systems Reform Cycle: Strengthening the Integration of Community Health Worker Programs Through an Institutional Reform Perspective

Efforts to scale community health worker programs within primary health care systems in 7 countries illustrated that these efforts are best understood as a complex process of institutional reform. Successful scale up depends on a problem-driven political process; requires that models develop solutions that align with resources, capabilities, and commitments of key stakeholders; and emerges from iterative cycles of learning and improvement.

Nan Chen, Mallika Raghavan, Joshua Albert, Abigail McDaniel, Lilian Otiso, Richard Kintu, Melissa West, David Jacobstein
https://doi.org/10.9745/GHSP-D-20-00429

Galvanizing Action on Primary Health Care: Analyzing Bottlenecks and Strategies to Strengthen Community Health Systems in West and Central Africa

In West and Central Africa, “leaving no one behind” requires strengthening community health systems by increasing health financing, improving the supply chain system, and fostering community ownership and partnerships in all settings. Countries with high child mortality rates should improve service delivery through better integration. Galvanizing context-specific country actions is fundamental to improve primary health care services and move toward universal health coverage.

Aline Simen-Kapeu, Maria Eleanor Reserva, Rene Ehouonou Ekpini
Glob Health Sci Pract. 2021;9(Suppl 1):S47-S64
https://doi.org/10.9745/GHSP-D-20-00377
Applying the Community Health Worker Coverage and Capacity Tool for Time-Use Modeling for Program Planning in Rwanda and Zanzibar

The C3 Tool supports community health worker (CHW) program planning by making tradeoffs apparent between human resources and the services to be provided at varying levels of population coverage. Governments in Rwanda and Zanzibar used the tool, respectively, to optimize CHW time allocation and to estimate how many CHWs were needed to meet universal health coverage goals.


https://doi.org/10.9745/GHSP-D-20-00324

Community Health Worker Program Sustainability in Africa: Evidence From Costing, Financing, and Geospatial Analyses in Mali

Understanding specific program costs through efficiency analyses and geospatial targeting allows national stakeholders to make strategic, targeted investments, making the first steps toward sustainability. Costs required for community health worker programs can be reduced without sacrificing quality, and spending can be geographically targeted to optimize service use by rural populations. Results from Mali provide an example for other sub-Saharan African countries.

Patrick Pascal Saint-Firmin, Birama Diakite, Kevin Ward, Mitto Benard, Sara Stratton, Christine Ortiz, Arin Dutta, Seydou Traore

https://doi.org/10.9745/GHSP-D-20-00404

Evaluating Vertical Malaria Community Health Worker Programs as Malaria Declines: Learning From Program Evaluations in Honduras and Lao PDR

Community case management by community health workers has substantially reduced malaria across the Greater Mekong Subregion and Central America. To sustain current and achieve further reductions in malaria, surveillance and delivery platforms must be redesigned to ensure their continued use by key populations.


https://doi.org/10.9745/GHSP-D-20-00379
Measuring Knowledge of Community Health Workers at the Last Mile in Liberia: Feasibility and Results of Clinical Vignette Assessments

We integrated clinical vignettes into routine programmatic supervision to assess community health worker knowledge of integrated community case management in rural Liberia. Results included higher rates of correct diagnosis and lifesaving treatment for uncomplicated disease than for more severe cases, with accurate recognition of danger signs posing a challenge.


https://doi.org/10.9745/GHSP-D-20-00380

Implementation of a Community Transport Strategy to Reduce Delays in Seeking Obstetric Care in Rural Mozambique

Encouraging local transport programs and transport infrastructure in poorly resourced communities can help improve community access and strengthen engagement with health systems. Mobilizing community resources and leadership to implement a community-based transport scheme in rural Mozambique to support referrals to health facilities can help improve maternal and child health outcomes.

Felizarda Amosse, Helena Boene, Mai-Lei Woo Kinshella, Sharla Drebit, Sumedha Sharma, Prestige Tatenda Makanga, Aníta Valá, Laura A. Magee, Peter von Dadelszen, Marianne Vidler, Esperança Sevene, Khátia Munguambe, the Community Level Interventions for Pre-eclampsia (CLIP) Working Group

https://doi.org/10.9745/GHSP-D-20-00511

Volunteer Community Health and Agriculture Workers Help Reduce Childhood Malnutrition in Tajikistan

Paired agricultural and health interventions led by volunteer community health workers and community agricultural workers through home visits, community events, and peer support groups proved successful in improving nutrition of children and may be applicable in other contexts.

Roman Yorick, Faridun Khudonazarov, Andrew J. Gall, Karah Fazekas Pedersen, Jennifer Wesson

https://doi.org/10.9745/GHSP-D-20-00325
METHODOLOGIES

Using Human-Centered Design to Adapt Supply Chains and Digital Solutions for Community Health Volunteers in Nomadic Communities of Northern Kenya

Investing the time and effort to use human-centered design (HCD) approaches is beneficial to designing supply chains and digital solutions for complex sociocultural settings. HCD enables users to be engaged in cocreating solutions that address their challenges, are appropriate for their context and capacity, and build local ownership.

https://doi.org/10.9745/GHSP-D-20-00378

FIELD ACTION REPORTS

Early Lessons From Launching an Innovative Community Health Household Model Across 3 Country Contexts

Community health worker programs can contribute substantively to health systems working to implement universal health coverage, but there is no one-size-fits-all model. Program leaders should anticipate needing to adapt their plans as local realities demand, but lessons learned in other contexts can provide guidance on how to best proceed.

Daniel Palazuelos, Lassana M. Jabateh, Miry Choi, Ariwame Jimenez, Matthew Hing, Mariano Matias Iberico, Basimene Nhlema, Emily Wroe
https://doi.org/10.9745/GHSP-D-20-00405

Learnings From a Pilot Study to Strengthen Primary Health Care Services: The Community-Clinic-Centered Health Service Model in Barishal District, Bangladesh

The community-clinic-centered health service model piloted in Bangladesh strengthened community and local government engagement, harmonized the work of different community health worker cadres, and improved client satisfaction. The approach has the potential to strengthen the delivery of close-to-community primary health care services and accelerate progress toward achieving universal health coverage.

Md. Eklas Uddin, Joby George, Shamim Jahan, Zubair Shams, Nazmul Haque, Henry B. Perry
https://doi.org/10.9745/GHSP-D-20-00466
Strength in Diversity: Integrating Community in Primary Health Care to Advance Universal Health Coverage

Charlotte E. Warren, a* Ben Bellows, a* Rachel Marcus, b Jordan Downey, c Sarah Kennedy, a Nazo Kureshy d

THE INTEGRAL ROLE OF COMMUNITY HEALTH IN ACHIEVING UNIVERSAL HEALTH COVERAGE

Approximately half of the world’s population do not have access to essential health services.1–3 Recognizing the potential for community health to address gaps in coverage, financial protection, and access to quality care, the Declaration of Astana in 2018 committed to strengthening the role of community health in primary health care (PHC) as a means to accelerate progress toward universal health coverage (UHC).4,5 Before the Declaration of Astana, the transition from Millennium Development Goals to the Sustainable Development Goals (SDGs) also helped to reposition communities as resources for health systems strengthening and sources of resilience for individuals and families. A growing emphasis on the roles of communities recognizes community engagement, including community health workers (CHWs), as a means of realizing the full potential of PHC and the broader health system.6,7 CHW-delivered services are an integral component of responsive, accessible, equitable, and high-quality PHC.8 Countries are at the heart of the movement to renew political commitment for reenvisioned health systems that are capable of achieving UHC. Countries must mobilize the whole society—both public and private sectors as well as communities—as essential resources.4,9,10 There is a new urgency to design and operationalize the community component of PHC so that it can reach the most underserved, respond to pandemics, close the child survival gap, and accelerate the transformation of health systems in the next decade.

We underscore the significance of this special issue of Global Health: Science and Practice on community health, the first of its kind in the journal. The breadth of knowledge presented in this supplement exemplifies the progress made and persisting challenges in the global movement to redefine health systems and revitalize community-based PHC in the next decade. The 15 articles included in this supplement detail implementation experiences of designing, deploying, improving, scaling, and strengthening community health initiatives in PHC. The articles contain new methodologies, analysis, tools, and approaches that reinforce a systems-thinking lens in scaling and sustaining community health policies and programs in diverse contexts to achieve quality, equity, and efficiency. Learning from multiple countries and perspectives from across the globe, including findings on policy and practice and a new regional analysis from West and Central Africa and an update on financing trends in sub-Saharan Africa, highlight the challenges and opportunities in accelerating community-integrated PHC. Reflections on national progress from ministry of health representatives and key partners reinforce the urgent need to sustain political commitment, including addressing the financing gap and focusing on the “last mile.”

The knowledge acquired from these articles comes from implementing national priorities anchored in high-quality CHW platforms that were supported by collaborations such as the Integrating Community Health Collaboration (ICH) and the Community Health Roadmap.10,11 Several articles present the work of collaborators including ministries of health, nongovernmental partners, donors, and multinational institutions in the ICH collaboration, which the U.S. Agency for International Development, United Nations Children’s Fund, and the Bill and Melinda Gates Foundation supported in 7 countries (Bangladesh, Democratic Republic of the Congo, Haiti, Kenya, Liberia, Mali, Uganda). These articles provide an analysis of national directions that are needed to optimize policies and programs to engage communities and CHWs, and they demonstrate how local learning can strengthen linkages between communities and systems that improve quality, measurement, governance, and accountability in Bangladesh, Kenya, Liberia, and Mali.

To overcome barriers to achieving community health scale-up, more insight is needed into the functioning of community health programs (data and performance measures). Building on the ICH collaboration, a companion supplement in the Journal of Global Health (March 2021) focuses on the Community Health

---

* Joint first authors.
Correspondence to Charlotte E. Warren (cwarren@popcouncil.org).
Worker Performance Measurement Framework developed by the Population Council and includes cross-country analyses using newly developed scales on trust in CHWs, CHW motivation, and related performance metrics. The work presented in both supplements advances national dialogue and decision making around key recommendations and complements the World Health Organization’s Guideline on Health Policy and System Support to Optimize CHW Programs and the evidence generated in Exemplars in Global Health countries, both of which approach UHC objectives with the understanding that community members and community-based providers are critically important health system actors.

By synthesizing cross-country learning and showcasing the directions being taken by countries that are at the forefront, both of these supplements reflect the growing momentum to renew and advance the role of communities as the cornerstone of health systems. The intent is to use this emerging knowledge to bring an equilibrium to health systems with a greater community focus in the next decade.

THE UNIQUE OPPORTUNITY FOR COMMUNITIES TO ACCELERATE HEALTH OUTCOMES

This GHSP supplement highlights a systems approach that recognizes the unique roles of communities and their interaction with other health system actors to accelerate outcomes and reflect the diversity of the community health ecosystem. We highlight the cross-cutting priorities for integrating the community within PHC that emerge from the articles: coverage, community health financing, policy change, institutionalization, resilience, accountability, community engagement, and whole-of-society efforts.

Coverage of Populations

Multiple articles describe the results of developing assessment tools that support reform of community health systems and improve functional population coverage. Simen-Kapeu et al. conducted a bottleneck analysis of processes to strengthen and expand community health systems and strategies in 22 West and Central African countries; the analysis identified gaps in community health financing, lack of equipment and supplies, and limited community ownership. Morrow et al. used the CHW Coverage and Capacity (C3) Tool to identify the required number of CHWs and their time allocation in Rwanda and Zanzibar, describing the importance of optimizing CHW investments by understanding the context and existing opportunities to engage with decision makers and stakeholders. Chen et al. describe how the institutional health reform cycle can guide policy makers in identifying gaps and opportunities while coordinating input from multiple stakeholders to extend CHW program coverage. These studies provide additional evidence that the likelihood of achieving the SDGs increases as coverage of underserved populations accessing lifesaving interventions and commodities improves.

Community Health Financing

Globally, it is recognized that improved population health outcomes and economic performance are interlinked. Gichaga et al. reinforce this thinking and argue that an effective way for countries to build resilient health systems is to invest more in community-based PHC. For example, in sub-Saharan Africa, CHW investment has the potential to produce an economic return of up to 10:1. However, funding sources are rapidly shifting from being donor-led to a greater reliance on the domestic tax base in many countries, especially those entering middle-income status. Consistent with that accelerating shift, financing is described as a critical bottleneck to achieving maturity and scale in several articles. Saint-Firmin et al. analyze the distribution of reported expenditure, efficiency, and geospatial mapping in Mali to inform decision makers in transitioning to a domestically funded CHW program. They demonstrate where efficiencies could be found and targeted geographically to reach underserved communities. In Kenya, we see a need for additional research into the pathways through which health financing interventions support or hinder the success of community health programs.

Policy Change

Several articles, including those already mentioned, focus on policy change and explore the drivers of policy change in community health which, like any system, are complex at every level from global to regional and national to local. Hussein et al. and Healey et al. discuss the CHW policy development process in Liberia and Kenya. Two articles discuss how learning from vertical CHW programs drove evolution into broader and more integrated community programs. Palazuelos et al. describe adopting a community health model in 3 countries, broadening
from a focus on individuals with HIV, multidrug resistant-TB, and noncommunicable diseases to a whole-household approach. Napier et al. look at the successes of reducing malaria in Lao People’s Democratic Republic and Honduras and the need for expanding the roles and responsibilities of CHWs as community needs shift. Downey et al. stress the importance of orienting to policies that track CHW knowledge as a performance metric and that promote quality service delivery in CHW programs. Another critical policy priority is reducing CHW attrition by improving motivation and providing sufficient support.

Institutionalization
Institutionalizing community health within the PHC systems is also a common cross-cutting theme in the supplement. The institutional health reform cycle can guide policy makers in identifying gaps and opportunities, coordinating input from multiple stakeholders, to institutionalize CHW programing. Several articles explore the institutionalization of CHWs in terms of supportive supervision, remuneration, recognition, and referrals. Although the priorities vary across settings (e.g., career concerns, service delivery, and support), formal linkages to the broader health system are consistently important. Substantive change is more likely to occur when these performance domains of community health are institutionalized. Hussein et al. describe how the institutionalization of the community health services in Kenya occurred as a result of the extensive consultative process in developing the community health policy as well as increasing the visibility of the community strategy as a cornerstone of UHC.

Resilience
Other articles describe efforts to strengthen resilience and sustainability of community health as an effective layer of services in the health system. Several articles mention resilience of community health systems and CHWs especially in their response to earlier epidemics such as Ebola and polio and some success in mitigating the current coronavirus disease (COVID-19) crisis. Gichaga et al. describe how experience of contact tracing and home-based care by CHWs built on previous epidemics, but the high population density of informal urban communities make sustaining any gains a challenge. Healey et al. discuss how CHWs successfully responded to the Ebola virus disease outbreak of 2014–2016 in Liberia, which directly led to providing a strong platform for addressing COVID-19.

Community Engagement
Community engagement is a critical component within PHC. Community health has sometimes been incorrectly viewed as a field dominated by lay health workers and volunteers who move in and out of their positions in a state of impermanence. However, articles in this issue present evidence from across both the public and private sectors that are critical links in the broader health system and discuss CHW performance as essential for quality improvement. In particular, integrating community voices within monitoring and evaluation processes helps to triangulate with other data and galvanize policy makers to act. In some examples, processes were also developed to ensure information flows back to communities, improving both accountability and responsiveness. In Bangladesh, a community-clinic-centered-health service model helped to harmonize the work of different CHWs and improve accountability of both CHWs and community clinics to community members, which resulted in increased maternal health consultations and client satisfaction. In Mozambique, Amosse et al. discuss community engagement in setting up transport funds for obstetric and other emergencies. Community engagement, strengthening CHW capacity, and creating linkages with local transport infrastructure is critical to support access to the wider health system. Three articles describe specific challenges and opportunities on CHWs engaging communities around malaria, childhood malnutrition, and polio from diverse countries (Lao People’s Democratic Republic, Honduras, Tajikistan, and India).

Whole-of-Society Efforts/Linkages
We recognize the roles of communities and their interaction with other health system actors that have the potential to accelerate outcomes and reflect the diversity of the community health ecosystem. Healey et al. describe Liberia’s community health program’s journey to scale after the Ebola virus disease outbreak in West Africa, highlighting the critical role of policy entrepreneurs and the importance of capitalizing on windows of opportunity to build strong coalitions. Palazuelos et al. discuss a cross-country learning process and the experience of a near-facility CHW program building trust between communities and health care teams. Two articles describe experiences from Kenya and include an in-depth discussion
on the policy process over the last 15 years and the use of human-centered design to address a specific issue regarding the commodity supply chain among nomadic communities.

CONCLUSION

From the breadth of articles included in this supplement, it is clear that there is no single blueprint for strengthening a community health system but rather a range of processes, tools, and political commitment to support countries in their policy prioritization, financing, community engagement, and program rollout.

Community health is a significant component of PHC and driver of progress toward UHC, namely by expanding access to services, improving quality of interactions with the health system, and reducing out-of-pocket expenditure by promoting preventive health care. This year is important for reviewing national progress and country stock-taking. Translating the renewed political will and country roadmaps to strengthen the performance of a community-centered approach is fundamental to strengthening national systems that truly reach the most underserved, measure progress, increase equitable access to PHC, and ultimately make UHC a reality.

Acknowledgments/Funding: The authors wish to acknowledge the support of U.S. Agency for International Development and the Bill and Melinda Gates Foundation. This article reflects the views of the authors and does not represent the views of the U.S. Government or of the Bill and Melinda Gates Foundation.

Competing interests: None declared.

REFERENCES


31. Solomon R. The untold story of community mobilizers re-engaging a disengaged community during the endemic era of India’s polio eradication program. *Glob Health Sci Pract.* 2021;9(Suppl 1). CrossRef

Received: February 17, 2021; Accepted: February 17, 2021


© Warren et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-21-00125
The Untold Story of Community Mobilizers Re-engaging a Disengaged Community During the Endemic Era of India’s Polio Eradication Program

Roma Solomon

Key Messages

- Programs, no matter how vital, cannot be pushed into communities without proper information preceding them.
- People are suspicious of handouts especially when there is no rapport with the service providers. Misinformation will lead to suspicion and refusals.
- Good public health infrastructure engenders trust between the health service providers and communities.
- Policy makers need to realize that even the most disenfranchised have entitlements.
- Communication skills among the frontline workers are a must.
- Program managers would do well to interact with the decision makers in the community and take their inputs before planning any intervention.

BACKGROUND

In 1995, the India polio eradication program began in earnest as the Pulse Polio Initiative, targeting all children under 5 years old. The program dispensed the oral polio vaccine to children nationwide through campaigns at kiosks set up at fixed sites twice a year. The vaccine was badly needed because in the mid-1990s, an estimated 150,000 polio cases were reported annually in India.1,2 Starting with a well-advertised flourish, the campaign drew crowds. Because polio was a dreaded and visible disease, people were eager to get their children protected and came willingly.

However, it soon became apparent that many children were being missed in these national immunization campaigns.3 In 1999, the government decided to send frontline health workers (FLWs), such as auxiliary nurse-midwives and other government-trained workers, as vaccinators to people’s houses. The door-to-door campaign triggered larger scale suspicion because of the government’s previous family planning efforts at the cost of other public health and sanitation improvements. Local suspicion was fueled by the fact that children were still becoming paralyzed by polio after being vaccinated.2 In my personal conversations with community members, I realized that people seemed to be suspicious of government intentions when the polio vaccine was made available at their doorsteps because no other vaccine was so conveniently, freely, and repeatedly provided.

In states like Uttar Pradesh, vaccinators were met with refusals, sometimes accompanied by abuses and physical aggression as experienced by our own teams. By rejecting the vaccine, people also got a chance to vent their long-standing grievances against inefficient health services. First, the auxiliary nurse-midwives and later, the accredited social health activists, came under fire and bore the brunt of the refusals.

The much-touted “People’s Program” descended into what began to be perceived as a “Government Pogrom” corroborated by house markings left by the vaccinator—viewed as sinister symbols identifying certain populations. Was a certain community being targeted with a different vaccine? Did 2 drops of vaccine mean they could only have 2 children? This break in communication led to community disengagement.

Was it merely a refusal by people to accept the polio vaccine or was it something else?

The annals of war are usually written by generals and strategists, and many stories from the trenches remain untold. However, the soldiers return with tales of acts of valor, defeat, and victory—all contributing to not only the outcome of the war but, more importantly, a change in their personas. This is the story of a band of ordinary people who were hired to promote the polio vaccine—a seemingly innocuous task that turned into a war. How the war was won needs to be told so that the lessons can be used for other community interventions.
**CORE GROUP POLIO PROJECT EFFORTS IN INDIA**

In 2003, CORE Group Polio Project placed community mobilization coordinators (CMCs) at the frontline of this battle in Uttar Pradesh, the most populous and politicized Indian state and one of the first to become overtly hostile toward the polio program. The CMCs’ job was to support the FLW vaccinators by mobilizing families to accept the polio vaccine—a seemingly easy task because they were selected locally. All vaccines were given at both institutional and outreach sessions at predetermined sites, and parents would not need so much motivation to bring their children.

**FACTORS CONTRIBUTING TO VACCINE REFUSAL**

The community’s refusals of the vaccine, therefore, were most unexpected since the families knew the CMCs. As it turned out, the polio vaccine became the target of people’s anger, which stemmed from factors like substandard health service delivery leading to more out-of-pocket expenses, which in turn, affected their lives. Based on conversations with individuals in southern states in India, because good public health infrastructure had engendered trust between the health service providers and communities, the vaccine was not rejected because services had been provided to them as an entitlement and not as a handout. Polio was eliminated there sooner than in northern states like Uttar Pradesh and Bihar, where people had to spend money on private health care, leading to debt and poverty. A repeated, coercive, and “doorstep” vaccine campaign lit the spark that would trigger large-scale refusals.

Accompanying the FLW vaccinators in Varanasi, Uttar Pradesh, one day, we came across a weaver sitting at his doorstep, blocking our entry. Holding a beautifully woven piece of silk in his hands, he was crying with frustration and anger. He told us that the import of cheap Chinese artificial silk had flooded the market, killing the weaving industry to such an extent that he could not even buy food. Government policies like these would destroy the centuries-old craft that Varanasi was famous for, and impoverish its artisans. The weaver’s priority was food, not the polio vaccine. Barring India’s coercive family planning program of the 1970s, no other government initiative had evoked so much anger in recent times. To avoid another repeat reaction, the people needed to be heard, no matter how trivial their grievances may have appeared. It was also vital that communities received correct information about the polio vaccine and not assume that they would accept whatever was being offered.

Sometimes, the cause behind a refusal can be avoided. A CMC led us to a house where the husband had strictly forbidden any FLW vaccinator to enter, thus it had no door markings. When the wife opened the door and saw the CMC, she started shouting at us and told us to leave. Upon asking, she blurted out the reason behind her behavior. A couple of months ago, her son had developed paralysis of one leg. Because this was a symptom of polio, the surveillance officer took a stool sample from her son and left. The family was boycotted by the community because they feared that the son had polio. In fact, the son did not have polio. The parents demand for a letter or certificate clarifying that—a simple demand and logical step that could have been easily addressed—was never met. Not having the letter, in turn, barred all vaccinator visits, and all the children remained unimmunized.

There were many such instances where parents needed reassurance through reasoning that the vaccine would not harm their child. However, this effort required time and skill.

The CMCs were placed in the harshest places where the population was the poorest, most disenfranchised, neglected, unreached, migratory, and not registered in government records. To begin with, they were not trained communicators, just young girls, literate enough to collect and record data, most having never worked before. At the first residential training, some came accompanied by a sibling or parent. It had become clear that for them to succeed, they had to have people’s acceptance, therefore, their training concentrated on interpersonal communication skills, coupled with basic technical knowledge about vaccination and polio. They learned to talk to parents and seniors like mothers in-law and delve deep into their minds to understand where the negative behavior was coming from.

A very important component of their work was to support and accompany the FLW vaccinators from house to house, and this required a lot of mutual adjustment. The FLWs were older, experienced, and technically qualified, whereas the CMCs were younger, fresh out of school, or at home. However, both parties soon realized that close cooperation was the only means of succeeding. Their roles became clearer: the CMCs prepped the parents for the vaccine, and the FLWs delivered it. Thus, the CMCs earned a valid place for themselves in the program and became a vital resource for reaching people.

It soon became evident to the CMCs that making significant progress into homes would not be

---

*An ongoing U.S. Agency for International Development-funded initiative started in 1999 in India and other polio-endemic countries to assist governments in community mobilization and surveillance for polio through civil society organization consortia.*

---

The vaccine wasn’t rejected in southern India states because services had been provided to them as an entitlement, not as a handout.

CMCs—tasked with supporting FLWs in helping families accept the vaccine—realized that they had to closely cooperate with FLWs to succeed.
possible without the help of “influencers” who had a standing in the community such as village and religious leaders, local doctors, etc. These individuals agreed to accompany the vaccinators to address refusals and gave their time voluntarily. They held regular community meetings to answer questions, especially those pertaining to religious beliefs that were some of the hardest to address. The FLW vaccinators, being government appointed, were not accustomed to refusals. However, their air of authority quickly disappeared in the face of sullen or even aggressive reactions. The CMCs had a different skill set, more empathetic body language, and simple tools that calmed angry parents and explained why the vaccine was important for their children. The CMCs let the vaccinators do their job and promised to return to not only check on the child but also discuss other health issues since their training skill set now also included messages on water and sanitation, diarrhea management, antenatal care, breastfeeding, etc. These repeated visits to track children’s health and immunization started bringing down the barriers. Mothers’ groups were formed to discuss health issues. Fathers were accessed through other contacts like local barbers who were trained to initiate conversations about immunization in general and polio while they cut hair. Schoolchildren carried messages on the importance of hygiene to their homes.

All of these efforts helped to build bridges between the people and the program. Slowly, the polio eradication program began to be accepted and owned by those for whom it was meant. More importantly, the government functionaries and CMCs worked as a team, sharing their maps, material, and data with each other.

**CONCLUSION**

In summary, community engagement needs to be on the agenda of any public health program from the start and not viewed as a separate objective. In fact, it is the most valued indicator of success. The tide of acceptance of the polio vaccine turned with the realization that the most important people were actually those for whom the program was intended. This significant shift occurred when the people who were trying to change the community’s behavior realized that they themselves also had to undergo transformation in their own attitudes.

The CMCs had to pass on the skills that they had acquired through experience and practice to the FLWs, especially to the accredited social health activists who were closest to the communities. FLWs, whether from the government or elsewhere, had to change by perceiving the “beneficiaries” as “clients”—the latter designation garnering more respect. The FLWs also had to listen and respond to people’s other health complaints. This responsive climate became the new normal, building trust between the community and program staff until India was officially declared polio-free on March 27, 2014.

**Acknowledgments:** I would like to acknowledge the contribution of my secretariat colleagues: Jitendra Awale, Deputy Director; Rina Dey, Communications Director and Manojkumar Choudhary, M&E specialist, in reviewing the manuscript.

**Funding:** The author received consultancy support from the U.S. Agency for International Development (USAID) under Cooperative Agreement AID-OAA-A-12-00031. This consultancy support has covered the implementation of the CORE Group Polio Project. USAID was not involved in the writing of the manuscript.

**Competing interests:** None declared.

**REFERENCES**


Mind the Global Community Health Funding Gap

Angela Gichaga, Lizah Masis, Amit Chandra, Dan Palazuelos, Nelly Wakaba

Key Messages

- Community health workers (CHWs) play a critical role in bridging the huge human resources for health gap while providing both essential health services and pandemic response.
- The case for investment is strong but funding for this sector is limited and fragmented. The current funding gap for at scale CHW program in sub-Saharan Africa has increased from an estimated US$3.1 billion to US$5.4 billion annually but is still cost effective as the cost per capita remains low (US$1.50–US$13.00).
- To close this funding gap, political prioritization, supportive policies, programs designed to deliver, and reducing fragmentation of existing resources will be critical.
- Governments can achieve universal health coverage targets by building community health systems that are people centered and quality oriented.
- Funders should also take a systems approach and focus their investments toward building resilient and sustainable platforms of delivery.

COMMUNITY HEALTH SYSTEMS ARE CRITICAL

The value of community health workers (CHWs) cannot be overstated: they provide basic health care and health promotion within the communities they live. In sub-Saharan Africa (SSA), which has a gross shortage of health care workers of only 5 health professionals per 10,000 population—compared to a global threshold of 23 per 10,000—CHWs are part of the solution through task sharing and an increase in scope of work. Additionally, during the recent Ebola virus disease outbreak in West Africa and the global coronavirus disease (COVID-19) pandemic, CHWs played a critical role in mobilizing communities, finding active cases, and filling health service gaps.

DESPITE THE STRONG CASE FOR INVESTMENT, COMMUNITY HEALTH SYSTEMS ARE UNDERFUNDED

The community health financing landscape has changed immensely since we published a report in 2017 on closing the US$2 billion gap; more countries have begun their journey toward universal health coverage by launching ambitious countrywide community health programs and generating a wealth of primary programmatic data. As a result, following a comprehensive comparison of costs across national programs based on the available country data, the annual resource needs for at-scale community health systems in SSA has increased from US$3.1 billion to US$5.4 billion (Figure 1). The main driver of this cost is the increased coverage to include both rural and urban population. This cost comparison was considered across 9 countries (Figure 2).

Consequently, the average CHW to population coverage ratio in SSA was 1:680 and varied widely from...
FIGURE 1. Updated Annual Total Costs of At-Scale Community Health Worker Program Resource Needs in Sub-Saharan Africa, by Model US$Billions

<table>
<thead>
<tr>
<th>Model</th>
<th>Cost (US$ Billions)</th>
<th>CHW Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 million CHW Model (2015)</td>
<td>US$3.169 billion</td>
<td>560,000 more</td>
</tr>
<tr>
<td>Updated FAH Model</td>
<td>US$5.389 billion</td>
<td>to extend coverage to urban communities. This is the main driver of the cost difference</td>
</tr>
</tbody>
</table>

Key driving factors of cost are rural versus rural and urban coverage (62% versus 100% of sub-Saharan Africa population) and higher cost per community health worker (11% difference).

Abbreviations: CHW, community health worker; FAH, Financing Alliance for Health.

FIGURE 2. Cost Comparison of National Community Health Programs Across 9 Countries\(^a\) in Sub-Saharan Africa, GDP Per Capita, US$

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP Per Capita (US$)</th>
<th>Lower middle income</th>
<th>Upper middle income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malawi</td>
<td>397</td>
<td>536</td>
<td>9,6</td>
</tr>
<tr>
<td>Liberia</td>
<td>440</td>
<td>704</td>
<td>6.2</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>13.4</td>
<td>9.8</td>
<td>9.8</td>
</tr>
<tr>
<td>Country X</td>
<td>7.0</td>
<td>6.6</td>
<td>6.6</td>
</tr>
<tr>
<td>South Sudan</td>
<td>34.6</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Rwanda</td>
<td>773</td>
<td>820</td>
<td>6.9</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>4.5</td>
<td>8.1</td>
<td>8.1</td>
</tr>
<tr>
<td>Country X</td>
<td>18.8</td>
<td>6.1</td>
<td>6.1</td>
</tr>
<tr>
<td>South Africa</td>
<td>58.8</td>
<td>8.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Key insights:
- Diverse mix of countries with varying levels of economic potential and commitment to health
- Commitment to health does not depend on GDP

Abbreviation: GDP, gross domestic product.

\(^a\) Countries X and Y are masked - awaiting formal government approval to share the data.
~200–2,400 people per CHW.7 This implies that approximately 1.6 million CHWs are needed in SSA and a gap of more than 600,000 CHWs currently exists, assuming that the 1 million campaign was on target in 2015 (Figure 3). However, given that by September 2016, the available data from 37 countries in SSA showed that only 332,000 CHWs of the 1 million CHWs campaign existed1; this would translate to a CHW gap of about 1.3 million.

Despite the high total costs1 (unpublished data), this analysis demonstrated that community health programs at scale offer considerable value for the investments made (Figure 4); annual average cost per person served ranged from US$1.50–US$13.00 (Figure 5) and, as number of people served increases, cost per person served decreases, indicating greater cost efficiency with scale (unpublished data) (Figure 6). In comparison, a primary health care (PHC) system in low-income countries would cost between US$50–US$55 per capita per year.7

There are 4 main reasons why this gap in funding exists based on the available evidence as well as our experience working with governments on community health in SSA. We highlight these and propose solutions that could be a pathway to closing this funding gap.

1. Lack of Political Prioritization

Beyond the prevailing economic situation in a country, political prioritization greatly influences the allocation of resources. Diverse champions for community health are needed to advocate for support and increased funding. Juxtaposed in this is a myriad of competing health priorities1 and an ever-shrinking fiscal space. Maximizing on existing windows of opportunity, such as a budgeting process or favorable political climate, and providing evidence that supports the investment in community health to the influential champions would influence the allocation of resources needed in closing this funding gap.4

For example, in Ethiopia, strong political will in 2000s from then Prime Minister Meles Zenawi and then Minister of Health Tedros Adhanom Ghebreyesus ensured buy-in for the Health Extension Program of Ethiopia at all levels of government, including multisectoral collaboration. With approximately 40,000 health extension workers and about 4 million health development army volunteers, the program has greatly contributed to the more than doubling of immunization rate and contraceptive prevalence while also increasing skilled birth attendance by up to 10 times.4,8–11 This high political prioritization resulted in required financing from domestic resources as well as pooled and earmarked funding from donors—usually an uphill task given the rampant vertical and silo funding. However, in 2006–2010, the health extension program received more than US$180 million in pooled funding (Table).12–14

---

**FIGURE 3. Average Community Health Worker to Population Ratio in 9 Countries in Sub-Saharan Africa**

<table>
<thead>
<tr>
<th>Country</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rwanda</td>
<td>208</td>
</tr>
<tr>
<td>South Sudan</td>
<td>240</td>
</tr>
<tr>
<td>Liberia</td>
<td>349</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>417</td>
</tr>
<tr>
<td>South Africa</td>
<td>465</td>
</tr>
<tr>
<td>Malawi</td>
<td>613</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>1,345</td>
</tr>
<tr>
<td>Country Y</td>
<td>1,801</td>
</tr>
<tr>
<td>South Africa</td>
<td>2,307</td>
</tr>
</tbody>
</table>

a Excludes country Y in the average number; model only costed one cadre who play more of a supervisory role and that serve entire population but did not include volunteer CHWs because the program has not been costed. Costs are based on recurrent costs including commodities. Costs reflected are final year costs for the duration of the community health strategy (and hence final year of costing model). This assumes that at the final year, the program will be fully scaled, hence will have reached the steady state. Steady state costing values are adjusted to 2019 US$ for comparison. Countries X and Y are masked - awaiting formal government approval to share the data.
2. Lack of Supportive Policies, Strategies, and Investment Case Documents

It is critical to also document this political will in the form of a community health policy and a community health strategy, both of which should be linked to the overall national health policies and strategic development plans. Evidence shows that the effectiveness of CHW systems also depends on how well the rest of the health system functions because CHW programs are not “stand alone.” Hence, other levels of care, such as the PHC level, provide logistical support, supervision support, and adequate supplies for CHWs. Therefore, it is imperative that CHW programs are embedded within a functional PHC system.7

FIGURE 4. Community Health Annualized Program Costs Showing Salaries and Incentives as the Main Cost Drivers Across 9 Countries in Sub-Saharan Africa

Commodities and salaries/incentives were the main cost drivers accounting for between 50%–90% of costs. Countries X and Y are masked; awaiting formal government approval to share the data.

Key insights: overhead costs were relatively higher for countries with whole directorates; inclusion of mobile phones resulted in relatively higher costs; countries with longer training programs had relatively higher training costs.

FIGURE 5. The Average Annual Cost per Capita Served Across 9 Countries in Sub-Saharan Africa, US$ 

The annual average cost per person served ranged from $1.50–$13.0. Excludes country Y in the average number; model only costed one cadre who play more of a supervisory role and that serve entire population but did not include volunteer CHWs because the program has not been costed; costs are based on recurrent costs including commodities; costs reflected are final year costs for the duration of the community health strategy (and hence final year of costing model). This assumes that at the final year, the program will be fully scaled, hence will have reached the steady state. Steady state costing values are adjusted to 2019 USDs for comparison. Countries X and Y are masked; awaiting formal government approval to share the data.
FIGURE 6. Cost Efficiency of Community Health Programs With Scale in 9 Countries in Sub-Saharan Africa

As the number of people served increases, cost per person served decreases. South Africa is an outlier with both a higher population and higher cost structure for its community health program, which is based on high-cost ward-based outreach teams, a multidisciplinary platform integrated into primary care. Excluding South Africa, the trendline goes downward indicating economies of scale likely due to shared fixed costs.

TABLE. Funding Flows for the Health Extension Program in Ethiopia

<table>
<thead>
<tr>
<th>Description</th>
<th>Channel 1: Ministry of Finance</th>
<th>Channel 2: Ministry of Health</th>
<th>Channel 3: Outside of GOE Oversight</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of total health fundinga</td>
<td>50% (includes Government of Ethiopia and donor budget support funds)</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Key mechanisms</td>
<td>PBS: Pooled donor fund launched in 2006 to provide general budget support for basic services (across sectors) via federal block grants. ~20% of PBS at woreda level used in health, largely for HEW salaries, and some for procurement</td>
<td>M/SDGPF: Non-earmarked pooled donor fund for health sector support, launched in 2008. Scope of activities determined through consultative process and joint financing agreement each year. Funds supplies, training, construction (not salaries). Became SDGPF in 2015.</td>
<td>Flows from donors via implementing partners, largely outside of GOE oversight (but aligned with government strategies)</td>
</tr>
<tr>
<td>Major donor contributors</td>
<td>• PBS: CIDA, Italy, Netherlands, World Bank</td>
<td>• M/SDGPF: DFID, Irish Aid, Italy, Spain, Netherlands, Gavi, UNFPA, WHO, World Bank</td>
<td>• USAID, PEPFAR, CDC (largest)</td>
</tr>
<tr>
<td></td>
<td>• Other Channel 1: Austria, Spain, Irish Aid, UNICEF, UNFPA, WHO</td>
<td>• Other Channel 2: UNDP, CIDA, Italy, USAID, World Bank, Global Fund</td>
<td>• Most other bilateral and some multilateral donors provide some funds through channel 3</td>
</tr>
</tbody>
</table>


a Approximated based on Harvard/Ministry of Health data (2010). Estimates of % of funding through each channel are order of magnitude based on Harvard/Ministry of Health data from 2010. Indicative, not comprehensive.
Further, with these supportive policy frameworks in place, making the case for investment provides the evidence required to support resource mobilization, consequently reducing the funding gap. In South Africa, following the launch of the PHC re-engineering approach in 2012, which placed the ward-based outreach teams as an integral part of PHC, the National Department of Health commissioned the development of an investment case that provided the evidence to invest in the CHW program. All the interventions by the CHWs in maternal and child health, TB, HIV, hypertension, and diabetes demonstrated a decrease of 200,000 deaths and more than 4.8 million disability-adjusted life years averted over 10 years. Consequently, a saving of R30 billion (US$2 billion) could be made over the 10 years. Beyond the impact on health metrics, this investment case demonstrated a multiplier effect of 1.5 due to the additional salaries injected into the economy as well as additional gains of R143 billion (US$9.6 billion) to the gross domestic product from increased productivity due to the deaths averted over the 10 years. This evidence for investment facilitated decision making and resource mobilization; in 2017/2018, the PHC services in South Africa accounted for 30% of the consolidated national and provincial health budget.

The Financing Alliance for Health continues to support countries in developing community health strategies and investment cases as a part of key efforts toward closing this CHW funding gap.

3. Ineffective and Fragmented Existing Donor Funding Structure

Whereas a gap in funding needs to be addressed, how existing funding for CHW program is utilized is ineffective. The funding flows are heavily fragmented with many donors funding vertical programs. The majority (60%) of the CHW program funding in sub-Saharan Africa is from donors and most of this is for vertical, disease-specific programs. Between 2007 and 2017, only 2.5% of the total health-related development assistance was for CHW programs, and most of the funding was for vertical, disease-control programs (HIV and other sexually transmitted infections, 38.9%; malaria, 19.8%; and reproductive health, 9.3%).

Hsiao, a global expert in public health argued⁴:

more money for health is a necessary but insufficient condition to better health. Money can be transformed into equitable, efficient, and effective health care only when appropriate financing methods are used . . .

To overcome this fragmentation, national CHW programs must focus on designing integrated community health programs by ensuring that the programs are embedded within the PHC system as a

FIGURE 7. Health Impact of the Community Health Worker Program in Rwanda

Community health systems contribute to achieving universal health care, disease elimination, and SDG goals

- Reduces morbidity and mortality from preventable causes
- Necessary platform for reaching disease elimination targets (e.g., HIV 90-90-90)
- Reducing the risk of catastrophic pandemics (e.g., Ebola)
- Reduces strain on often overburdened health facilities

1.100,000 children screened for growth monitoring
170,000 low birth weight children referred for family planning initiation
900,000 children seen by midwives in 2015 only
240,000 pregnant women delivered
93,000 TB suspected cases referred to health facilities
linkage to the overall health care system, guiding the donors on the government priorities, and establishing mechanisms for accountability to encourage harmonization of donor funding.

Rwanda exemplifies this commitment of steering donors toward a unified vision. The government did not yield on their quest for channeling donor resources for horizontal PHC which contributed largely to their achievement of the health-related Millennium Development Goals before the target of 2015. Additionally, even though the Rwanda CHW program was heavily donor funded (87%), the government also allocated domestic resources (13% of total cost of CHW program) and set up other financing mechanisms, such as community-based health insurance and CHW cooperative societies, as a pathway toward sustainability (Figure 7).

A combination of community-based health insurance, community health workers, and good external partnerships led to the steepest reductions in child and maternal mortality ever recorded.—Paul Kagame, President of the Republic of Rwanda

4. Suboptimal Impact of Community Health Worker Programs

Unfortunately, recent evaluations of national CHW programs have revealed poor access, suboptimal quality in service delivery, and minimal impact on health indicators. This is because, beyond financing, CHWs programs must embrace a strong system design to be impactful. The patchy implementation that is common in SSA resulted in suboptimal impact. To ensure that CHW programs are effective, these 8 design principles and practices should be highly considered when designing national programs (Figure 8).

LESSONS LEARNED AND RECOMMENDATIONS

Over the past years, Financing Alliance for Health has learned several lessons in articulating the resource needs and advocating for closing the annual funding gap.

- Prioritize political economy: It is not about the economic conditions prevailing in a country but rather the political prioritization of health that influences resource allocation. The socioeconomic status of a country does not necessarily correlate with health expenditure. Higher country income may not always translate to higher government spending on health, and low-income countries can build robust and ambitious, yet affordable, health systems despite their limited resources (unpublished data) (Figure 9).
- Establish supportive policies, strategies, and program design: Financing follows well-designed CHW programs that are embedded within PHC and are supported by policies and strategies to ensure integration of services and hence efficient and effective use of resources. We recommend that governments consider the 8 key design elements for effective CHW programs.
- Develop a strong case for investment: In the context of limited resources and competing

- Mind the Global Community Health Funding Gap
Mind the Global Community Health Funding Gap

health priorities, making the case for investment would facilitate advocating for more resources as well as guiding key decision makers on the allocation of the scarce resources. The Financing Alliance for Health has supported many governments in SSA in doing this and is open to supporting more countries in taking this critical step toward closing the community health funding gap.

- Governments and donors should strongly invest in integrated CHWs program over verticalized programs: Having one guiding vision and working collaboratively with donors toward an integrated CHW program will result in equitable, efficient, and effective use of existing funding. Donors should take a systems approach and focus their investments toward building resilient and sustainable platforms of delivery. These must respond to the breadth of disease burden of a country and be systems focused, a stark contrast to the disease-specific, “vertical” set-up.

- Tap into funding beyond the traditional sources: We must shift the global financing architecture to reflect and be responsive to realities on the ground. Current funding is insufficient and fragmented, leading to inefficiencies. In fact, despite a common narrative that community health and PHC are the most important investments for achieving universal health coverage, development assistance for CHW projects has been small, unstable, and declining over recent years. Increased funding is needed, starting with governments meeting their domestic health spending commitments, such as the Abuja declaration,

which can in turn catalyze additional investments. There are massive opportunities to tap into capital markets and explore innovative approaches and instruments for health such as impact bonds, results-based financing, innovative private sector engagement, and blended financing. These efforts will help partner governments respond to the challenges of today, like COVID-19, and the communicable and noncommunicable disease challenges of the future.

CONCLUSION

Concerted effort and renewed focus is direly needed to establish a resilient PHC platform that can reach every person with an integrated package of services. This system will need resources from multiple stakeholders to be efficient, equitable, and sustainable.

To those who have considered such a vision too expensive in the past, one needs only to look at what has been lost economically and socially in light of the pandemic crises such as Ebola and COVID-19. The question is no longer can we afford to build strong health systems that fundamentally address vulnerability for everyone, everywhere? The question is can we afford not to?

Competing interests: None declared.

REFERENCES


Peer Reviewed

Received: October 5, 2020; Accepted: January 26, 2021


© Gichaga et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00517
Liberia’s Community Health Assistant Program: Scale, Quality, and Resilience

Jessica Healey,a S. Olasford Wiah,b Jannie M. Horace,a Dianah B. Majekodunmi,c Derry S. Duokieb

Key Messages

- Liberia’s national community health program went from dispersed pilots to nationwide scale within 4 years.
- A network of policy entrepreneurs from the Liberian government, donors, and implementing partners capitalized on several windows of opportunity to achieve this success.
  - First, they seized the evidence from a series of pilot projects and—during a point of significant global momentum around community health—evaluated the agenda.
  - Second, they leveraged the impact of the community health workers during the Ebola virus disease outbreak to propel forward a consolidated, paid cadre with significant political and financial backing.
- Policy makers and program managers should consider coalition building and identifying diverse champions as an essential ingredient for impacting large-scale change, even in the face of significant challenges.
- Liberia’s community health program is bolstered by significant research and evidence. However, the policy entrepreneurs who brought the community leaders, Government of Liberia stakeholders, donors, and partners around the table to buy into a common program has been the “secret sauce” of the program’s success.

INTRODUCTION

Liberia has weathered significant financial, economic, and social hardship including over a decade of civil war and a year-long outbreak of Ebola virus disease (EVD). Over half of the country lives in poverty. The country’s economic situation has been challenged by limited agricultural production and reliance on exports of raw materials, subject to global fluctuations in value. Given these challenges, how did Liberia transition from small-scale community health pilot programs to a government-led nationwide community health assistant (CHA) program in just 4 years?

We argue that this success and the emergence of the community health program as a central pillar of Liberia’s health strategy can be attributed to the convergence of ideas, interests, and institutions during significant windows of opportunity in Liberia. This catalytic and unifying change was driven by networks of “policy entrepreneurs”1,2 many of whom—in the Liberian government, among donors, and implementing partners—continue to guide and refine the strategy and program.

An important opportunity presented itself after community health workers were successfully mobilized to respond to the EVD outbreak of 2014–2016, thrusting the community program onto “center stage” in Liberia. During this period, community-based information systems for infectious disease surveillance and response were strengthened and integrated into the community health program. Leaders within the Ministry of Health (MOH), as well as funding and implementing agencies, capitalized on this momentum that led to the harmonized expansion of the program and contributes to the country’s ability to respond to the coronavirus disease (COVID-19) pandemic and other health threats as they arise.

THE NATIONAL COMMUNITY HEALTH ASSISTANT PROGRAM

CHAs are a formal, standardized, and compensated cadre of community health providers. They are supported by community health services supervisors within the community health structures such as community health committees. The CHAs serve as the backbone of the revised national community health services policy and plan for 2016–2021,3 which aims to extend the reach of the country’s primary health care system to provide a package of essential lifesaving primary health care services and epidemic surveillance within communities and to households on an equitable basis. CHAs—literate men and women who live in the communities they
serve—are selected by their respective communities. They receive training to deliver an integrated and standardized service delivery package, which includes promotive, preventive, and curative services and epidemic surveillance, to households located more than 5 km from the nearest health facility (estimated at 29% of the population as of the last census). CHAs provide health education; test for and treat malaria; provide family planning methods, oral rehydration solution, and zinc; refer pregnant women for antenatal care; assist in mass immunization campaigns; and oversee mass drug administration. Community event-based surveillance of infectious diseases became an important component of CHA training and responsibilities during the EVD outbreak and provided a strong platform for addressing the COVID-19 pandemic response.

By early 2020, the CHA program covered 80% of all communities outside of the 5 km radius of a health facility in 14 of the 15 counties of Liberia.4 The national report for 20195 highlighted the following achievements in the top priority indicators (Table). By June 2021, the CHA program is expected to achieve full county coverage of all targeted communities in all 15 counties. At the time of writing, the program has 3,448 CHAs (2,862 male [83%] and 586 female [17%] and 373 community health services supervisors (191 male [51%] and 182 female [49%]). CHAs have not only expanded the reach of primary care into remote villages but have also contributed to improvements in maternal and child health, as reflected in the 2019/2020 Liberia Demographic and Health Survey that noted a considerable increase in skilled birth attendance and facility deliveries.6

For its achievements to revitalize primary health care through the national community health program, Liberia has garnered global recognition,7 including being nominated to host the next Global Community Health Symposium. Liberia’s new National Community Health Services Policy (2021–2027) is poised to tackle the unfinished agenda focusing on national scale, quality, resilience, and sustainability. Liberia’s ambitions and experiences in adapting, innovating, and institutionalizing the national CHA program at national scale can serve as valuable lessons for countries in the midst of boldly redefining and reforming their community health platforms.

### FACTORS CONTRIBUTING TO CHA PROGRAM SCALE AND SCOPE

The CHA program’s success was determined by 3 major factors: (1) foundational success with community volunteers through a series of pilots coupled with global momentum, presenting an opportunity for consolidation of policy and programs; (2) emergence of community health workers as the champions of the EVD crisis, presenting another opportunity for large-scale change; and (3) significant leadership from policy entrepreneurs at the community to executive levels who drove change and propelled unity of focus and purpose.

#### 1. Foundational Success With Community Health Volunteers and Global Momentum

Like many countries, Liberia’s initial focus in community health was largely on malaria, pneumonia, and acute respiratory illness with unpaid
volunteers, called general community health volunteers (gCHVs). The implementation was through various models supported by different partners, some that aligned with the 2011–2015 policy8 and focused more squarely on integrated community case management (iCCM) and some that explicitly went beyond the bounds of the current policy (e.g., offered remuneration for gCHVs).9 These pilots produced largely robust, positive results and demonstrated that lay community members with basic training and supervision could deliver information, testing, and referrals for malaria, pneumonia, and diarrhea.

The Minister of Health at the time, the Honorable Dr. Walter T. Gwenegale, visited a remote pilot site in Grand Gedeh County and contributed to the momentum and leadership behind the 2010 version of the community health policy that included a harmonized iCCM training, gCHV treatment registers, and the initial tools for the community health information system. As early as 2011, Dr. Gwenegale coauthored an article suggesting that10:

> a substantial rural health delivery gap remains, but it could be bridged with a robust cadre of community health workers integrated into the primary health care system.

Building on this early program infrastructure, 4 partners (Africare, EQUIP, International Rescue Committee, and Child Fund) received MOH approval for their proposals to expand the pilot phase in Gbarpolu, Lofa, Nimba, and Bong counties. The pilot trained 114 gCHVs in 93 catchment communities. These iCCM pilots laid a foundation to develop a scalable model for engaging communities in primary health care systems through strengthening and reestablishing community governance structures.

In 2015, Liberia finalized its Community Health Roadmap, which was an important coalition building process in its own right, bringing in 100 participants from 50 organizations, government, and nongovernmental programs, including the MOH departments, county health team representatives, United Nations agencies, bilateral and donor agencies, and local and international nongovernmental organizations. The roadmap began addressing the major components of the future policy, including standardized incentives, a draft service package, and integration across other systems, and paved the way for many of the “policy entrepreneurs” to further network and solidify ideas and aspirations for the program.

This early work built on global momentum to prioritize community health emanating from the global campaign, led by Jeffrey Sachs, for 1 million community health workers by 2015, which was helpful for bringing the international community squarely to the table.11

### 2. Emergence of Paid Community Health Workers as the Champions of the EVD Crisis

By the height of the EVD epidemic in 2014, the MOH changed its strategy from a largely top-
Global Health: Science and Practice 2021 | Volume 9 | Supplement 1

BOX 1. Spotlight on Current Director of the Ministry of Health Community Health Services Division

Mr. S. Olaford Wiah, co-author and Director of the Ministry of Health Community Health Services Division, recalled a period when he was the HIV/TB focal person in River Gee County as the turning point in his career. One of his patients with HIV, who lived in a remote village and to whom he was particularly close, died along with her baby after prolonged labor. At that time and during that period of grief, he learned about the integrated community case management pilots and was appointed as County Community Health Department Director. That is when he decided to focus on community health and “do all it takes to strengthen local community structures.” He noted, “I strongly believe that if there was a community health worker in that village, my patient would be alive today.” Mr. Wiah has since been a driving force behind the scale-up of the community health assistant program.

down, directive approach that was not achieving results to a bottom-up approach, engaging more with the communities to listen and find solutions. The approach utilized the governance system at the subnational level to consult with local leaders including chiefs, traditional leaders, and other community groups and employed multimedia strategies to address traditional practices that were putting people at risk.

Although development partners came to consensus on how to engage communities through local structures and gCHVs, there was no common guidance on tools and incentives. Development partners introduced incentives at varying amounts to social mobilizers, community engagement officers, and contact tracers. By the end of the outbreak, it became clear that with an appropriate motivation package and adequate supervision, CHVs could deliver quality services. It also became clear that the various proposed incentives, tools, and approaches were creating inflated expectations and some chaos within the community health program. It was widely seen as not feasible to revert to a voluntary system or one with ad hoc, limited supervision.

The success of CHVs who supported social mobilization, community engagement, and contact tracing during the EVD crisis were lauded at the highest levels. In her remarks at a U.S. Senate Foreign Relations Subcommittee Hearing, President Ellen Johnson Sirleaf stated:

I could not agree more about building local capacity. Our 10-year health workforce plan is about building capacity at all levels, particularly at the bottom. It’s like a pyramid. We will train . . . community health workers to provide basic services . . . we are going to make the final push to fight Ebola now by supporting community workers to get the job done.

This support provided an opening for the new community health program and CHAs to be institutionalized, with common training, deployment tools, and supervision structures (Box 2).

By the close of 2015, the previous policy was coming to an end. After a global review, the MOH arrived at paying the CHAs US$70 monthly. The new National Community Health Services Strategic Plan 2016–2021 institutionalized the CHAs and their community health services supervisors.3 As the EVD outbreak ended, a new policy was launched, reflecting Liberia’s vision for a stronger role for communities in the primary health care system by including paid and supervised CHAs, community governance structures, and a community-based information system.13

3. Strong Leadership From Policy Entrepreneurs

Without the unrelenting leadership from communities to the highest levels of the national government, the national CHA program could not have been harmonized, scaled up, and continually adapted for quality and sustainability through changing administrations. During the pilot process and earlier periods, Mr. Tamba Boima, Director of the MOH Community Health Services Division during the EVD outbreak, catalyzed early successes of the pilot and built on the political leadership of Liberia’s Minister of Health and President to bring the technical components and partners together in a common plan. By highlighting community health as a flagship program, President Sirleaf paved the way for significant MOH support from donors and development partners.

As the program was developing, the MOH-led orientation and advocacy meetings with heads of ministries and agencies (ministries of youth and sports, internal affairs, gender, and child protection, etc.), county superintendents, and district commissioners gained widespread buy-in from political and traditional leaders. This leadership continues to bring diverse partners together, providing a platform for focus, financial, and
MOH leadership across all levels that sought integration of core health services and systems into the community health program was important and likely bolstered the program’s longevity and resilience in the face of political and country changes.

The CHA program is widely viewed as a realistic entry point for other innovative work being introduced in Liberia.

---

**BOX 2. Spotlight on Previous Ministry of Health Leadership**

Dr. Bernice T. Dahn, in her role as chief medical officer and Deputy Minister for Health Services, was another driving force behind the consolidation of many community health volunteer programs into the community health assistant program. During the early stages of the Ebola virus disease outbreak in 2014–2015, Dr. Dahn coordinated the national response to the epidemic. Upon establishment of the incident management system, she focused on community-based initiatives and restoration of routine health care services. Community health services was at the center of this effort to mobilize communities to restore and rebuild trust in the health system. Under the leadership of Mr. Tamba Boima, Director of the Ministry of Health (MOH) Community Health Services at the time, the MOH led several community engagement and dialogue sessions with community leaders and catchment communities and service providers. These sessions informed national stakeholders about the many resources and solutions available at the community level and provided lessons on how to promote partnerships with these communities for future outbreaks.

---

technical support. These partners included U.S. Agency for International Development (USAID), the World Bank, Last Mile Health, United Nations Children’s Fund (UNICEF), Partners In Health, Samaritan’s Purse, Co-Impact, and the Global Fund. The significance of this number of funding partners and the investment in a common program cannot be overstated.

Although there were central figures who drove the overall program implementation, the leadership across the MOH from national to sub-national levels that pursued the intentional integration of core health services and systems with the community health program was equally important and likely bolstered the program’s longevity and resilience in the face of political and country changes. For example, the new community health program was integrated into human resource guidelines, information systems, supply chain protocols, and the country’s research agenda. The MOH leaders’ actions to intentionally integrate the program created more government ownership of the program, made it less of a temporary “donor” program, and made the program more resilient to future changes.

The current Director of the MOH Community Health Services Division, S. Olasford Wiah, has maintained this momentum and focus by conducting routine reviews, forming a MOH-led steering committee, and developing a new “One County, One Partner” 2020 plan* that ensures each county’s CHA program is harmonized, national CHA program steered by strong leadership and regular reviews brings health closer to the Liberian people. Today, the CHA program is widely viewed as a realistic entry point for other innovative work being introduced in Liberia including Sayana Press, a unject family planning method, mental health services, and treatment for severe malaria among young children before referral.

Nevertheless, significant challenges remain. Variations between implementation in different counties due to different partners remains, despite having a harmonized plan and policy. The supply chain challenges that plague the overall health system also impact commodities and supplies for CHAs and represent a significant bottleneck to overall implementation. Supervision structures are frequently weak, which hampers the quality of care provided. Routine changes with payment and support for the CHAs due to funding gaps or other challenges continue.5

One significant future challenge is that the CHA program depends almost entirely on donor funding. Even though some salary support from the government is in place, the program cannot

---

*This leadership brought Global Fund onboard to support Bomi, Margibi, and additional areas of Lofa and Nimba. With the new “one county, one partner strategy,” the World Bank will support Gbarpolu and Grand Cape Mount; Last Mile Health will continue in Rivercess and expand in Grand Bassa. Global Fund will expand in Nimba, Margi, Montserrado, and Bomi. USAID will expand in Lofa and Bong by 2021. At the time of writing, the support for Grand Gedeh, River Gee, Maryland, Grand Kru, and Sinoe is under discussion.
provide sufficient training and supervision. The program has held together and grown stronger through several different donor funding cycles. The World Bank, UNICEF, USAID, and the Global Fund all went through new strategy processes and made new funding decisions within the past year; all maintained or increased their support for the CHA program.

However, this external support is not a guarantee. Stakeholders and the MOH routinely express a need to increase domestic funding to ensure the sustainability of this important program, but with Liberia’s limited fiscal space, it is unlikely this is on the immediate horizon. Liberia will have to think creatively about sustainability beyond full financial coverage. This could involve graduating communities from the program that have reached a certain level of program achievement or integrating resource mobilization strategies into the CHA program.

Another challenge is the harmonization and integration of the gCHV program for service delivery within 5 km into the overall national strategic plan. More than a third of Liberia’s population lives in urban centers that have different but significant health needs. The MOH is advocating for a CHA approach within these urban centers to address the needs and maximize the efficient use of resources for a clearly defined, singular program.

Critical to overcoming these challenges is renewing and expanding political support across the government and down to the community level for the CHA program, particularly as leadership changes. Some of the new political leadership is not aware of the long history and buy-in for the community health program and see it as a “donor activity.” Without strong domestic political support, the national CHA Program is in a precarious position to garner greater financial support from the Government of Liberia and to maintain donor commitment.

In November 2021, Liberia will host the next Global Community Health Symposium. The MOH, its partners, and supporters are planning internal advocacy in advance of the symposium to improve this buy-in and rekindle the broad commitment. This provides an important opportunity for Liberia to share its lessons learned with other countries and to gain insights from other country programs. It also provides the program in Liberia with an important opportunity to further bolster the political engagement, particularly among leaders outside the MOH, with the CHA concept and the critical role the community health program plays in the health sector.

Ebola and then COVID-19 illustrated the power and resiliency of frontline workers to adapt in the face of new needs and challenges. New diseases will continue to plague both Liberia and the world. All eyes must remain on those community-based workers as the foundation of our health system for maternal and child health services and for epidemic preparedness.

Acknowledgments: The community health assistants who bring counsel, diagnostics, medicine, and supplies to their communities and the leaders who stood behind the program provide the inspiration to tell Liberia’s story. A special thanks to the leadership of the Ministry of Health and our financial and technical partners in the community health assistant program in Liberia who have banded together through changes and challenges and continue to adapt and push forward. Another special thanks to Nan Chen of Last Mile Health for valuable feedback and guidance as well as input from the Liberia Global Exemplars publication.

Funding: The U.S. Agency for International Development (USAID) funds support the community health assistant program through several partners including International Rescue Committee and Last Mile Health. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or the USAID.

Competing interests: None declared.


COMMENTARY

Institutionalizing Community Health Services in Kenya: A Policy and Practice Journey

Salim Hussein, a Lilian Otiso, b Maureen Kimani, a Agatha Olago, a John Wanyungu, a Daniel Kavoo, a Rose Njiraini, c Sila Kimanzi, d Robinson Karuga b

Key Messages

- Institutionalizing community health services is a long journey that involves developing relevant policy documents that align with national and global priorities and have the support of political stakeholders.
- A legal framework and continuous engagement with leaders of subnational units is important to ensure standardization, institutionalization, and financing of policies.
- Policy should be informed by evidence generated from within the country to understand what is working well and address challenges that may limit implementation.
- Engage multiple stakeholders to use a multisectoral approach and to harness their various strengths to support policy development.

INTRODUCTION

Kenya has made tremendous progress in institutionalizing community health services at the policy and practice level. The last 5 years have been particularly instrumental as this period also coincided with key changes globally and in Kenya. Globally, the push for universal health coverage (UHC) since the United Nations declaration of 2012 1 and the refocus on primary health care (PHC) from the Alma Ata declaration of 19782 and the Astana declaration of 20183 has been instrumental in informing Kenya’s more recent policy priorities as the country signed onto them.

In 2017, the Kenyan President made UHC a priority as part of the Big Four Agenda for development4,5 to ensure all Kenyans could access the services they required without experiencing financial hardship. This progress would not have been possible without strong government leadership and a strong partnership and engagement with devolved subnational governments, referred to as counties and other stakeholders.

In Kenya, community health volunteers (CHVs) are key for delivery of PHC services and UHC. This cadre of lay health workers gained prominence after the Alma Ata Declaration of 1978.2 In response to declining health indicators from the 1990s, Kenya’s Ministry of Health (MOH) first launched the Community Health Strategic Plan in 2006 (Figure).6 The strategic plan focused on providing community level health services for all, building the capacity of the community health extension workers (CHEWs), strengthening health facility-community linkages, and strengthening the community to progressively realize their rights for accessible and quality care.

In 2014, the MOH operationalized the second national health sector strategic plan (2014–2019),7 which aimed to further reverse declining health indicator trends. This revised strategy focused on improving the delivery of integrated, comprehensive, and quality community health services for all population cohorts; strengthening data demand and information use at all levels; and bolstering mechanisms for resource mobilization and management for sustainable implementation of community health services. Community units—identified as the basic geographical unit for delivery of basic health services (health prevention, promotion and education, targeted disease prevention, and basic curative services)—comprised 5,000 people or 1,000 households. Each community unit was served by CHVs that were supervised by CHEWs. The second strategy also addressed gaps in attrition of CHVs and recognizing the heterogeneity of the country when implementing the strategy.

Despite having a revised strategy, the implementation of full community health services at the county level was hampered by lack of a community health policy that served as a legal framework.8

This article is based on reflections of the policy makers (leadership of the Division of Community Health in the MOH), donors, and implementing partners who were involved in the processes that have led to institutionalizing the
community health services. We describe how development of the community health policy has contributed to institutionalization of community health services and increased the visibility of the community strategy as a key pillar toward achieving the UHC and PHC priorities in Kenya.

THE COMMUNITY HEALTH POLICY

In July 2020, Kenya launched its first Community Health Policy 2020–2030 alongside the Primary Health Care Strategic Framework 2019–2024 at an event led by the Cabinet Secretary for Health in recognition of the key role that CHVs play in delivering PHC services.

The policy’s key objectives are to provide guidance for establishing and implementing a strong, comprehensive, integrated, equitable, holistic, and sustainable community health structure in Kenya (Table). The policy provides the legal framework to facilitate implementation and achievement of 100% coverage with community units and recognition of community health personnel by the counties. This policy addresses issues such as recruitment, remuneration, training, and deployment of the community health workforce and a stronger community health information system.

Key Factors That Contributed to the Successful Establishment of the Policy

We identified 4 factors that had the most significance in ensuring successful policy development and ensuring progress in institutionalizing community health services. These factors were the result of reflection and iteration of various factors that arose during the writing of the article.

1. The Importance of Context (Devolution/Decentralization)

In 2013, Kenya devolved health and other services from the central government to 47 new subnational governments known as counties, which are semiautonomous units responsible for implementation of health services. The national government is responsible for training and development of policies and guidelines. Devolution presented a number of challenges, including the differences in how counties implemented the second 2014–2019 community strategy. Some county leaders did not recognize the CHVs’ role in the health system. Other counties developed their own models of the strategy and overhauled the entire program with varying levels of success. Some counties served as model counties by establishing mechanisms for remunerating CHVs (Siaya County), and others adapted the strategy to prioritize their health needs. The varying implementation of the community strategy highlighted to the national MOH the urgent need for development of a national community health policy in response to the changes to the legal policy and institutional framework governing the health sector. This policy would be informed by county priorities and would enable buy-in and implementation by counties.

2. Evidence-based Policy Making

Community health policy and guidelines development in Kenya has been informed by research and...
evaluations conducted by the MOH in partnership with various stakeholders. The first strategy (2006) was informed by implementation research that demonstrated improved health indicators due to work performed by CHVs. After the first 5 years of scale-up, a countrywide evaluation revealed that the strategy was successful in improving indicators such as hygiene, sanitation, uptake of antenatal care services, and child health (immunization and diarrhea). The evaluation also identified high CHV attrition due to lack of a reward or remuneration system, inadequate empowerment of community members, and weak accountability and governance structures.14

After this evaluation, the 2014–2019 community strategy was defined, recognizing the challenge of nonremunerated CHVs and proposing a monthly stipend equivalent to US$20. It proposed a new structure for the community unit with fewer CHVs and 5 CHEWs who could provide health promotion and basic curative services at the household level. The revised strategy also recognized the need for adaptation of the strategy based on the diverse socioeconomic and ecological contexts seen in the country (i.e., urban, agrarian, nomadic, and pastoralist communities).7 In 2015, various stakeholders in all counties conducted a national evaluation that provided the evidence demonstrating the need for a community health policy, due to the lack of a legislative framework, that counties could use to advocate for and budget for CHV remuneration and other CHS costs.15

A 2018 national assessment of the community health strategy in the 47 counties (unpublished) found that most counties did not have specific community health policies or guidelines, and they relied on the national guidelines and the constitution to guide their community health planning. About 10 counties had a community health bill (legislation to recognize CHVs in law). About two-thirds of the counties reported allocating funds for community health, albeit inadequate. A third of the counties reported providing financial incentives to CHVs although this was inconsistent. The assessment identified challenges related to the varied implementation of community strategy across counties: varying number of CHVs per community unit, training, and supervision structures; lack of budgetary allocation and proper utilization of funds for community health in most counties.

<table>
<thead>
<tr>
<th>General Objective</th>
<th>Specific Policy Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>To provide policy guidance for the establishment and implementation of a strong, equitable, holistic, and sustainable community health structure</td>
<td>Secure effective leadership and governance in the formation, maintenance, and management of community health structures and participation mechanisms</td>
</tr>
<tr>
<td>Ensure the recruitment and retention of community health human resources for health, including obtaining appropriate numbers and strengthening mechanisms for capacity building and supportive supervision of community health personnel</td>
<td>As per the community health strategy, ensure provision of high-quality community health services at the household and community level, including referral and follow-up services</td>
</tr>
<tr>
<td>Support the development and strengthening of community-based health information system and the monitoring and evaluation of systems to sufficiently inform the implementation of community services at all levels</td>
<td>Promote and strengthen supply chain systems for community health that are integrated into the government-led reporting systems and that link facilities including the use of available technology</td>
</tr>
<tr>
<td>Provide various mechanisms for mobilizing, managing, and appropriately allocating resources for sustainable financing and delivery of community health services at all levels</td>
<td>Provide for community health services and human resources data and knowledge management that will inform evidence-driven decision making</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE. Summary of the Community Health Policy Objectives, Kenya6</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Objective</strong></td>
<td>To provide policy guidance for the establishment and implementation of a strong, equitable, holistic, and sustainable community health structure</td>
</tr>
<tr>
<td><strong>Specific Policy Objectives</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1. Leadership and Governance</strong></td>
<td>Secure effective leadership and governance in the formation, maintenance, and management of community health structures and participation mechanisms</td>
</tr>
<tr>
<td><strong>2. Community Health Workforce</strong></td>
<td>Ensure the recruitment and retention of community health human resources for health, including obtaining appropriate numbers and strengthening mechanisms for capacity building and supportive supervision of community health personnel</td>
</tr>
<tr>
<td><strong>3. Service Delivery</strong></td>
<td>As per the community health strategy, ensure provision of high-quality community health services at the household and community level, including referral and follow-up services</td>
</tr>
<tr>
<td><strong>4. Community-Based Health Information System</strong></td>
<td>Support the development and strengthening of community-based health information system and the monitoring and evaluation of systems to sufficiently inform the implementation of community services at all levels</td>
</tr>
<tr>
<td><strong>5. Health Products and Technologies</strong></td>
<td>Promote and strengthen supply chain systems for community health that are integrated into the government-led reporting systems and that link facilities including the use of available technology</td>
</tr>
<tr>
<td><strong>6. Financing for Community Health</strong></td>
<td>Provide various mechanisms for mobilizing, managing, and appropriately allocating resources for sustainable financing and delivery of community health services at all levels</td>
</tr>
<tr>
<td><strong>7. Monitoring, Evaluation, Research and Community-Based Surveillance</strong></td>
<td>Provide for community health services and human resources data and knowledge management that will inform evidence-driven decision making</td>
</tr>
</tbody>
</table>
with reliance on donors or nongovernmental organizations (NGOs) in others; low quality of community health services due to lack of training, commodities, supervision, and quality improvement of CHWs; and poor coordination of partners/stakeholders including funders at the county level. Finally, lack of a legal framework to sustain the funding for community health services at the national or county level was a common and urgent problem similar to that identified in the 2015 evaluation and informed the need to expedite finalization of the community health policy that had been in development since 2016.

3. Stakeholders’ Engagement
The policy’s development and launch was a result of concerted efforts since 2016 by many stakeholders, including the county governments and partners led by the MOH. The community health program has benefited from support from various stakeholders at the national and subnational levels including development partners such as United Nations Children’s Fund (UNICEF), U.S. Agency for International Development (USAID), NGOs, religious bodies, community-based organizations, and community leaders. This has been in line with recommendations from various global guidelines.16,17

In 2017, Kenya’s MOH officials and stakeholders, including UNICEF, USAID, and NGO representatives that are members of the Community Health Technical Working Group, attended the first Institutionalizing Community Health Conference in Johannesburg, South Africa. This delegation developed an action plan toward institutionalizing community health in Kenya, reflecting on progress made, key challenges, and priorities for achieving goals based on their knowledge of the Kenyan community health landscape.

The stakeholders set 3 priority objectives that have contributed to the institutionalization of community health described in this article.

1. Finalize the Community Health Services Policy: The progress had begun in 2016 but had stalled and needed engagement with counties for input and finalization.
2. Conduct an assessment/evaluation of Kenya’s community health services: Although the revised community strategy had been launched in 2014, it had been developed prior to devolution and was due for a review that would meet the varying needs of counties. This process informed an evaluation in 2018 that is being used to revise the strategy that is ongoing at the time of submission of this article.
3. Increase the visibility of community health services: Stakeholders felt that community health services in Kenya were not prioritized beyond the Division of Community Health Services or adequately financed by the MOH and other donors14 despite being in existence and mentioned in several government policy documents since 2006. At the time of the conference, the MOH Community Health and Development Unit only received salaries from the government and completely relied on donors and NGOs to conduct operational activities in their work plans. In addition, although the community strategy had been in place since 2006, it was not recognized, integrated, or budgeted for across all program areas and priority government initiatives, including Linda Mama (free maternal health care) and UHC programs that had been rolled out by the government.

The stakeholders agreed to utilize all opportunities to advocate for CHWs in all programs.

The action plan helped to synergize and catalyze efforts toward strengthening and institutionalizing community health services in Kenya by all stakeholders. The MOH Division of Community Health Services regularly convened stakeholders through technical working groups to conduct a national evaluation of the community strategy and support the development of the policy and other relevant policy documents and guidelines. Throughout all these processes, county governments were engaged to provide input into the development as they are responsible for the implementation of the community health strategy in the county. The result has been national documents that have input from a wide range of stakeholders and are likely to be sustained.

4. Political Leadership and Alignment with Political Priorities
The role of politics in informing health policies and financing cannot be understated.18 The stakeholders involved in developing the community health policy recognized that for community health to be integrated and institutionalized in the health system in Kenya, there had to be buy-in from the top government leadership. They identified opportunities or policy windows19 that had presented themselves to support recognition of the community strategy. The most important was the UHC agenda.
As part of the Kenya President’s Big Four Agenda for development 2017–2022, the UHC agenda aims to ensure affordable and quality health care for all and specifically mentions scaling up CHVs as a priority initiative. The Cabinet Secretary for Health attended the Global Conference on Primary Health Care in Astana, Kazakhstan, in October 2018, and Kenya endorsed the declaration on PHC that prioritized working with CHWs. The Primary Health Care Strategy 2019–2024, which incorporates CHVs as members of the multidisciplinary team at the PHC level, is set to drive the UHC agenda in Kenya. The Cabinet Secretary for Health has committed to prioritize institutionalization and integration of community health in all health policies.

The 47 county governments have all endorsed the UHC agenda, the Primary Health Care Strategy, and the Community Health Policy as a result of the political buy-in from the President and the Cabinet Secretary for Health. This has resulted in increased commitments from counties to prioritize and budget for CHVs and other community health cadres in their counties.

**Milestones in the Journey to Institutionalizing Community Health Services**

The consultative process of developing the Community Health Policy began in 2016 and was completed in 2020 following several consultative meetings with the county governments. Other policy level events happened in tandem, which strengthened the community health system and advocacy. First, finalization of the National Kenya Health Act institutionalized the community level as tier 1 in the health system. Second, publication of the Investment Case for Community Health Services demonstrated a 9.4 to 1 return on investment when Kenya invests in community health services. This was similar to global investment cases that showed that investing in community health can generate up to 10 times return on investment and was key to supporting advocacy efforts to finance community health at the national and county government level. To ensure quality of CHW programs, the USAID SQALE project developed a mechanism for implementing quality improvement at the community level by adapting the Kenya Quality Model for Health.

Some of the key milestones to date that resulted from the processes undertaken by the MOH and its stakeholders to institutionalize community health in the health system are described here.

1. The CHVs have played a significant role in the coronavirus disease (COVID-19) pandemic response in Kenya. With training and support from the MOH and stakeholders, they have supported infection prevention control, contact tracing, and home-based care. This has gained them recognition and special mention by the Cabinet Secretary for Health, county governors, and the President on many occasions. We anticipate that this will cement the financing of the CHW programs and further institutionalization.

2. In line with the community health strategy, the government has disbursed funds to train 31,780 CHVs to increase coverage of community units to 100% nationally. The government has also committed to train and recruit 2,000 salaried CHEWs through government-owned Kenya medical training colleges across the country.

3. The MOH is working with the Senate on the Community Health Services Bill, which will anchor the community health services and formally recognize tier 1 services, giving it a legal mandate to be funded by counties. This will augment the existing county-level community health service bills that have given CHVs recognition and will allow them to earn a stipend in some counties.

4. There have been advancements in developing systems and strategies to strengthen community health services. The following are ongoing processes at the time of publication of this article: development of a revised community strategy (2020–2025) that incorporates findings from the national evaluation; development of community-based surveillance system to enhance early identification of outbreaks at community level; and digitization of the community-based health information system—electronic CHIS (E-CHIS).

**Challenges in Institutionalization of Community Health Services**

Despite the gains made in institutionalizing community health in Kenya, a lot of work still needs to be done by the MOH and stakeholders to sustain these gains. Some of the priority activities are listed here.

- **Sustained advocacy for funding for community health services from domestic sources (national and county level) by MOH staff, NGOs, and development partners.** This will supplement the financial support received from bilateral and multilateral funders.
- **Completion of the legislation processes to ensure community health services are delivered** with training and support from the MOH, CHVs played a significant role in the COVID-19 pandemic response in Kenya.
and financed through legitimate and sustainable policy frameworks.

- Strengthening of accountability mechanisms at different government and health system levels starting with communities to demand quality and sustained primary and universal health care. 2,6
- Ensuring quality of community health programs by aligning them to the policy, standardized training, commodities, supervision, and quality improvement mechanisms as described in the World Health Organization guidelines on community health. 2,6

**CONCLUSION**

Kenya’s MOH has made significant progress in institutionalizing community health services in policy. The lessons learned on understanding context, use of evidence, meaningful engagement of stakeholders, and alignment to political priorities are important to inform successful policy engagement processes for others in a similar situation. Sustaining these gains will be a key priority for the technocrats in the MOH and the stakeholders to ensure CHW programs remain a political priority that is financed as a core component of the health system.

**REFERENCES**


The Community Health Systems Reform Cycle: Strengthening the Integration of Community Health Worker Programs Through an Institutional Reform Perspective

Nan Chen, Mallika Raghavan, Joshua Albert, Abigail McDaniel, Lilian Otiso, Richard Kintu, Melissa West, David Jacobstein

Key Findings

- Despite strong interest and policy commitments from many countries, models for community-based primary health service delivery have been slow to achieve full scale or deliver quality that matches their potential.
- Reform requires a carefully choreographed effort to enroll key stakeholders to support change by spotlighting a locally relevant gap in the existing health system’s performance.
- Designing and launching community health programs depends heavily on local context and must draw from models that are available within a given health system and that align with the resources, capabilities, and commitments of key stakeholders.
- Reform should be viewed as an ongoing adaptive and evolutionary process; learning, governance, and management systems must be designed with this trajectory in mind.

Key Implications

Ministries of health, development partners, and other reform stakeholders can:

- Use the principles in the reform cycle process to identify gaps and priorities for technical work or investment
- Examine community health efforts to identify where technical approaches can be complemented by political, institutional, and reform approaches
- Critically examine projects that implement term-limited, externally driven interventions and adapt designs to promote sustained, well-integrated community health programs at scale

ABSTRACT

To develop guidance for governments and partners seeking to scale community health worker programs, we developed a conceptual framework, collected observations from the scale-up efforts of 7 countries, workedshopping the framework with technical groups and with country stakeholders, and reviewed literature in the areas of health and policy reform, change management, institutional development, health systems, and advocacy. We observed that successful scale-up is a complex process of institutional reform. Successful scale-up: (1) depends on a carefully choreographed, problem-driven political process; (2) requires that scaled program models are drawn from solutions that are available in a given health system context and aligned with the resources, capabilities, and commitments of key health sector stakeholders; and (3) emerges from iterative cycles of learning and improvement, rather than a single, linear scale-up effort. We identify stages of the reform process associated with each of these 3 findings: problem prioritization, coalition building, solution gathering, design, program readiness, launch, governance, and management and learning. The resulting Community Health Systems Reform Cycle can be used by government, donors, and nongovernmental partners to prioritize and design community health worker scale-up efforts, diagnose challenges or gaps in successful scale-up and integration, and coordinate the contributions of diverse stakeholders.

BACKGROUND

The world today faces a daunting global health crisis; despite decades of medical and technological progress, half the world’s population remains without access to primary health care (PHC) services.

Community health workers (CHWs) are essential to realizing strong PHC that is:

- accessible, equitable, safe, of high quality, comprehensive, efficient, acceptable, available and affordable, and will deliver continuous, integrated services that are people-centred and gender-sensitive.

CHWs can extend access to health services, save lives, and generate strong returns on investment. This evidence has culminated in technical guidance such as the 2018 World Health Organization guidelines on CHW programs. However, many countries that have made
policy commitments to scale CHW programs remain stuck in implementation challenges or have fallen short on their targets. In multiple cases, countries have scaled community health programs only to find that those programs had little effect on access to PHC services or health outcomes such as mortality. These challenges range from implementation fidelity, governance, management, and financial resources. For those countries that have achieved success it is often not understood or documented how success has been achieved. Recent studies on “exemplars” in community health have started to unpack this “black box.”

In response to this challenge, the U.S. Agency for International Development (USAID), United Nations Children’s Fund (UNICEF), and the Bill and Melinda Gates Foundation formed the Integrating Community Health Program (ICH), a collaboration to advance community-based service-delivery models in 7 countries: Bangladesh, Democratic Republic of the Congo, Haiti, Kenya, Liberia, Mali, and Uganda. ICH-supported partner organizations in each of these countries have worked with their respective ministries of health to scale, strengthen, or sustain community health programs.

As part of this collaboration, we present a framework for community health reform, draw on lessons learned from across the 7 countries’ institutionalization efforts, and provide guidance on CHW institutionalization within government-managed health systems (The Supplement contains more details on the framework development). This article explores how an institutional reform perspective may guide practitioners in forging through the persistent implementation failures that have been experienced by governments seeking to scale CHW programs (Box).

We summarize 3 key findings from country experiences and the literature:

1. Successful institutionalization efforts depend on a carefully choreographed, problem-driven political process.
2. Successful community-based program models must be drawn from solutions that are available in a given health system context and aligned with the resources, capabilities, and commitments of key health sector stakeholders.
3. Progress toward goals of scale, integration, and quality is the product of iterative cycles of learning and improvement, rather than a single, linear scale-up effort.

We identify and describe the critical stages of this process—the Community Health Systems Reform Cycle. Additional information on this process is available in a Supplement. We draw short vignettes from the 7 ICH partner countries that have navigated through these stages.

### COMMUNITY HEALTH INSTITUTIONALIZATION AS A “REFORM CYCLE”

The Community Health Systems Reform Cycle is illustrated (Figure). Key features that a country may take on at each stage of the reform cycle are listed (Table). The context surrounding reform will differ by country. However, community health reformers generally include government stakeholders, technical and NGO partners, institutional partners, funders, and frontline health workers. These reformers often collaborate through groups or coalitions established that support the reform process including technical working groups, steering committees, or ongoing stakeholder coordination mechanisms.

The following sections will dive deeper into the specific stages and highlight examples from

---

**BOX.** Defining Institutionalization and Integration in the Context of Community Health Reform

For the purposes of this discussion, we define “institutions” as the formal and informal norms that structure political, economic, and social interactions. In the context of community health systems, these include formal norms like policies, program designs, local laws, government organograms, donor protocols, monitoring frameworks, and informal norms like the beliefs, culture, and practices of communities, nongovernmental organizations, governments, and donors.

We define “institutionalization” as the process by which new norms (including effective community health interventions) are identified, introduced, refined, and become the dominant norms within a health system.

We also refer to “integration,” which is a key part of this process whereby aspects of community health programming are adopted into the formal public, primary health care system and coordinate across that system. We note that while this article focuses on institutionalization and integration at a country level, this concept has parallels in the global health policy space as well (for example, the Universal Health Coverage Global Action Plan and its associated “accelerators” for primary health care and health financing can more effectively integrate the community sector). The reform cycle can inform designing global agendas to support national reform.
each country’s reform journey, both to demonstrate the features of each stage within the country context and to elevate examples of countries’ learning and success.

Building Political Will: Problem Prioritization and Coalition Building

Our first finding from observing community health scale-up efforts is that the fundamental challenge faced by countries seeking to institutionalize CHW programs is political rather than technical. Successfully achieving scaled and institutionalized CHW programs requires the coordinated support of a range of governmental and nongovernmental stakeholders. The failure to align these stakeholders around a common vision of reform and secure their material support has stalled CHW scale-up efforts in numerous countries, as evidenced by the large number of countries that have formally published CHW scale-up plans but have struggled to secure critical inputs, such as financing, standardized training, or a pathway to absorption of CHWs into the government health system workforce.16

This challenge is a familiar one to students of institutional reform processes. Analyses of successful institutional development find that reform depends on critical “authorizing” stakeholders—which may include senior government authorities but also include informal authorities and middle- and frontline workers—being convinced of the need for institutional change and recruited to participate in defining and implementing the appropriate reform.13 This process of institutionalization depends on would-be reformers illustrating the compelling gap in the services provided by the existing system and using that problem to recruit the authorizers needed to mount a large-scale reform effort.

Thus, the Community Health Systems Reform Cycle begins with 2 stages that reflect this essential political process: problem prioritization and coalition building.

Problem Prioritization

During the stage of problem prioritization, local reform actors diagnose and frame a compelling problem or opportunity that convinces critical stakeholders of the need for action. Compelling problems harness windows of opportunity, which might include political or economic shocks, routine changes like transitions in administrations, or newly publicized facts (e.g., health statistics), which reformers can frame as urgent provocations in response to which a problem must be prioritized.17,18 To effectively recruit participants into a
reform effort, the prioritized problem should be defined by influential local actors within the health system and framed with reference to the dimensions of the problem considered most important by key stakeholders within the system. Examples from Liberia and Haiti illustrate problem prioritization efforts.

Liberia Prioritized the 2014 Ebola Virus Disease Response for CHW Reform. Liberia’s response to the 2014 Ebola outbreak demonstrates the potential impact of problem prioritization. Key reformers, including President Ellen Johnson Sirleaf, harnessed the focusing power of the epidemic and the dramatic need for new capacity to deliver services at the community level to push forward specific reforms in health. President Sirleaf directly connected the emergency response to CHW reform in a 2014 briefing:

“We are going to make the final push to fight Ebola now, by supporting community workers to get the job done.

Previous attempts at community health reform faced opposition. For example, many clinicians resisted task shifting the provision of key health services, such as family planning or management of childhood illnesses, to community health volunteers. This, along with other contributing factors, undermined efforts to promote the
professionalization and payment of community health volunteers. However, the Ebola epidemic created a window that allowed reformers to both demonstrate the capacity of CHWs to achieve dramatic results and intensify focus on the problem that remote and rural communities were out of reach of essential health services, including Ebola screening, isolation, and referral. The urgency of this challenge attracted a broad coalition of high-level political champions, technical actors, implementers, and donors that were motivated to play a role in the reform. Ultimately, this exploitation of a well-framed problem led to a 2016 revised National Community Health Policy and Strategy that created a new cadre of CHWs, the community health assistants.

Haiti Prioritized Community Health Institutionalization to Expand Primary Health Care. Haiti’s history illustrates how an urgent health sector problem—in this case, extending primary care to all citizens—was used to motivate prioritizing community health institutionalization. As Haiti was rebuilding the health system after the devastation of the 2010 earthquake, the government emphasized that weak health system infrastructure, an insufficient health workforce, and lack of primary health care of good quality were the core challenges driving some of the worst health outcomes in the Western Hemisphere. The Ministry of Public Health and Population (MSPP) and other stakeholders recognized the success of CHW programs in Haiti—ranging from HIV accompagnateurs, to women’s health agents—at providing quality essential care services. However, the success of these programs was limited due to their fragmentation. While the government had defined an official cadre of community health agents (agents de santé communautaire [ASC]), in practice, they were primarily recruited and supported through NGO-run and verticalized programs that lacked standardization and only served a fraction of the Haitian population. Therefore, MSPP and its partners prioritized the need to create a unified, national cadre that could extend essential care services across Haiti and be sustained by the MSPP. Key to the government’s vision was a transition from overlapping, disease-specific ASCs to multipurpose ASCs offering a standardized package of services. The government termed these multipurpose ASCs as polyvalent ASC (ASCP), drawing from collaboration with the governments of Cuba and Brazil as part of their commitments toward the earthquake response.

The MSPP recognized that a critical first step toward reform would be to better understand the challenges with Haiti’s previous community health efforts and align stakeholders behind its vision. Between 2015 and 2019, the MSPP mobilized resources from funders and partners, such as USAID, UNICEF, the Global Fund, the World Bank, and Zanmi Lasante, to organize a series of activities to identify pain points and areas for reform. For example, the MSPP sought to develop a stronger understanding of the status of CHWs in Haiti. Leaders were concerned that there were significant overlaps and gaps in coverage that contributed to inefficient use of scarce resources. To gather the data necessary to address the problem, the MSPP and its partners mapped the distribution of CHWs (ASCs and ASCPs) across the country and calculated the ratios of CHWs to population by geographic area. This information is now helping the MSPP to realign the community health workforce, inform the national budgeting process, review the national community health strategic plan, and revise the curriculum for ASCP.

To demonstrate early national commitment to community health services and ensure a cohesive coalition could be assembled, the MSPP’s leadership took early steps such as integrating a percentage of the ASCPs into the national budget. Reinvigorating that problem prioritization process was essential to help inform subsequent stages of reform, in particular reconvening a coalition and the design choices that would need to be considered within the policy, strategy, and program package.

Coalition Building

In the coalition building stage, key stakeholders, organizations, and individuals (“coalitions”) are brought together to collectively effect change. A compelling problem at the right moment galvanizes a winning coalition, while a tepid problem quickly loses momentum. The careful construction and maintenance of a winning coalition connects the priority problems with actors who can influence the health system throughout all stages of reform. Successful coalitions are typically anchored around a high-level champion (often a minister-level official), and particular attention should be given to bringing in and consistently syncing with “well-networked health champions and strong national advocacy institutions.”

Political economy tools or influence mapping may help identify who is needed for the coalition, what roles they play, and opposing interests.
Coalition builders have the goal of crafting an “authorizing environment” for decision making that encourages experimentation and “positive deviance” and engaging broad sets of agents to ensure that reforms are viable, legitimate, and relevant.13

Mali Built a Coalition Through Local Actors, Savvy Recruitment, and Well-Functioning Coalition Structures. As Mali worked to roll out its strategy for advancing essential community health services, community health leaders struggled to generate momentum for reform. In response, in June 2017, the National Federation of Community Health Associations, the Ministry of Health (MOH), and supporting partners launched the National Advocacy Coalition for essential community health services as a platform for directing attention to the need for community health service reform in Mali. The local reform actors found a compelling and shared problem—persistent gaps in the quality of community-based health services due to the lack of proper payment, education, and support of CHWs—and framed it to recruit other influential donor voices, including USAID and UNICEF. The actors also devoted resources to create and sustain the National Advocacy Coalition. Functioning coalition structures such as a steering committee and a technical committee continue to meet regularly. Since 2017, membership in the National Advocacy Coalition has grown every year, from 12 member organizations in 2016 to 24 by 2020. During that time, the National Advocacy Coalition emerged as a leading voice driving national efforts for the sustainability of the essential community health services strategy.

Discovering What Is Possible: Solution Gathering, Design, and Readiness

Our second finding is that successfully scaled and institutionalized community health programs must be sourced from the existing capabilities, practices, partners, and resources within a health system through a process of collective discovery and negotiation.

It is no wonder that large-scale CHW programs struggle with quality when they look and perform nothing like they did at smaller scales of operation. Initially, small-scale programs are often designed and managed by external partners. Government engagement is inconsistent. However, subsequent larger-scale programs often emerge when partner-supported programs are transitioned to government. Key elements of effective CHW programs, such as supportive supervision or competency-based training, are missing from community health programs that have been scaled in recent years.22 In some cases, design features are removed from the program during policy development and scale-up—this occurred in Liberia when a peer supervisor cadre integral to the successful pilots was removed from the nationally scaled design—while in other cases, health systems fail to effectively execute program activities beyond their original context and size.9

Institutional reform literature explains why “pilots never fail, pilots never scale.”23 CHW program design often begins with external “experts” improving programs through a mostly technical lens but shielded from the social, political, institutional, and policy realities required at larger scale. Moreover, effective tactics to engage these broader constraints are near impossible to predict or design in advance, especially from the outside. The success of a new institution depends on factors as wide ranging as how central, local, and external bureaucracies interact, prevailing and dissenting cultural norms about change, and explicit or hidden agendas and power.24 These factors and their effect on how a given externally sourced institutional model will operate once scaled are often invisible to actors within the system, including actors directly implicated in or affected by that context. As a result, Andrews et al. noted that the process of arriving at [new institutions] matters more than the form for sustained functional success.13 Effective institutional reform efforts require that a committed coalition of stakeholders undertake a process of discovery and learning to identify constraints and capacities within the health system and test potential solutions to the prioritized problem, drawing on existing institutions and capabilities.

The next 3 stages of the reform cycle, solution gathering, design, and readiness, reflect this process of discovery. These stages turn the energy of a coalition into early action toward solutions. Doing so requires actors to build from a shared understanding of the problem to develop a shared vision of the future, making difficult trade-off decisions about how to get there acknowledging the starting place, and taking the first steps.

Solution Gathering

During the solution-gathering stage, reform coalitions develop a shared set of criteria or principles defining what is needed to address the prioritized problem. Then, armed with these principles, the reform coalition must cast a wide net to identify potential solutions, drawing proposed solutions...
from both within the reform coalition and outside of it. Good solutions tend to be (1) technically correct, (2) politically supported, and (3) administratively feasible. These and other criteria can be tested by gathering rapid feedback, via consultation, workshop, survey, or small experiments with a wide array of health sector stakeholders. A strong practice of soliciting feedback in this manner during the solution-gathering stage helps to both inform better design and legitimize the reform via early wins.

**Kenya Reformers Collaborated on Gathering Solutions to Improve Community Health Strategy.** Kenya provides a strong example of how collaborative solution gathering by reformers can help to accelerate progress from problem prioritization to later stages of design and readiness. In 2016, Kenya embarked on a comprehensive reform of its community health system. These reforms were interlinked with both Kenya’s devolution of governance and its broader primary health care and universal health care agendas. The MOH-led Community Health Steering Committee served as the focal point for guiding stakeholders from problem prioritization into the solution-gathering stage. The committee first framed their core reform problem; Kenya’s lack of a community health policy was an institutional weakness that left counties without clear guidelines for funding and implementation decisions. In response, the committee revitalized the process for developing the community health policy and revising Kenya’s community health strategy. The group defined clear principles for an ultimate solution; to be successful, any new guidelines would need to reflect the current status of community health in the country, link to the President’s universal health coverage agenda, gain support from county governments, and build on available evidence and innovation.

In 2018, the community health steering committee launched a community health services evaluation with funding from UNICEF and guidance from technical committees. The evaluation used a systems approach to examine the status of community health services within the devolved context and evaluate selected health outcomes. It also documented case studies and best practices from different county models.

A notable strength identified by the evaluation—and one that has positioned Kenya’s community health system to function effectively within an increasingly devolved context—is the prominent role of community policy and governance structures, such as community health committees. For example, in 2017, UNICEF Kenya supported Turkana County to introduce a redesigned and locally adapted community health structure, which placed a community health volunteer in every village. The volunteer moves with households in nomadic villages, connects with the health facility management committees, and establishes a sublocation corresponding with each community unit, ensuring access to political and administrative services.25

The evaluation also revealed strengths in certain counties’ prioritization, investment, and planning for community health. Under devolution, county governments are free to set their own budget allocations for health. By comparing counties with high- and low-performing counties, reformers developed a stronger understanding of how prioritization of community health services was driving coverage and health outcomes. The assessment of Siaya County is particularly illustrative. Siaya’s government made the country’s highest level of financial investment in community health and translated this financing into institutional functions such as community health commodity security and the provision of regular monthly incentives for community health volunteers. As a result, Siaya county drastically outperformed low-investment counties as well as the national average.25

The findings from the evaluation positioned the steering committee to make clear cases for how community health reform could accelerate the country’s health agenda and base policy choices in the redesign of a revitalized community health strategy on domestically proven best practices and solutions.

**Democratic Republic of the Congo Advanced Community Health Reform.** In recent years, the Democratic Republic of the Congo (DRC) has taken unprecedented steps to advance community health reform, marking a shift from earlier stages of problem prioritization and coalition building to solution gathering.

These emerging reforms stem, in large part, from lessons learned during the Millennium Development Goal (MDG) era. In 2013, leaders recognized that the country was not on track to meet health-related MDGs and took stock of approaches that had proven successful, such as Integrated Community Case Management of Childhood Illnesses (iCCM). They determined that community health would need to be a driver of any corrective action and placed community health at the center of a new MDG flagship program.26 While DRC ultimately fell short of targets, the program contributed to notable improvements in health outcomes and moved community health to the forefront of the health sector agenda. The
program’s evaluation decisively recommended that the government prioritize “institutional anchoring” of community health to scale and sustain results in the long term. In conjunction, the government issued a call to action that without significant reform, the country would risk not attaining the SDGs.27 This problem framing set the stage for two major milestones in 2016. For the first time, the government explicitly integrated community health into the National Health Development Plan 2016–2020 (recently reframed and extended into 2019–2022). As a complement, the government crafted a Community Participation Strategy, defining the community structures and cadres that form the foundation of DRC’s community health system. Together, these documents created an unprecedented policy basis for further community health reform.

However, to secure the place of community health and improve the effectiveness of its implementation, reformers recognized the need to assess the country’s community health landscape, gather learning across a constellation of programming, and align resources and operational capacity behind a shared set of priorities. This would be no small task. For years, myriad normative documents in parallel technical areas had enabled a fragmented community health implementation environment. Further, those experiences were not sufficiently monitored, evaluated, or disseminated, thereby complicating attempts to distill and integrate best practice.

Accordingly, the MOH sought to address a core obstacle: the lack of a national, unified Community Health Strategic Plan (CHSP). In late 2017, the MOH mobilized a coalition, chaired by a technical committee of key stakeholders, to lead a participatory process of problem prioritization, coalition building, and solution gathering. The coalition worked across the layers of the health system to conduct stakeholder mapping exercises, desk reviews, key informant interviews and focus groups, and validation workshops. The result is a comprehensive situational analysis; strategic, operational monitoring and evaluation framework; and preliminary budget that are grounded in existing practice but present ambitious reform. At its core, the CHSP presents a set of solutions aimed at establishing a more harmonized, efficient, and effective community health system that is grounded in community engagement and aligns resources and actors. The institutionalization of these reforms will depend largely on a successful transition into later stages of the reform cycle.

**Design**

In the design stage, the reform coalition connects the policy or program reform goals that have been drawn from the prioritized problem (e.g., increased service coverage) with intervention designs (e.g., CHW recruitment and training). These designs, sourced via the solution-gathering process, may include new innovations, expansions of existing innovations, or revisions to programs already at some level of scale and institutionalization. Critically, stakeholders should ask themselves how the proposed interventions will function within the current system. At this stage, reformers must find a balance between pushing the system to develop new capabilities that address the prioritized problem, and exercising caution to avoid “premature load bearing,” where new program designs are overly optimistic about the existing technical, political, and operational capabilities within the health system and therefore fail to deliver the expected results. The ExpandNet framework provides a useful set of key areas of capacity inquiry: technical skills, training, logistics and supplies, supervision, leadership and coordination, monitoring and evaluation, physical facilities and equipment, values supportive of the innovation, human resources, and a necessary policy framework.28 This is also the stage of the process where coalition actors clarify the answer to key planning questions: What will be required of government, of partners, or of other technical institutions to implement the new design? Is there a need for one or more intermediary organizations to support the scaling up process alongside the government? What organizational or structural changes will be required to implement and roll out the model?

Often in LMICs, community health impact is conceptualized as the result of community health “projects.” However, designers would be encouraged to think early on how the “project” evolves into an institutionalized, routine part of the health system.24,29

*In the design stage, reformers must find a balance between pushing the system to develop new capabilities that address the problem and exercising caution to avoid being overly optimistic about existing capabilities.*

**Liberia Designed a New Community Health Program.** The structured, multistakeholder process used in Liberia in 2015 to design a new community health program illustrates the impact of a design process that builds from a well-constructed problem, considers the capacities of...
the existing system, and involves key health system stakeholders. As the Ebola outbreak was coming increasingly under control, Liberia set out to build the country’s first national, incentivized CHW program. Effectively building the program from scratch required a comprehensive and data-driven process to identify policy and design considerations for an initiative intended to address the dramatic health service gap faced by the country’s most remote communities.

Picking up on the political momentum generated by the President’s calls for reform, the Minister of Health revitalized a core steering committee called the Community Health Technical Working Group, composed of government, technical, and donor stakeholders, ensuring perspectives were diverse and contributed to an aligned vision, and that actors with a critical stake in the functioning of the health system were given a forum for collaboration. The working group was responsible for setting the vision of the planned CHW program, providing leadership on the institutional, system, and operational decisions that went into the design of the program.

Liberia reached a major milestone in 2016, when the working group finalized the National Community Health Policy and the Minister of Health approved it, establishing a national community health assistant (CHA) program. This marked a critical transition from policy to program design; the reform team shifted its attention to the development of a CHA training curriculum, supervision and information systems, recruitment and human resources standards, supply chain processes and a comprehensive costing of the program to inform resource mobilization. The working group established a set of subgroups to help drive this detailed design process, recognizing that the integration and harmonization of historically fragmented systems would need to be considered. These subgroups included training and supervision, community-based information systems, supply chain, and human resources for health.

Although each subgroup took its own form and function, they shared some key components to the design process: the review and deliberation of key design considerations, informed by pilot projects, evidence and learning from implementation experiences, and best practices across key stakeholders; the assessment of the operational and scale feasibility of each element of the program; and the development of a management and sustainability strategy, including resource mapping and costing to inform how program rollout would occur.

**Readiness**

During the program readiness stage, health systems actors align the necessary resources for launch. These include financial, material, human resources, programmatic, planning, and political commitments in service of reforming the system (often launching or expanding a program). In effect, the reform coalition must ensure there is a clear “launch” plan that applies strong planning and management tools to coordinate rollout of the new institution, including action plans,
program. This is also a critical moment in the troubleshooting process. During the readiness stage, actors should begin anticipating the eventual transition of partner-delivered programming to the government or other permanent institutions once the institution is operating at scale. This might involve aiming to frame the financial resources of the new program within a budget envelope that the government can realistically finance, even if it means not having the “perfect” program. This is also a critical moment in the process for advocacy events that illustrate sustained political support, such as policy dissemination or program launch events.

Uganda “Built” Readiness to Scale Community Health Nationally. Uganda’s recent progress in scaling community health is illustrative of this critical stage. In 2001, Uganda established village health teams (VHTs) to bridge the health service delivery gap into communities and households. Since then, an estimated 180,000 VHTs have been deployed across the country. However, after a 2014/2015 assessment found a number of critical challenges with the VHT program, a policy reform process led ultimately to new community health extension worker (CHEW) policy.

In 2018, in anticipation of this new policy, the Ugandan MOH conducted district readiness assessments in 13 districts. The assessment identified key intervention changes and assessed areas such as current knowledge of health workforce, availability of health workforce, familiarity with e-health technologies, existing supervision practices, and existence of health unit management committees, among other things. The assessment revealed key challenges prior to implementation that were otherwise difficult to anticipate in design. For example, certain districts lacked a biostatistician which would make data reporting difficult and other districts had broken referral systems. This district readiness assessment and other activities illustrate critical steps of the program readiness stage: socializing changes to the health system, communicating role transitions, and identifying potential challenges to the change early in the process of rollout. Although readiness assessments or evaluations of programs are common in the research world, rarely are they explicitly connected to desired policy changes.

In 2019, despite encountering political setbacks in securing approval for the CHEW policy, the Uganda MOH continued to build “readiness” for implementing reforms of community health institutions. Even in the absence of a new official policy, the reform-minded stakeholders (including the MOH, donors, and implementing partners) identified areas ripe for reform and critical for policy change and documented the main priorities for the Ugandan community health system in a Community Health Roadmap.* These priorities include resource mobilization and costing the community health strategy, leadership and governance, multisectoral collaboration, supervision and motivation, investment in technology such as digital health, supply chain, and community engagement. In 2019/20, the Uganda MOH, in collaboration with partners, has advanced several of these priorities such as integration of the community health supply chain system and inclusion of community level data into national health information systems, such as DHIS2. Uganda’s experience with the Community Health Roadmap demonstrates a key element of program readiness—taking a systems integration lens to identify what capabilities need to be marshalled or strengthened to pave the way for upcoming program or policy changes.

Consolidating Progress and Laying the Foundation for Future Work: Launch, Governance, and Management and Learning

Our final finding from observation of efforts to scale and integrate community health programs is that successfully building these programs is an iterative, cyclical process. Reform efforts should proceed in a manner that anticipates this ongoing nature, rather than expecting scale-up to be successfully “completed.”

This understanding is embedded in the final 3 stages of the reform process: launch, governance, and management and learning. During these last stages, the system and its actors are building processes to progressively extend implementation of the new institution to a greater portion of the health system, continuously increase capability of the actors implementing the institution, improve quality of the services delivered, and adapt the institutional design to new realities and lessons learned.

As reflected in our characterization of a reform cycle, we note that none of these stages are implemented in a necessarily linear or sequential order. This is especially true with the following 3 stages,

* All countries profiled, except Bangladesh, developed a Community Health Roadmap, see https://www.communityhealthroadmap.org/.
during which launch, governance, and management and learning are likely all happening at the same time.

**Launch**

During the program launch stage, reforms are launched and actors take on new roles and responsibilities. Effective approaches reflect the understanding that launching a reform is not simply “implementing a new plan,” but that actors in the system are transitioning from one reality or identity to a new one. Reformers must recognize that actors in the system lose or let go of previous identities embedded in prior practices. For example, a new CHW might have previously felt confident as a high-performing community health volunteer, or a vertical program might lose control as it is rolled into a new CHW program platform. Launch requires intentional management of this transition via orienting stakeholders amidst the uncertainty of change, sourcing frequent feedback, celebrating early wins, and reminding stakeholders of the ultimate goal. Building on the socialization aspects of the program readiness stage, actors across the system are trained, equipped, and asked to begin adopting their new roles. Challenges in implementation should be expected, and troubleshooting systems should be set up to address emergent gaps or problems. Supervision, performance management, and monitoring systems are supported to reinforce quality and provide critical information about the performance of the reforms within the system.

**Mali Launched a CHW Remuneration Program.** Mali’s journey toward paying CHW salaries illustrates a path from problem framing through program launch driven by local actors with appropriate support. A group of community health advocates coalesced around addressing the financing gap for the essential community health services strategy and the lack of sustainable payment mechanisms for CHW salaries. The MOH first conducted a costing analysis in 2016 and 2017 through the USAID-funded Health Policy Plus (HP+) that highlighted substantial challenges to understanding the costs of the essential community health services strategy, due to fragmentation, inaccurate information, and lack of centralized information. This key learning led to further research that found the overall cost of community health programming to be approximately US$13.7 million per year and that the majority of CHWs were operating informally and with inconsistent payment. This evidence helped frame the National Advocacy Coalition’s push to increase the share of government contribution.

As the CHW payment issue was gaining traction, in September to October 2016, the Ministry of Health and Public Hygiene assembled a multi-sectoral group of experts to understand the legal constraints to paying CHWs as civil servants. Both the HP+ situation analysis and further inquiry into legal status were steps in solution gathering and program readiness—atttempts to probe where capabilities in the health system lie and uncover the changes necessary to move reform forward.

In 2018, community health reformers further created and sustained the window of opportunity. Community health stakeholders had repeatedly held sessions with the parliamentarians on the importance of the essential community health services strategy as a whole and resource mobilization for CHW salaries specifically. In April 2018, the National Advocacy Coalition and the National Assembly’s Health Commission organized testimonies from a CHW, a mother, a village chief, the president of a civil society organization, and a district health director to highlight the challenge to essential community health services sustainability if CHW salaries were not paid with domestic resources. In response, the National Assembly recommended initiating a bill to integrate CHWs as civil servants, an advocacy win that was broadcast on national television.

To turn this new priority into reality, the National Advocacy Coalition in Mali worked with the government, donors, and implementing partners to gather solutions, design, build readiness, and launch this new policy. The heart of the National Advocacy Coalition’s goals was to persuade the government to provide a specific budget line to municipalities for the payment of CHW salaries. The National Advocacy Coalition convened all parties to identify mechanisms for paying CHWs through commune budgets and drafted a service contract between CHWs and community-level local authorities. The group identified Mali’s Kadiolo district, where Save the Children had already been working with local actors since 2014 to shift CHW salaries to local budgets, as an opportunity to build off existing experience in new reform.

As part of program readiness planning, the National Advocacy Coalition identified the needed changes in local roles and ensured that parties were equipped to step into the new roles. This included training for local authorities on budget analysis, monitoring health expenditures, and holding roundtables to mobilize funds. Moreover, the mayors agreed to a gradual transition of
financial ownership over 3 years (from 50% to 100%), which also allowed for actors to gradually build experience and responsibility for the reformed institution. Lastly, the Minister of Health visited Kadiolo just after the mayors committed to taking full responsibility for CHW salaries, which showed the Malian government’s commitment to this reform and sustained momentum for these changes.

**Governance**

The governance of the system, as used here, refers to the set of rules (formal and informal) and relationships among actors that allow for collective action and decision making, including setting of strategic direction, creating an enabling environment, and overseeing execution. During this stage, actors establish systems and methods by which a program’s strategy and plan will be defined, authorized, and monitored. The establishment of formal governance often accompanies the transition from outside reform priority to institutional adoption. As financial commitment to funding CHWs may not be institutionalized across a particular health system, it is important to plan for the governance systems for payment and human resources management to reduce silos and fragmentation during the implementation phase.

**Bangladesh Improved Governance to Support Community-Based Primary Health Care Services.** With a rich history of CHWs as a key pathway to improve primary health and family planning priorities in the 1970s and 1980s, and a prolonged national rollout of a Community Based Health Care program over the last few decades, Bangladesh has recently turned its focus into improving program management and governance to support the ongoing implementation and quality of its community based primary health care services. However, as country of 161 million people, Bangladesh still faces a particularly complex challenge in constructing its health governance structures. Moreover, by some estimates, the public sector provides less than 20% of curative services, and the rest are provided by complementary private or NGO service providers. To manage this, the government has instituted multiple layers of governance systems to encourage formal and informal actors to swim in the same direction. Bangladesh’s experience illustrates the critical governance functions of defining roles and setting goals for the sector and its associated challenges.

At a national level, Bangladesh has used a sector-wide approach (SWAp) for sector planning since 1998 and continues to do so in each subsequent health sector strategy cycle. This approach emphasizes holistic government defined operational plans that donor and NGO partners help execute. For example, the 1998 SWAp replaced 128 discrete projects under the Ministry of Health and Family Welfare. The SWAs “facilitated the alignment of funding and technical support around national priorities, and improved the government’s role in program design as well as in implementation and development partner coordination.”

This governance approach, like any, is not without its challenges; in recent years, the distinct operational plans of different line ministries have generated sector fragmentation, especially given that governance of community health sector activities is held in 2 different directorates (family planning and general health services).

At a subnational level, upazila (subdistrict) health councils and ward-level community clinics provide governance support. The fourth national health plan also reinforced commitment to the vision of the community clinic as the basic unit of the primary health care system and extended the scope of the community program to include the provision of essential health services from all upazila health facilities. With this, the program aimed to strengthen health system integration across community, upazila, and district levels. When properly implemented, the community clinics and accompanying community groups serve as effective forums for coordination, where leaders or community groups from within a clinic’s catchment can exchange information with other levels of the health systems and define their own needs. However, many community clinics still struggle with the coordination and planning functions of governance.

**Management and Learning**

During the management and learning stage, actors implement reformed policies and programs and utilize learning and data to inform improved performance of the system. Key stakeholders identify gaps in implementation and enforce adherence to established standards. During this time, gaps or obstacles are addressed to achieve strong performance.

**Bangladesh Evolved Community Health Service Implementation Using Program Learning and Data.** Bangladesh’s history with community health services also illustrates the management and learning elements needed for progressively advancing reform. Over 4 decades,
Bangladesh’s community health services have evolved from including family planning services in the 1970s to adding oral rehydration and immunization services in the 1980s to additional broadening of the service package (maternal health, other essential services) and greater integration into the primary health care system with community clinics over the past 30 years. Each of these changes was responsive to data on health challenges. Much of this also benefited from the SWAp governance framework’s integration of inputs across program monitoring data, research institutions like the International Centre for Diarrheal Disease Research, various government agencies, and implementing partners like BRAC. These partnerships allowed Bangladesh to bring together sources of programmatic data and implementation research findings, supporting effective program management and learning, ongoing identification of gaps in implementation, awareness of changing context, wide scope of evidence to inform change, and open channels for innovation diffusion.

Liberia Established Quarterly Collaborative Forum to Review Data and Drive Decision Making. The Liberia MOH also integrated a set of comprehensive adaptive management and learning practices across the country, immediately following the launch of the national CHA program, during which the MOH and partners trained and deployed over 3,000 CHAs across 14 of 15 of Liberia’s counties. As each of the 15 counties in Liberia receives varying levels of financial and technical support from a range of donors and NGO partners, coordination has become increasingly challenging and even more critical in order to maintain government ownership and the quality of implementation across counties. To sustain program management and learning in this complex landscape, the MOH established quarterly review meetings to bring key stakeholders together in a collaborative forum to review existing and new data to drive discussion and adaptive decision making.

During these review meetings, the MOH, national and subnational government stakeholders, donors, and partners review program performance and develop policy and implementation adaptations that are informed by the program’s successes and challenges in real time.

Quarterly meetings have become an essential part of the institutional structure of the national CHA program. This convening promotes government ownership and allows the MOH to cultivate a culture of continuous learning and adaptive management where all stakeholders are aligned and accountable to set performance indicators, work together to identify persistent problems, and commit to adopting successful implementation practices that address them. The result is significantly improved program management and learning, where the MOH is able to lead other stakeholders in analyzing data to prioritize unresolved problems, plan experiments to test potential solutions, and develop action plans for actors at all levels to ensure solutions are scaled. This illustrates how effective management and learning practices allow for continuous cycles of reform, with each newly scaled institutional component (e.g., standardized CHW cadre) revealing new challenges and opportunities for further reform (e.g., improving accuracy and timeliness of reporting via digitization of community-based health information systems).

CONCLUSION

Taken together, these 8 stages offer a roadmap for governments, health sector partners, and others seeking to support the scale-up and institutionalization of CHW programs. The cycle can be used diagnostically—as a framework for assessing whether would-be reformers have addressed the key considerations critical to success—or as a planning tool for focusing the efforts of health sector stakeholders seeking to make change. For community health programs that are already underway, the reform cycle considerations can illustrate where further efforts should focus. Additionally, reformers entering a new stage of a reform process can use the key considerations associated with the stages of the reform cycle to prioritize their work. These broadly align with lessons from exemplary community health countries in taking a problem-driven approach, cultivating political will, and building government-led coalitions.

This work should be situated in the context of other complementary trends and current initiatives. Partners to the SDG Global Action Plan’s PHC Accelerator may use this framework and supplemental tactics to move the levers of the PHC system. As countries and partners prepare for the upcoming Institutionalizing Community Health Conference 2.0, this can inform diagnostics and targeted planning for reform efforts. In many countries, the COVID-19 pandemic has both exacerbated existing inequities and fragilities in the health system, while accelerating windows for opportunity for reform — the Reform Cycle can help make the most of these opportunities.

This framework is based on the premise that building and sustaining community health programs requires employing the tools of institutional
reform. This premise should be examined through further research that aims to do the following:

- Revisit failed or partially successful community health efforts and assess whether gaps in reform process as outlined in this cycle contributed to the suboptimal outcome.
- Test applications of the reform cycle in new and ongoing reform efforts by encouraging coalitions of governments, development partners, and donors to experiment with the reform cycle as a diagnostic and planning tool.
- Spur greater investment by governments, development partners, and donors in the requisite governance, programmatic monitoring, and implementation research efforts to provide timely feedback on reform processes. Given the potential contribution of community health to achieving global and country-level goals for extending PHC and achieving universal health coverage, a deeper investment in understanding reform processes should be reflected in health sector budgets and investment plans, as part of advancing those goals.
- Compare the reform cycle with systems change and reform frameworks from other sectors (e.g., collective impact models).

We hope that application of this framework over time will result in more effective integration and institutionalization of community health programs that support CHWs to provide essential health services to the most under-served populations globally.

Acknowledgments: We thank the ministries of health, development partners, nongovernmental organizations, and civil society organizations from Bangladesh, the Democratic Republic of Congo, Haiti, Kenya, Liberia, Mali, and Uganda that hosted our workshops and shared their valuable perspectives, experiences, and aspirations. We thank contributors Daniëlle Boyda, Michelle Choy, Carla López Castañeda, Lauren Mawe, and Katie Zeno who conducted research and analysis in individual countries. We thank the technical advisory groups and workshop participants that provided further guidance in this endeavor. We are grateful for the partnership of the Bill and Melinda Gates Foundation, U.S. Agency for International Development, and United Nations Children’s Fund.

Funding: Funding was provided by the Bill and Melinda Gates Foundation.

Competing interests: None declared.

REFERENCES

20. Murungu Y, Musila N, Onorje R, Zulu E. The role of political will and commitment in improving access to family planning in Africa.
The Community Health Systems Reform Cycle


26. Évaluation du CAO 4&5 en RDC


Peer Reviewed

Received: July 31, 2020; Accepted: January 7, 2021


© Chen et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00429
Galvanizing Action on Primary Health Care: Analyzing Bottlenecks and Strategies to Strengthen Community Health Systems in West and Central Africa

Aline Simen-Kapeu, Maria Eleanor Reserva, Rene Ehounou Ekpi

Key Findings

- Challenges with health financing, essential medical products and technology, and community ownership and partnerships emerged as the severe or very severe health system bottlenecks that hampered the strengthening of community health systems, irrespective of mortality context.
- Country-led progress is possible. Potential strategies to overcome bottlenecks include increasing domestic allocation and leveraging innovative funding mechanisms for primary health care (PHC), integrating supply chain systems, and strengthening policy implementation with communities and local governments.
- Countries with high child mortality rates should improve service delivery through better integration.

Key Implications

- Countries must seize the opportunities to systematically strengthen community health systems in their efforts to achieve universal health coverage.
- We must galvanize efforts to mobilize resources for effective PHC, which is reliant on strong community health systems to expand access to services and live no one behind.
- Community-based integrated programming should be reinforced to strengthen resilience, disease surveillance, and rapid responses to health crises, including infectious diseases like COVID-19.

ABSTRACT

Introduction: The renewed commitment to primary health care (PHC) presents an opportunity to strengthen health systems in West and Central Africa (WCA). Though evidence-based cost-effective interventions that are predicted to prevent up to one-third of maternal, newborn, and child health complications and deaths with universal coverage have been identified, more than 50% of people living in rural areas or from poor families still do not have access to these interventions in resource-constrained settings.

Methods: We conducted a multicountry systematic analysis of bottlenecks and proposed solutions to strengthen community health systems through a series of collaborative workshops in 22 countries in WCA. Countries were categorized by their under-5 mortality rate (USMR) to assess specificities related to reported challenges. We also reviewed existing data on selected health system tracer interventions to analyze country profiles.

Results: The bottlenecks identified as severe or very severe were related to health financing (19 countries, 86%), essential medical technology and products (16 countries, 73%), integrated health service delivery (14 countries, 64%), and community ownership and partnerships (self-reported by 14 countries, 64%). Only the integrated service delivery was self-reported as a severe challenge by countries with high U5MR. The issue of human resources for community health was one of the least reported challenges.

Conclusion: In WCA, strengthening community health systems as part of PHC revitalization efforts should focus on increasing health financing and innovative investments, strengthening the logistics management system, and fostering community ownership and partnerships. Countries with high USMR should also reinforce integrated service delivery approaches through innovation. Government actions galvanized by global and regional ongoing initiatives should be sustained to ensure that no one is left behind.

INTRODUCTION

In 2018, the international community reaffirmed its commitment to primary health care (PHC) in the Declaration of Astana. In this declaration, PHC was articulated as a cornerstone toward achieving universal health coverage (UHC) and the United Nations (UN) Sustainable Development Goals (SDGs). Global health
leaders agree that building stronger PHC delivery systems, with emphasis on community-based systems, is required to provide context-specific and locally-adapted responses to the needs of marginalized and underserved populations. A community health system is the set of local actors, relationships, and processes engaged in producing, advocating for, and supporting health in communities and households outside of, but existing in relationship to, formal health structures.

Although it may take time to build enough health facilities providing quality services to ensure that marginalized and vulnerable populations, including those living in rural and remote areas, are within walking distance of health facilities, community health workers (CHWs) connected to well-trained PHC teams can extend the reach of high-quality care to people who need it the most, right where they are. Studies conducted in low- and middle-income countries have shown that focusing on provision of health services at the community level not only leads to more efficient and equitable use of health resources and better health outcomes but also is a consistent component of strong, effective health systems.

Considerable progress has been made in improving health and well-being over the past 40 years, with dramatic reductions in maternal, neonatal, and child deaths. A systematic analysis found a significant impact of community case management with antibiotics: 32% (RR: 0.68, 95% CI: 0.53, 0.88) reduction in acute respiratory infections mortality and 20% (RR: 0.80, 95% CI: 0.77, 0.83) reduction in all-cause mortality among children aged 1–4 years. Although evidence-based, cost-effective interventions have been identified that are predicted to prevent up to one-third of maternal, newborn, and child health (MNCH) complications and deaths with universal coverage, more than 50% of people living in rural areas or from low-income families face challenges to access these simple interventions in resource-constrained settings.

Many countries, especially in West and Central Africa (WCA), are lagging far behind the health-related SDG targets, calling for increased action. WCA is one of the poorest regions in the world and is affected by violent extremism, armed conflict, hazardous events including epidemics like Ebola and coronavirus disease (COVID-19), and climate-related disaster risks. These trigger humanitarian crises that weaken already overwhelmed health systems. As a result, scarce resources are diverted from health to security priorities. Slow progress is also due to weak government leadership, inadequate integration of basic services, and low access to care and treatment. There is little investment in community health, leading to limited large-scale implementation and major gaps in coverage of community-based interventions.

However, the achievement of expected results varies between and within countries. There seems to be a difference between high mortality and low mortality countries in terms of health system functionality, capacity, and coverage of interventions. Knippenberg et al. noted that the strengths and weaknesses of a health system are crucial but are often not assessed in health program design, including community health. The big challenge remains how to put health systems strengthening into practice at the community level to achieve high, equitable, and effective coverage of care.

To ensure all populations have access to and use quality health services, systematic and context-specific identification of the health system barriers is needed to plan and implement community health programs. In this article, we aim to identify common community health system bottlenecks, review progress made by selected countries, and propose strategies to move forward. We also assess particularities by child mortality context through a multicountry analysis in WCA.

**METHODS**

Between January and April 2019, we contacted all 24 countries in the United Nations Children’s Fund (UNICEF) WCA region to conduct a systematic analysis of their community health system. We excluded Gabon and Sao Tome and Principe in the regional analyses as they reported not having a national community health policy or strategy (neither as a separate document nor clearly embedded in the national health strategic plan) or a clear framework describing the national community health program at the time of the survey. This was the only exclusion criteria. We then performed 2 analyses as followed.

**Analysis 1. Systematic Analysis of Bottlenecks to Strengthen Community Health Systems**

**Community Health System Bottleneck Analysis Tool**

To assist countries in their analysis of health system bottlenecks, including identifying challenges that prevent the scale-up of community-based interventions and potential solutions, we developed the community health system bottleneck
analysis tool, taking into consideration the World Health Organization (WHO)/UNICEF draft PHC operational framework (Supplement). The tool development involved: (1) adapting the health system framework used by Dickson et al. for the maternal-newborn bottleneck analysis tool, and (2) using the programmatic components described in the interagency Community Health Worker Assessment and Improvement Matrix (CHW-AIM) to assist data collection, compilation, analysis, and cross-country comparison. The bottleneck analysis tool, which is a questionnaire, was divided into 7 health system building blocks: (1) leadership and governance (including policies and coordination), (2) health financing, (3) human resources, (4) essential medical technologies and products, (5) health service delivery (including quality of care), (6) health information systems, and (7) community ownership and partnership.

The seventh building block, community ownership and partnership, was included on the basis of the recommendations of the Ouagadougou Declaration and the Ouagadougou Declaration was divided into 7 health system building blocks: (1) leadership and governance (including policies and coordination), (2) health financing, (3) human resources, (4) essential medical technologies and products, (5) health service delivery (including quality of care), (6) health information systems, and (7) community ownership and partnership. The tool was tested in 2 countries and slightly revised.

To better analyze supply chain challenges, we considered the recommendations of the United Nations Commission on Life-Saving Commodities to improve access to essential commodities. We considered the following areas: (1) availability of policy or strategy, (2) finances, (3) efficiency regulation, (4) product quality and patient safety, and (5) procurement and availability of inputs. Second, we selected the 3 recommended essential medicines that are required to treat the major causes of child deaths: amoxicillin, oral rehydration salts, and zinc, as well as artemisinin-based combination therapy.

Participants and Process for Country Consultations

The community health bottleneck analysis tool was used in a series of national workshops held between January 15 and April 30, 2019, in the 22 selected countries. The number of workshop participants varied by country and included members of national technical working groups that consisted of program managers from the ministries of health, UN agencies, nongovernmental organizations, bilateral agencies, and other stakeholders at national levels. Members of the working groups were experts from diverse fields nominated by their governments to provide advice on community health issues on a regular basis. The workshop brought the working group members together to assess bottlenecks and propose strategies to strengthen community health systems. More than 200 individuals participated in these ministry of health-led workshops. Participants were oriented on the use of the tool during the first day of the workshop.

Participants examined each of the 7 health system building blocks—based on data and experience—to identify the key challenges. The groups then came to a consensus on whether the bottlenecks to the health system area should be graded as good (not a bottleneck), needs minimal improvements (minor bottleneck), needs important improvements (severe bottleneck), or inadequate (very severe bottleneck). Finally, participants proposed potential strategies to address priority challenges identified. The ministry of health program managers and working group members were responsible for collating all responses and submitting the final data; they also served as points of contact for clarification of any issues. In November 2019, the first high-level regional forum on community-based PHC organized in Benin was an opportunity to further discuss and validate the results with the 13 country teams who participated in the meeting.

Data Analysis and Grading of Bottlenecks

We received complete national-level data from 22 countries. We reviewed all the bottlenecks for each health system building block and all solutions presented by country participants (Tables 1 and 2). Issues reported by at least 3 countries were further reexamined against recent country surveys to assess their persistence. From all bottlenecks, we extracted those that workshop participants categorized as severe or very severe to establish whether there were health-system areas that could be prioritized to move forward. For more context-specific subanalysis, we categorized the bottleneck analysis data from the 22 countries into 2 under-5 mortality rate (U5MR) categories: U5MR of more than 100 deaths per 1,000 live births and U5MR between 80 and 100 deaths per 1,000 live births. A health system block is defined as a priority if at least 50% of the reporting country teams graded the health system area as severe or very severe. We also reviewed all strategies proposed by country teams to address identified challenges and proposed a grouping by country typology whenever possible.

Analysis 2. Quantitative Analysis of Country Profiles With Selected Tracer Indicators

To complement the bottleneck analysis in the 22 countries in WCA, we selected tracer indicators...
from the health system building blocks and indicated the coverage of key indicators for children to analyze countries’ progress toward reducing child mortality from a multisectoral lens. We categorized countries according to the latest U5MR, relative to one of the targets for the third Sustainable Development Goal (SDG3), which is to end preventable deaths of children under 5 years old by 2030, with all countries aiming to reduce under-5 mortality to at least 25 per 1,000 live births (LBs). Based on this target we proposed 3 groups of countries: Group 1 countries had U5MR of 25 deaths per 1,000 LB or less, Group 2 countries had U5MR between 25 and 75 deaths per 1,000 LB, and Group 3 countries had more than 75 deaths per 1,000 LB.

We further analyzed health system tracer indicators from existing global data to assess the profile of countries studied, taking into consideration the health system building blocks. Selected indicators can be found in Table 3. Data were most available on health facility service delivery, while data on essential medical products and technology were limited, with only 8–9 countries reporting on the chosen indicators. Variations were also found within health financing—data on national health financing was complete for all 22 countries but became less available for PHC-level financing.

| Table 1. Country Self-Grading of Health System Domains as Severe/Very Severea Bottlenecks to Strengthen Community Health Systems (N=22 Countriesb) |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Legislation, Policies, Governance, Coordination Health Financing Essential Medical Technology and Products Human Resources Service Delivery and Integration; Quality of Services Information System/ Monitoring and Evaluation Community Ownership and Partnership |
| Benin                           | *              | *              | *              | *              | *              | *              |
| Burkina Faso                   | *              | *              | *              | *              | *              | *              |
| Cameroon                       | *              | *              | *              | *              | *              | *              |
| Cabo Verde                     | *              | *              | *              | *              | *              | *              |
| Central African Republic       | *              | *              | *              | *              | *              | *              |
| Chad                           | *              | *              | *              | *              | *              | *              |
| Congo                          | *              | *              | *              | *              | *              | *              |
| Cote d’Ivoire                  | *              | *              | *              | *              | *              | *              |
| Democratic Republic of the Congo | *              | *              | *              | *              | *              | *              |
| Equatorial Guinea              | *              | *              | *              | *              | *              | *              |
| Gambia                         | *              | *              | *              | *              | *              | *              |
| Ghana                          | *              | *              | *              | *              | *              | *              |
| Guinea                         | *              | *              | *              | *              | *              | *              |
| Guinea-Bissau                  | *              | *              | *              | *              | *              | *              |
| Liberia                        | *              | *              | *              | *              | *              | *              |
| Mali                           | *              | *              | *              | *              | *              | *              |
| Mauritania                     | *              | *              | *              | *              | *              | *              |
| Niger                          | *              | *              | *              | *              | *              | *              |
| Nigeria                        | *              | *              | *              | *              | *              | *              |
| Senegal                        | *              | *              | *              | *              | *              | *              |
| Sierra Leone                   | *              | *              | *              | *              | *              | *              |
| Togo                           | *              | *              | *              | *              | *              | *              |
| Total number of countries      | 10/22          | 19/22          | 16/22          | 7/22           | 14/22          | 9/22           | 14/22          |

a * indicates severe/very severe.
b Excluding Gabon and Sao Tome and Principe as described in the method section.
The list of indicators included 5 indicators on health financing, 4 indicators on essential medical products and technology, 2 indicators on health workforce (focused on community health), and 4 indicators on health facility service delivery. To complement the analysis, tracer indicators for child health interventions and child health-related multisectoral interventions that address overlapping children’s deprivations were also added.

### RESULTS

#### Self-grading of Bottlenecks by Country Teams

A total of 22 country teams identified and self-graded the bottlenecks to strengthen community health systems in their respective country contexts. Tables 1 and 2 summarize the overall grading across all the countries, as well as grouped by U5MR.

#### TABLE 2. Country Self-Grading of Health System Domains as Severe/Very Severe Bottlenecks to Strengthen Community Health Systems by Under-5 Mortality Rate Category (N=21 Countries)

<table>
<thead>
<tr>
<th>Countries/Domains</th>
<th>Legislation, Policies, Governance, Coordination</th>
<th>Health Financing</th>
<th>Essential Medical Technology and Products</th>
<th>Human Resources</th>
<th>Service Delivery and Integration; Quality of Services</th>
<th>Information System/ Monitoring and Evaluation</th>
<th>Community Ownership and Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Countries with under-5 mortality rate = 25 to 75 deaths/1,000 live births (6 countries)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congo</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gambia</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liberia</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Togo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total number of countries</strong></td>
<td>2/6</td>
<td>5/6</td>
<td>5/6</td>
<td>3/6</td>
<td>2/6</td>
<td>0/6</td>
<td>4/6</td>
</tr>
<tr>
<td><strong>Countries with under-5 mortality rate &gt; 75 deaths/1,000 live births (15 countries)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameroon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central African Republic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cote d’Ivoire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Democratic Republic of the Congo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guinea</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mali</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mauritania</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total number of countries</strong></td>
<td>8/15</td>
<td>13/15</td>
<td>11/15</td>
<td>4/15</td>
<td>12/15</td>
<td>9/15</td>
<td>10/15</td>
</tr>
</tbody>
</table>

* * indicates severe/very severe.

b Excluding Gabon and Sao Tome and Principe as described in the method section. Cabo Verde has less than 25 deaths/100 live births.
TABLE 3. Grouping of 22 West and Central African Countries According to Under-5 Mortality Rates Showing Selected Health System Tracer Indicators (Financing, Supply, Health Workforce, and Service Delivery) and Child Indicators

<table>
<thead>
<tr>
<th>Countries With Data, No.</th>
<th>Group 1, USMR &lt;25 Deaths per 1,000 Live Births (N=1)a</th>
<th>Group 2, USMR 25 to 75 Deaths per 1,000 Live Births (N=6)b</th>
<th>Group 3, USMR &gt;75 Deaths per 1,000 Live Births (N=15)c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality/demographicsd</td>
<td>Under-5 mortality rate (Median, deaths per 1,000 live births)</td>
<td>19.5</td>
<td>54.2</td>
</tr>
<tr>
<td>Annual rate of reduction (2000–2018)</td>
<td>3.3%</td>
<td>4.2%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Health financinge</td>
<td>Median primary health care expenditure as % current health expenditure (2016–2017)</td>
<td>63.3%</td>
<td>67.7%</td>
</tr>
<tr>
<td>Median primary health care expenditure per capita (2016–2017)</td>
<td>US$94.5</td>
<td>US$34.9</td>
<td>US$24.7</td>
</tr>
<tr>
<td>Median domestic general government health expenditure per capita, PPP (2017)</td>
<td>US$215.1</td>
<td>US$34.5</td>
<td>US$25.7</td>
</tr>
<tr>
<td>Median government expenditure on health, percentage of gross domestic product (2018)</td>
<td>3.1%</td>
<td>1.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Median out-of-pocket expenditure, percentage of current health expenditure (2017)</td>
<td>28.9%</td>
<td>48.5%</td>
<td>43.5%</td>
</tr>
<tr>
<td>Supplyf</td>
<td>Median essential drug availability</td>
<td>-</td>
<td>37.1%</td>
</tr>
<tr>
<td>Median vaccine availability</td>
<td>-</td>
<td>83.9%</td>
<td>76.5%</td>
</tr>
<tr>
<td>Median basic equipment availability</td>
<td>-</td>
<td>87.0%</td>
<td>82.0%</td>
</tr>
<tr>
<td>Median facilities with clean water, electricity, &amp; sanitation (% of health facilities)</td>
<td>-</td>
<td>54.2%</td>
<td>69.2%</td>
</tr>
<tr>
<td>Health workforce</td>
<td>Median community and traditional health worker density (per 1,000 population)</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td>Median health center density (per 100,000 population)</td>
<td>3.8</td>
<td>5.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Health facility service deliveryg</td>
<td>At least 1 antenatal visit, median</td>
<td>97.6%</td>
<td>92.0%</td>
</tr>
<tr>
<td>At least 4 antenatal visits, median</td>
<td>72.3%</td>
<td>77.9%</td>
<td>51.3%</td>
</tr>
<tr>
<td>Skilled attendance at birth, median</td>
<td>92.3%</td>
<td>64.8%</td>
<td>67.3%</td>
</tr>
<tr>
<td>Institutional delivery, median</td>
<td>75.6%</td>
<td>72.8%</td>
<td>66.8%</td>
</tr>
<tr>
<td>Child health tracer indicatorsh</td>
<td>Diphtheria-tetanus-pertussis immunization coverage, median</td>
<td>98.0%</td>
<td>86.0%</td>
</tr>
<tr>
<td>Children with diarrhea treated with oral rehydration salts, median</td>
<td>-</td>
<td>36.0%</td>
<td>34.3%</td>
</tr>
<tr>
<td>Children with malaria with first-line treatment (artemisinin-based combination therapy) for under-5, median</td>
<td>-</td>
<td>57.8%</td>
<td>17.5%</td>
</tr>
</tbody>
</table>

Continued
Table 1 shows that for all 22 countries, the bottlenecks most frequently identified as severe or very severe (affecting at least 50% of the countries) were health financing (self-reported by 19 countries or 86%), essential medical technology and products (self-reported by 16 countries or 73%), integrated health service delivery (self-reported by 14 countries or 64%), and community ownership and partnerships (self-reported by 14 countries or 64%).

We conducted subanalyses of these bottlenecks by further categorizing countries according to their mortality context. As displayed in Table 3, only 1 country met the criteria for Group 1, 6 countries met the criteria for Group 2 (median U5MR of 54.2 deaths), and 15 countries met the criteria for Group 3 (median U5MR of 88.1 deaths). Table 2 shows that for the country teams with U5MR over 75 deaths per 1,000 live births (15 countries), health financing (13 countries) was the dominant challenge, followed by essential medical technology and products (11 countries), and community ownership and partnerships (10 countries). The major difference between both settings was that integrated service delivery at the community level was not a major concern for country teams in settings with U5MR between 25 and 75 deaths per 1000 deaths (2 of 6 countries) compared to country teams in settings with U5MR above 75 deaths per 1000 deaths (11 of 15 countries).

The results from the grading patterns showed that overall, and irrespective of mortality context, health financing, essential medical products and technology, and community ownership and partnerships...
emerged as the health system building blocks that were consistently rated as having severe or very severe bottlenecks.

In-depth Country Review of Bottlenecks
Further analysis of the thematic areas (Supplement, Table 1) self-reported by country teams (at least 50% of countries) revealed that commonly, health financing challenges were due to the lack of a budget line for community health or PHC (13 countries), inefficient financial flows (13 countries), and mostly, the absence of a clearly defined resource mobilization pathway outlining funding gaps and potential funding sources that could be tracked and collected (20 countries).

The second most challenging health system block was essential medical technology and products, which was self-reported by 16 of 22 countries, had several underlying issues. Countries highlighted lack of training of health facility staffs (17 countries), frequent stock-out of selected drugs (15 countries), nonfunctional monitoring tracking system for drugs on a real-time basis (15 countries), and inadequacy or lack of quantification of community needs as part of the national annual quantification exercise (14 countries).

Community ownership and partnerships was self-reported by country teams as a weak area exacerbated by the lack of a national community engagement strategy (13 countries), inadequate linkages between CHWs and community members (13 countries), and the absence of functional mechanisms for social accountability and citizen engagement (14 countries). In countries with USMR over 75 deaths per 1,000 LB, integrated service delivery was a challenging building block mainly due to poor integration between MNCH and TB/HIV, birth registration, promotional and preventive adolescent sexual and reproductive health services, or early childhood and education. Less than 40% of country teams reported issues integrating MNCH and nutrition or water, sanitation, and hygiene interventions.

Progress in Strengthening Community Health Systems
Despite the observed challenges, countries made progress during the past 5 years (Supplement, Table 2). We highlight selected country-led efforts toward strengthening their community health systems in the context of PHC with the support of stakeholders working in the field of health system strengthening. This nonexhaustive list of selected achievements includes: Primary Health Care Development Agency Act (Nigeria), Primary Health Care reform (Mali), Integration of the community health module into the district health information system or DHIS2 (Senegal, Liberia), National Health Insurance financing scheme (Ghana), and financial contribution of local collectivities/government through their annual investment plan (Guinea), to name a few (Supplement, Table 2).

Table 4 presents the strategies proposed by country teams to address the bottlenecks hampering community health system strengthening. Whenever possible, we have proposed specific actions for countries in Groups 1 and 2 with a stronger health system than those in Group 3. The working group members conceptualized these solutions by health system areas and according to individual country contexts, yet several common solutions emerged. For example, the development of an investment case for community health or for PHC (which includes the community component) could better inform resource mobilization efforts, and fostering implementation and expansion of pro-poor legislation and strategies could reduce financial barriers limiting access to services. Countries are also encouraged to establish functional mechanisms for social accountability (community scorecards and observatories) and citizen engagement with communities to enhance quality care. We further propose taking a closer look at the key strategic priorities to be jointly (with communities) addressed in each of the 7 countries that are part of the Community Health Roadmap initiative in WCA (Table 5).

DISCUSSION
The renewed commitment to PHC presents an opportunity to optimize the functionality of community health systems and accelerate progress toward universal health coverage and SDGs. Functional PHC systems provide adequate care with the communities and through the communities, ensure preparedness against future epidemics, fight against the major causes of deaths, and build capacity to handle the growing burden of non-communicable diseases.

This study is the first multicountry analysis of bottlenecks and strategies to strengthen community health systems in WCA. There is a growing body of literature synthesizing current evidence and developing conceptual understandings on the design of national CHW programs and the processes of scaling up and integration into national health systems. Despite recent progress, substantial efforts are required by all to accelerate progress. This study emphasizes the great need to focus on increasing health financing, strengthening the supply chain system, and fostering community partnerships.
### TABLE 4. Examples of Country Achievements and Proposed Strategies to Strengthen Community Health Systems

<table>
<thead>
<tr>
<th>Highlights of Recent Achievements</th>
<th>Key Strategies to Enhance Current Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1 and 2: Countries with U5MR &lt; to 75 deaths / 1,000 live births</strong></td>
<td><strong>Senegal</strong></td>
</tr>
<tr>
<td></td>
<td><strong>High-level commitment and government leadership to scale up PHC: national health financing strategy developed; National UHC program defined; PHC review completed (2018–2019)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>National community health program 2019–2023</strong></td>
</tr>
<tr>
<td></td>
<td><strong>National health investment case developed; including community health component</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Various CHW cadres in place, mostly funded by external resources</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Engagement of local authorities for the management of health posts (casde santé) through local health development committee</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ongoing resource mobilization efforts conducted, with a great focus on external resources</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CHW package of services defined; scale up of integrated services in most regions, including health and nutrition at the community level</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CHIS developed and integrated into DHIS2</strong></td>
</tr>
<tr>
<td><strong>Liberia</strong></td>
<td><strong>High-level presidential engagement to scale to community health post Ebola virus disease-crisis (2016)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Community health investment case completed; National community health policy developed</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Financing gap analysis and resource mobilization, with a main focus on external funding – international aid</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Roll-out of the national community health assistant program; training modules and tools developed; community health assistants and supervisors recruited and trained in selected regions</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CHIS is integrated into DHIS2; Ongoing digitalization of the system to strengthen CHW performance</strong></td>
</tr>
<tr>
<td><strong>Group 3: Countries with U5MR Over 75 deaths/1,000 live births</strong></td>
<td><strong>Guinea</strong></td>
</tr>
<tr>
<td></td>
<td><strong>National health investment case developed; National community health policy developed (CHA profile harmonized)</strong></td>
</tr>
</tbody>
</table>
ownership and partnerships to strengthen community health systems in all settings. Countries with high U5MR should also reinforce integrated service delivery approaches through innovation.

Increase Health Financing

Our study shows that health financing was a very severe hurdle in all country contexts. Financing PHC or CHW programs have continued to be a
major obstacle to improving health outcomes in Africa, particularly considering that the WCA region bears the bulk of the global morbidity and mortality burden for mothers, newborns, children, and those infected by HIV. One explanation could be that government health prioritization did not seem to be associated with national income or level of government revenues in Africa. Despite increases

<table>
<thead>
<tr>
<th>Country</th>
<th>Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>• Develop a clearly defined pathway to mobilize domestic resources for community health (financial gaps, potential sources of funding, and actions)</td>
</tr>
</tbody>
</table>
in fiscal capacity in some countries, spending on health as a proportion of total public expenditure had been de-prioritized as governments strived to meet other obligations; and this tended to be associated with country-level fragility or poor governance.\textsuperscript{34} The Health Systems Strengthening Accelerator\textsuperscript{11} is partnering with U.S. Agency for International Development missions, country leaders, and partners in Cote d’Ivoire, Guinea, and Togo to develop near-term adjustments to public financing to lay the foundation for longer-term transition and ensure adequate and efficient use of health sector resources.

Another explanation could be that, in most African countries, public monies flowed disproportionally to high-end care at secondary and tertiary levels, referral hospitals, and capital facilities.\textsuperscript{33,34} Because of prohibitive costs also, governments balked at optimizing CHW programs through their proper integration in health systems. Taking into account the challenges of raising sufficient domestic resources for health, distributing the burden of health expenditure in an equitable manner, and addressing the need for efficient use of the scarce resources, close collaboration among the ministries of finance, territorial or internal affairs, and health is vital.\textsuperscript{32} External funds will still remain critical in many contexts, but efforts should focus on improving predictability of funding flows and harmonizing funds allocation with national priorities and mechanisms to ensure their effective use. The Financing Alliance for Health\textsuperscript{13,35} helps governments design and fund ambitious, affordable, and at-scale community health programs including finding innovative financing pathways and investment opportunities that utilize the private sector. Technical assistance has also been provided to countries, including in WCA, to develop community health strategies, comprehensive community health packages, community health investment cases, community health model improvement interventions, and financing policy briefs to advocate for resource mobilization.

**Strengthen the Supply Chain**

Most country teams self-reported that the supply chain was a severe health system bottleneck due to reasons such as lack of funding including for operating costs, ineffective procurement cycles and delays, inadequate commodity security strategies, and inadequate quantification for CHWs. Country-specific implementation barriers could have been overlooked due to information gaps and lack of data sources in this area. However, the literature showed that access to medicines or health commodities remained one of the most serious global public health problems and resulted in critical gaps in the delivery of PHC services.\textsuperscript{36} Challenges reported by country teams were also most likely due to heterogeneity in the governance structure of central medical stores, existing parallel systems that are not government-led, non-inclusion of the community module into the national supply chain plan causing inadequate budgeting, and poor health worker performance and accountability. Similar findings were observed in various countries in Africa.\textsuperscript{37,38} In addition, Pronyk et al.\textsuperscript{31} showed similar supply chain bottlenecks in relation to the accessibility and availability of the 13 reproductive care and MNCH lifesaving commodities.

For all settings, key strategies to address challenges could include: effective integration of the community-based supply chain system into national supply chain policies, systems, training on data collection and analysis leading to improved forecasting and reduced stock-outs, reducing tiers in the operational system, streamlining information flows, using of mobile technology across tiers and/or facilities where possible, and developing efficient quality assurance processes.

Additional challenges were absent or irregular supplies of key commodities in public health facilities (including CHWs) most likely due to weak systems for restocking, inadequate quantification, or lack of funds. One strategy could be the use of information and communication technology (ICT) or computerized systems that analyze local data use to drive the supply of commodities according to need, which can be set to both forecast seasonal needs and to generate alerts when commodities fall below a specified threshold.\textsuperscript{37,39} A hallmark of functioning health systems is the availability of essential medicines in adequate amounts, appropriate dosage forms, assured quality, and at a price that is affordable for local communities.\textsuperscript{40} Because most health care delivery occurs at the lowest level of care, efforts should focus on ensuring a more responsive integrated supply chain management system to substantially improve the effectiveness of health workers.

**Foster Community Engagement and Partnerships**

Community engagement was a severe challenge for most country teams in all contexts. Enhancing community participation—a fundamental principle of PHC—has proved problematic, and how it is operationalized and sustained in practice is not always well understood.\textsuperscript{41,42} Our study, as well as previous
underlying issues such as the lack of national community engagement strategy, limited social capital and community capacities, and absence of national and local established mechanisms to enhance local stakeholders’ accountability. Many international health policies recognize the WHO’s vision that communities should be involved in shaping PHC services. The literature revealed a small but substantial body of evidence that community engagement is associated with improved health outcomes. For example, in Burkina Faso, Mali, and Côte d’Ivoire, as a matter of policy, respective governments aim at increasing access to health services through CHWs, civil society organizations, women’s groups, nongovernmental organizations through community partnership, and full participation. Additional research on the impact of community-based participatory processes remained to be done at a large scale in WCA. In other settings, findings showed that partnering with communities could lead to designing new service models that fit within existing budgets and address local aspirations and health care priorities. Country teams proposed that policy makers should develop community engagement plans, strengthen policy implementation with communities, and support funding for participatory mechanisms in PHC.

**Integrate Service Delivery**

The highest burden of mortality and morbidity is often seen where health system gaps are the greatest. Since mortality data can be regarded as a tracer for the health system, countries were split into categories by U5MR. Countries with higher U5MR (Group 3) reported additional challenges related to integrated service delivery most likely due to poor coordination across programs, inadequate professional skills, or lack of cross-sectoral funding mechanisms. Our analyses also showed that these countries had lower government expenditures on health and lower intervention coverage than those with lower mortality rates. Few country teams reported challenges in integrating MNCH and integrated community case management of childhood diseases. Poor MNCH/ HIV/TB service integration was reported as a severe bottleneck by 14 countries. The majority of the missing cases with TB and HIV will only be found through decentralized, integrated, and family-centered service delivery at the PHC level. Screening and awareness of TB and HIV need to be an integral part of community-based child health and nutrition programming in high-burden settings, with shared mandates and accountabilities across health programs. Integrated case management of multiple diseases by appropriately trained CHWs has been demonstrated to be feasible, promote care seeking, improve rational antibiotic use, and reduce all-cause mortality among children under 5 years old. A Cochrane review found that integrated management of childhood illnesses was associated with a 15% reduction in child mortality when activities were implemented at both health facilities and communities.

Community-based integrated programming should be reinforced to strengthen disease surveillance, rapid responses to health crises that may emerge in different areas, including infectious diseases (like coronavirus disease [COVID-19]), first aid, and mental health as we learned from the Ebola outbreak. Whereas similar investigations have examined health system challenges to the scale-up of newborn care, pneumonia and diarrhea, and malaria treatment, this analysis provides new insight into which system bottlenecks are severe and common for community-based health care in WCA.

**Strengthen Leadership and Governance, Health Information System, and Human Resources**

**Leadership and Governance**

Although this health system block has not been self-graded as a major bottleneck by country teams, its importance cannot be overstated. Governments and communities need to plan and act to institutionalize CHWs as per the 2018 WHO policy since relying on donor funding is not sustainable. Communities are crucial drivers for health system efforts to scale up and improve care and need to be involved in all mortality contexts. Country teams also highlighted the need for operational changes to support service integration, including tailoring actions and resources to reach the most disadvantaged areas and social groups and building capacity in PHC to deliver proactive promotion and preventive care at the community level.

In terms of partnerships, there is also a need for strong intersectoral linkages beyond health alone as well as multilevel partnerships, which are crucial to driving and maintaining effective systems. More countries in WCA can also benefit from global and regional ongoing initiatives to mobilize investments and expertise to strengthen community health systems including the Global Financing Facility, the 2017 Institutionalizing
Community Health Conference, the Community Health Roadmap, the 2019 Primary Health Care Conference, the Primary Health Care Performance Improvement partnerships, the Health System Strengthening Accelerator, the Health Data Collaborative, the Collectivity, the integrated Community Case Management Financing Task Team, and the Financing Alliance for Health. All these initiatives aim to support governments in their efforts to strengthen the health system through health policy reforms and initiatives to increase government expenditures on health and expand basic services to all, including the most vulnerable.

Health Information System

Although this building block was not self-graded a major bottleneck, at least 50% of countries reported challenges related to lack of community data, poor quality of data reported, and the capacity of communities to analyze and use the data for decision making. This is most likely due to weak supervision of CHWs by health facility staff and insufficient number of CHWs trained on information system management. Several countries, including Liberia, Sierra Leone, Ghana, and Senegal improved their information system by integrating the community health module into the district health information system (DHIS2). In addition, Ghana moved forward with the roll-out of eHealth. Additional efforts should be done to develop and train PHC staff, including CHWs, on standard operating procedures for data management and use. Although eHealth has the ability to positively influence the quality of health care and improve health services, there are a number of challenges to its adoption. Constraints to the adoption of eHealth in Africa include the low ICT budgets, poor infrastructure in support of health services, erratic electricity supply, and inadequate human resource capacity. The private sector’s involvement in spearheading an eHealth revolution within the subregion could be an immense benefit to alleviating the burden on governments and their inadequacy.

Human Resources

Challenges related to human resources at the community level were not perceived to be severe or very severe by most country teams, most likely due to ongoing efforts. A regional study conducted by WHO in 2019 showed that 70% of 47 African countries had a human resources strategy or plan showing their commitment to address workforce issues. Although these plans particularly emphasized equitable distribution of health workers to rural and hard-to-reach areas and the use of incentives to recruit and retain them to those areas, only 8% of plans mentioned formally integrating CHWs into the health system to meet the CHW shortfall or to train and integrate them to assure equitable distribution of CHWs throughout the country. This is in line with our study in which most country stakeholders reported the lack of retention and motivation mechanisms (12 countries) or any forms of contracts (17 countries) for CHWs. A recent review found strong support for ensuring community embeddedness, as this was associated with CHW retention, motivation, performance, accountability, and support and ultimately affects the acceptability and uptake of CHWs’ health-related work. In the WCA region, CHWs are mostly male; not only gender-responsiveness of policies is still inadequate, but also questions about these unbalanced ratios are insufficiently raised.

Strengths and Limitations

We categorized bottlenecks by health systems building blocks to allow the identification of issues and implementation of solutions. However, we recognize that barriers to care are inter-related and their solutions cut across several building blocks. For instance, low demand for care could be due to current nonavailability of services (health workforce), affordability (health financing), or lack of community awareness (community ownership and partnership). The focus on child health interventions for some health system areas may warrant some further narrowing of the presentation of findings, as issues around community-based child health interventions are not necessarily transferable to other community health areas. Country bottleneck identification depended upon the generation of categorical variables from nonstandard and qualitative data collected by different enumerators. Despite the use of expertly defined performance thresholds to generate these variables, this process might be subject to interpretation and bias. Finally, although this first regional assessment provides further insights into challenges and strategies to strengthen community health systems, further research linking the reduction of bottlenecks and outcomes is warranted. In-country exercises may have taken place without counter-balancing independent views (civil society or nongovernmental organizations). Despite these constraints, the results are in line with previous health systems assessments.
A Way Forward for All

The multicountry bottleneck analysis workshops provided an opportunity to engage country teams in identifying and prioritizing context-specific barriers to strengthen community health systems. Following this in-country exercise in 2019, countries such as Niger, Côte d’Ivoire, Sierra Leone, Mali, Burkina Faso, and Gambia have organized further dialogue with national experts and key stakeholders to review and revise their community health policy or strategy. The solutions proposed by the country teams could inform technical assistance needs and serve as a basis for further dialogue for countries to implement evidence-based, data-driven health programs and build resilience. Table 5 highlights further actions needed to strengthen community health systems in the Community Health Roadmap countries. We must galvanize efforts to mobilize resources for effective PHC, which is fundamental to mortality reduction and reliant on strong community health systems to expand access to services.69

CONCLUSION

In the context of PHC revitalization, addressing the regional situation of accelerating the reduction of maternal, neonatal, and child deaths by 2030 requires integrated, equity-focused, and multisectoral strategies, as well as strengthened community health systems.1 This article highlights bottlenecks and a way forward to optimize community health systems in one of the poorest regions in the world. In WCA, strengthening community health systems, as part of PHC revitalization efforts, should focus on increasing health financing and innovative investments, strengthening the logistics management system, and fostering community ownership and partnerships. Countries with high U5MR should also reinforce integrated service delivery through innovative approaches. Government actions galvanized by global and regional ongoing initiatives should be sustained to ensure that no one is left behind. Strong community health systems are fundamental to improve PHC services and move toward universal health coverage.

Acknowledgments: We greatly appreciate the contribution of Olga Bornemissa who provided technical advice and her expertise during the review of the article. We are grateful to the U.S. Agency for International Development, United Nations Children’s Fund colleagues (headquarters, region, and countries), and all partners who technically contributed through their work and expertise, directly or not, to the development of this research work.

Funding: This work was financially supported by the Global Fund through a grant supported by a Strategic Initiative.

Competing interests: None declared.

REFERENCES


44. Farmer J, Nimjeeer A. Community participation to design rural primary healthcare services. BMC Health Serv Res. 2014;14:130. CrossRef. Medline


46. Lown JE, Blencowe H, Oza S, et al. Every Newborn: progress, priorities, and potential beyond survival. Lancet. 2014;384(9938):189–205. CrossRef. Medline


Introduction: L’engagement renouvelé en faveur des soins de santé primaires (SSP) offre l’opportunité de renforcer les systèmes de santé en Afrique de l’Ouest et du Centre. Bien que des interventions peu onéreuses et efficaces, fondées sur des données probantes, puissent prévenir jusqu’à un tiers des maladies infectieuses et non transmissibles, le financement de la santé, les produits et technologies médicaux essentiels, ainsi que l’appropriation et les partenariats communautaires sont apparemment devenus les goulots d’étranglement majeurs ou les plus critiques au renforcement des systèmes de santé communautaires, quel que soit l’endroit de leur fonctionnement.

Le financement de la santé, les produits et technologies médicaux essentiels, ainsi que l’appropriation et les partenariats communautaires sont apparus comme les goulots d’étranglement majeurs ou les plus critiques au renforcement des systèmes de santé communautaires, quel que soit les tendances de la mortalité.

Les progrès impulsés par les pays sont possibles. Les stratégies potentielles pour lever les goulots d’étranglement comprennent l’augmentation des investissements publics dans les chaînes d’approvisionnement, le renforcement de la mise en œuvre des politiques et le développement des partenariats locaux.

Les pays ayant des taux de mortalité infantile élevés devraient améliorer la gestion des soins à cette population, grâce à une meilleure intégration.

En français

Galvanisation de l’action en faveur des soins de santé primaires: analyse des goulots d’étranglement et stratégies pour renforcer les systèmes de santé communautaire en Afrique de l’Ouest et du Centre

Résultat Clé

- Le financement de la santé, les produits et technologies médicaux essentiels, ainsi que l’appropriation et les partenariats communautaires sont apparus comme les goulots d’étranglement majeurs ou les plus critiques au renforcement des systèmes de santé communautaires, quel que soit les tendances de la mortalité.

- Les progrès impulsés par les pays sont possibles. Les stratégies potentielles pour lever les goulots d’étranglement comprennent l’augmentation de l’allocation budgétaire nationale et la mise à profit de mécanismes de financement innovants en faveur des soins de santé primaires (SSP), l’intégration des systèmes de chaîne d’approvisionnement et le renforcement de la mise en œuvre des politiques avec les communautés et les gouvernements locaux.

- Les pays ayant des taux de mortalité infantile élevés devraient améliorer la gestion des soins à cette population, grâce à une meilleure intégration.

Implications Clé

- Les pays doivent saisir les opportunités pour renforcer systématiquement les systèmes de santé communautaire dans leurs efforts pour atteindre la couverture sanitaire universelle.

- Nous devons galvaniser les efforts pour mobiliser les ressources pour des SSP efficaces, qui reposent sur des systèmes de santé communautaires solides pour élargir l’accès aux services et ne laisser personne sur le bord du chemin.

- La programmation intégrée à base communautaire devrait être renforcée pour en retour renforcer la résilience, la surveillance des maladies et les réponses rapides aux crises sanitaires, y compris celles dues aux maladies infectieuses comme la COVID-19.

RéSUMÉ

Introduction: L’engagement renouvelé en faveur des soins de santé primaires (SSP) offre l’opportunité de renforcer les systèmes de santé en Afrique de l’Ouest et du Centre. Bien que des interventions peu onéreuses et efficaces, fondées sur des données probantes, puissent prévenir jusqu’à un tiers des maladies infectieuses et non transmissibles, le financement de la santé, les produits et technologies médicaux essentiels, ainsi que l’appropriation et les partenariats communautaires sont apparus comme les goulots d’étranglement majeurs ou les plus critiques au renforcement des systèmes de santé communautaires, quel que soit l’endroit de leur fonctionnement.

Les progrès impulsés par les pays sont possibles. Les stratégies potentielles pour lever les goulots d’étranglement comprennent l’augmentation des investissements publics dans les chaînes d’approvisionnement, le renforcement de la mise en œuvre des politiques et le développement des partenariats locaux.

Les pays ayant des taux de mortalité infantile élevés devraient améliorer la gestion des soins à cette population, grâce à une meilleure intégration.

Recherches

- Nous avons mené des recherches sur les goulots d’étranglement majeurs ou les plus critiques au renforcement des systèmes de santé communautaires, quel que soit l’endroit de leur fonctionnement.

- Les stratégies potentielles pour lever les goulots d’étranglement comprennent l’augmentation des investissements publics dans les chaînes d’approvisionnement, le renforcement de la mise en œuvre des politiques et le développement des partenariats locaux.

- Les pays ayant des taux de mortalité infantile élevés devraient améliorer la gestion des soins à cette population, grâce à une meilleure intégration.
complications et des décès maternels, néonatals et infantiles avec une couverture universelle aient été identifiées, plus de 50% des personnes vivant dans les zones rurales ou issues de familles pauvres, dans des contextes aux ressources limitées, n’ont toujours pas accès à ces interventions simples. Cet article vise à évaluer les goulots d’étranglement et à proposer des solutions pour renforcer les systèmes de santé communautaire pour l’atteinte de meilleurs résultats.

**Méthodes:** Nous avons mené une analyse systématique multi-pays des goulots d’étranglement et proposé des solutions pour renforcer les systèmes de santé communautaire à travers une série d’ateliers collaboratifs dans 22 pays d’Afrique de l’Ouest et du Centre. Les pays ont été classés en fonction de leur taux de mortalité des moins de 5 ans pour évaluer les spécificités liées aux défis identifiés (> 75 décès pour 1 000 naissances vivantes, 25 à 75 décès pour 1 000 naissances vivantes et < 25 décès pour 1 000 naissances vivantes). Nous avons également examiné les données existantes sur certaines interventions traceurs du système de santé pour analyser les profils des pays.

**Résultats:** Les goulots d’étranglement identifiés comme sévères ou très sévères étaient liés au financement de la santé (19 pays soit 86%), aux technologies et produits médicaux essentiels (16 pays soit 73%), à la prestation de services de santé intégrés (14 pays soit 64%) et à l’appropriation et aux partenariats communautaires (14 pays ou 64%). Seule la prestation de services intégrés a été déclarée comme un défi majeur par les pays avec un taux de mortalité des enfants de moins de 5 ans élevé. La question des ressources humaines pour la santé communautaire était l’un des défis les moins signalés. Après un examen approfondi des progrès effectués par les pays, nous avons proposé des stratégies pour renforcer les systèmes de santé communautaire.

**Conclusion:** En AOC, le renforcement des systèmes de santé communautaires dans le cadre des efforts de revitalisation des SSP devrait se concentrer sur : l’augmentation du financement de la santé et des investissements innovants, le renforcement du système d’information et de gestion logistique, et la promotion de l’appropriation et des partenariats communautaires. Les pays avec un taux de mortalité infanto-juvénile élevé devraient également renforcer la prestation de services intégrées par des approches innovantes. Les actions gouvernementales, galvanisées par les initiatives mondiales et régionales en cours, doivent être soutenues afin que personne ne soit laissé sur le bord du chemin.
Applying the Community Health Worker Coverage and Capacity Tool for Time-Use Modeling for Program Planning in Rwanda and Zanzibar

Melanie Morrow, a Eric Sarriot, b Allyson R. Nelson, c Felix Sayinzoga, d Beatrice Mukamana, d Evariste Kayitare, d Halima Khamis, e Omar Abdalla, c William Winfrey f

Key Findings

- Governments in Rwanda and Zanzibar used the Community Health Worker Coverage and Capacity (C3) Tool to optimize community health worker (CHW) time allocation and to estimate how many CHWs were needed to meet universal health coverage goals, respectively.
- In Rwanda, 2 well-established CHW cadres were within a “manageable” workload range, whereas a new cadre was projected to achieve less than half of assigned activities.
- In Zanzibar, the model projected that 2,200 community health volunteers could achieve approximately 90% coverage of all defined services. Based on these figures, Zanzibar updated its national community health strategy, which officially launched in February 2020.

Key Implications

- Policy makers can use the tool to check the feasibility of existing or new CHW policy and strategy with respect to CHW numbers, workload, and population coverage of interventions.
- Program managers may find the tool useful to establish reasonable expectations for CHW contributions within existing policies and strategies, helping managers to make more realistic plans. Iterative use of the tool supports CHW strategy refinement. Used collaboratively, it can help with building consensus around decisions.

Résumé en français à la fin de l’article

Abstract

Community health worker (CHW) programs are a critical component of health systems, notably in lower- and middle-income countries. However, when policy recommendations exceed what is feasible to implement, CHWs are overstretched by the volume of activities, implementation strength is diluted, and programs fail to produce promised outcomes. To counteract this, we developed a time-use modeling tool—the CHW Coverage and Capacity (C3) Tool—and used it with government partners in Rwanda and Zanzibar to address common policy questions related to CHW needs, coverage, and time optimization.

In Rwanda, the C3 Tool was used to analyze 2 well-established cadres of CHWs and 1 new one. The well-established CHW cadres were within a “manageable” workload range whereas the new cadre was projected to achieve less than half of assigned activities. This is informing ongoing changes to the CHWs’ scopes of work. In Zanzibar, the C3 Tool was used to update the national community health strategy to include community health volunteers (CHVs) for the first time and determine how many CHVs were needed. The tool projected that 2,200 CHVs could achieve approximately 90% coverage of all defined services. Based on these figures, Zanzibar updated its national community health strategy, which officially launched in February 2020.

We discuss lessons from these 2 experiences. Translating analysis into decision making depends not only on the programmatic will and motivation of governments but also on finding opportune timing for when policy and program processes allow for optimization of CHW investments. Further research is needed but our experience supports the value of a modeling tool to ground program plans within estimated constraints on CHW time.

BACKGROUND

The provision of sufficient human resources is a critical challenge for health systems in low- and middle-income countries (LMICs). Community health workers (CHWs) are recognized as a value-added workforce in the health system architecture, essential to the revitalization
We aim to address a basic operational question “in the weeds” of design and implementation of CHW programs.

The C3 Tool is used to analyze the correspondence between the number and type of activities implemented by CHWs versus the time available to implement these activities.

We write as facilitators and country policy and program leaders in assessing and optimizing the time allocation of national CHW cadres on essential tasks through a new modeling tool. We focus on the experience of the Rwanda Biomedical Center (RBC), the government’s central health implementation agency under the Ministry of Health (MOH), with support from the U.S. Agency for International Development’s (USAID) Maternal and Child Survival Program (MCSP) and the experience of the Zanzibar Ministry of Health (ZMOH) with support from D-tree International.

CHW COVERAGE AND CAPACITY TOOL: DEVELOPMENT AND DESCRIPTION

MCSP developed the CHW Coverage and Capacity (C3) Tool in Microsoft Excel based on a review of the literature on CHW time use and performance, iterative prototyping, and “lab testing.” USAID prioritized the C3 Tool’s development with MCSP as part of a broader agenda on institutionalizing community health18 that included tools and technical assistance to support optimization of CHW policy implementation.19 The proof of concept was demonstrated in 2015 with 2 district managers in mainland Tanzania, in consultation with CHWs and their supervisors. The C3 Tool showed an important difference between the coverage expectations of CHWs and the reality of time and travel constraints. The tool has been used in 5 country settings as part of testing and development, including now mature implementation in Rwanda and Zanzibar. The current version of the tool and accompanying user guide are publicly available.20,21

The C3 Tool is used to analyze the correspondence between the number and type of activities implemented by up to 6 different CHW cadres versus the time available to implement these activities, factoring in country-specific epidemiology and demography. The tool is flexible, with CHW activities defined by the user to reflect the context. An interactive policy screen provides graphs and tables, allowing decision makers to explore the implications of various combinations of intervention packages and CHW time allocation to address 3 types of programmatic questions:

1. Quantification of needs for CHWs given a set policy: given C3 input parameters, how many CHWs are needed to achieve targeted coverage?
2. Quantification of the expected coverage, given a set number of CHWs: how much of the prescribed activities can materially be carried out by a fixed number of CHWs given the time they have available? This provides the equivalent of an expected coverage rate for CHW-delivered interventions. The tool allows adjustment of the parameters for population target size, for example, if a proportion of services is expected to be delivered in a facility and CHWs are expected to cover services in “the last mile.” This coverage can be revised over time or based on differences in regional balance of needs between facility and community-based services.

3. Optimization, given the number and level of effort of CHWs: How do possible changes in prioritization of interventions or changes in strength of implementation (more or fewer home visits, more or fewer “integrated” activities) affect intervention coverage and demands on time? This can also inform differential regional deployment choices.

Country Selection and Implementation Context
The 2 countries self-selected and were the most recent sites of C3 Tool implementation, feeding into their own active decision-making process.

Rwanda’s community health program is well-recognized for having contributed to the country’s achievement of the Millennium Development Goals for health.\textsuperscript{10} It is described in detail elsewhere.\textsuperscripts{10,22} The national CHW program started in 1995 and later expanded in 2005 to include 3 CHWs for every village nationwide: 1 female maternal health assistant (agents de santé maternelle [ASM]) tasked with maternal and newborn health, community-based family planning, and health promotion; and a male-female binôme (pair) jointly responsible for integrated community case management (iCCM) of malaria, pneumonia, and diarrhea in children; community-based family planning; nutrition, including monthly screening of children aged under 5 years; TB referral and treatment adherence; home-based management of malaria for adults; and health promotion. CHWs also report community health data and provide referrals. CHWs in Rwanda are volunteers but receive financial incentives linked to community performance-based financing and participation in CHW cooperatives. Rwanda’s community health program was comprehensively evaluated in 2016; findings included uneven implementation of services and recommendation to account for variations in setting such as urban vs. rural, population density, and epidemiologic trends.\textsuperscript{23} In 2019, a fourth CHW specifically for health promotion (HP-CHW) was elected per village, with responsibilities including early childhood development (ECD) and nutrition, among others. As of this writing, the Rwanda community health program reports a total of 58,567 CHWs (15,361 ASMs, 29,314 binômes, and 13,892 HP-CHWs) serving a total population of 12.37 million people (2019 estimate)\textsuperscript{24} and the CHW program is under further revision. RBC/MOH chose to partner with MCSP to carry out the C3 Tool analysis for all 3 of the government’s CHW cadres, with special interest in the new HP-CHW cadre, as it had been recruited but not trained and its scope of work was in flux.

In 2019, the ZMOH and the President’s Office of Regional Administration, Local Government, and Special Departments decided to update Zanzibar’s national community health strategy. The previous strategy (2011) relied on local health committees to manage community health activities but did not include a cadre of CHWs. Based on the success of smaller nongovernmental organization-led programs, the ZMOH decided to formally adopt a volunteer cadre of CHWs in support of universal health coverage goals in the revised strategy (2019). CHWs in Zanzibar are called community health volunteers (CHVs) and are remunerated with performance-based incentives. As most of the population lives within 5 km of a health facility, the ZMOH decided CHVs should provide only preventive and promotive reproductive, maternal, newborn and child health, nutrition, and ECD services. However, the specific interventions within the package of services they could provide, the frequency of household visitation, the desired coverage of each service, and the overall total number of CHVs needed to meet these targets without exceeding a maximum time commitment of 18 hours per week had yet to be defined. With technical assistance from D-tree International, the ZMOH used the C3 Tool to answer these key questions which would form the foundation of the CHV program structure in the updated national strategy. The C3 Tool and this article both use the term CHW generically except when referring to specific cadres, such as the CHVs in Zanzibar.

\section*{METHOD}
The C3 method is a decision-making process supported by an interactive modeling tool for defining priority program time-commitments of CHWs. Although there are iterations and back-and-forth
in the method, depending on context, the C3 process follows 5 major steps (Table 1). Steps 3 and 4 rely on the C3 Tool in Excel.

**Engaging Stakeholders**

The first step in implementation usually builds on prior partnership engagement with national or subnational structures. Before the C3 Tool can be used effectively to change policy or program implementation, government decision makers and supporting partners must recognize the need and value of exploring priority services for CHWs in comparison to effective time available and seek to find a solution for this operational and management issue that balances all requirements and strategy or program objectives.

In Rwanda, MCSP worked with the community health program at the district level to assess time use of different CHW cadres in 2017. This work ultimately led to carrying out a C3 exercise at the national level. The process was protracted to accommodate government planning timelines and interruptions related to a transition of leadership in the community health program, under the responsibility of RBC/MOH. MCSP was invited to send a team to Kigali to complete a C3 exercise in July 2019 as the Rwanda Community Health Program was adding a new CHW cadre for health promotion.

In Zanzibar, the community health strategy development committee became interested in the C3 process as part of its planning for strategy revision. A team was formed within the committee to work on modeling using C3 with the support of D-tree and subsequently to provide recommendations back to the larger committee. Community health strategy committee leadership and composition reflected both the ZMOH Health Promotion Unit responsible for community health activities and the ministry of local government (President’s Office of Regional Administration, Local Government, and Special Departments) responsible for implementing health services and managing staff.

**Defining the Questions**

The clear definition of research questions is an essential initial step in the process. As previously described, questions could pertain to number of CHWs needed, expected coverage given a set number of CHWs, and scenarios for optimizing parameters for coverage.

For Rwanda, the driving question was how much coverage the newly designated HP-CHWs could achieve with their number and tentative responsibilities. Given that there were already 2 types of CHWs widely available in communities—2 binômes and 1 ASM per village—this also allowed examination of what coverage was expected of these well-established cadres for their respective scopes of

<table>
<thead>
<tr>
<th>TABLE 1. Summarizing C3 Steps and Timelines in Rwanda and Zanzibar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rwanda</strong></td>
</tr>
</tbody>
</table>

1. Engaging stakeholders

| 2017–2018: District level testing and preliminary conversations with national stakeholders | September 2018: Engaged with key decision makers for community health strategy (ZMOH, UNICEF, Save the Children) |
| April 2019: Confirmed commitment to applying Tool with RBC/MOH for analysis at national level |

2. Defining the questions

| April, July 2019 | October 2018 |

3. Modeling assumptions and inputting data in the C3 Tool

| July 2019: MCSP-RBC/MOH in-country consultation | October–November 2018 |

4. Iterative testing of scenarios through the C3 Tool


5. Prioritizing and decision making

| Ongoing by RBC/MOH | January–February 2019: Followed by minor revisions when coupled with Management Sciences for Health’s Community Health Planning and Costing Tool costing data |
| | July 2019: Finalized revised community health strategy |

**Abbreviations:** MCSP, Maternal and Child Survival Program; MOH, Ministry of Health; RBC, Rwanda Biomedical Center; UNICEF, United Nations Children’s Fund; ZMOH, Zanzibar Ministry of Health.
work. Additionally, the Rwanda community health program leadership wanted to examine the implications of known difference in malaria epidemiology between regions, with special concern for rural areas. This led to the selection of 2 regional typologies for the analysis (Table 2). Identification of optimization opportunities was the ultimate objective of the exercise.

As Zanzibar was embarking on the rollout of its new CHV scheme, the first question was about quantifying the need for these CHVs. As it became rapidly clear that programmatic needs would be greater than capacity, the question evolved toward priority setting and optimization.

**Modeling Assumptions and Inputting Data**

This first step of the modeling exercise sometimes starts before substantial country engagement for known variables such as population size and number of existing CHWs. The default of C3 is to use national demographic data originating from World Population Prospects. Figure 1 maps the main stages of the C3 modeling steps.

Second, each country must establish values for a given set of parameters, including the level of effort of CHWs and time spent on various activities (e.g., administration, travel, and training, versus primary health interventions). The country must also set values for the nature of policy-supported interventions (e.g., home visits, engagement of groups in the community, campaigns, and referrals and accompaniment), with each intervention having a definition of the population targets, frequency of contact, and estimated time allocation. The full list of variables in the C3 model is provided in the user’s manual and in the tool itself.

The C3 Tool seeks to support management decisions that often must be made with imperfect data. Some variables have known and recognized estimates (national population and demographic distribution, CHW number). When the exercise focuses on a specific region, a first level of approximation enters in, for example applying or revising the national demographic profile to the region. Other variables have far less certainty, from the most basic information on time spent on work, travel times, even time spent on administration. When trusted data are not available, the facilitation team must engage with decision makers in making acceptable “reasonable assumptions.” Consultations with CHWs themselves and their supervisors can narrow down assumptions on travel and administrative work time: “at a maximum, time for activity X is not more than …” and “it is not less than ….” This is unsatisfactory from a research perspective, but par for the course for managers. Developing these assumptions also provides an opportunity for managers to become explicitly aware of management blind spots and increase the demand for follow-up assessments.

For Rwanda, data sources included national documents like the Community Health National Strategic Plan 2013–2018, the Comprehensive Evaluation of the Community Health Program: Final Report (2016), and the Demographic and Health Survey (2015); unpublished government statistics, and data from prior MCSP subnational intervention and engagement with CHWs.

The exercise in Rwanda, requiring differentiation between relatively higher and lower malaria prevalence regions, brought to light the limitations in translating malaria prevalence data into incidence rates, and consequently need for iCCM and adult home-based management services. We used prevalence rates and service statistics as benchmarks to establish that binômes from the Eastern province would need to see approximately 13 times the number of children seen in the Northern and Western provinces for malaria. In Zanzibar, the demographic parameters were

---

**TABLE 2. Rwanda Model Assumptions by Typology: Population and CHWs**

<table>
<thead>
<tr>
<th>Rural Eastern: Higher Malaria Typology, No.</th>
<th>Rural Northern and Western: Lower Malaria Typology, No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total population</strong></td>
<td></td>
</tr>
<tr>
<td>2,600,814</td>
<td>2,178,695</td>
</tr>
<tr>
<td><strong>Under-5 population</strong></td>
<td></td>
</tr>
<tr>
<td>338,106</td>
<td>286,259</td>
</tr>
<tr>
<td><strong>ASMs</strong></td>
<td></td>
</tr>
<tr>
<td>3,794</td>
<td>3,456</td>
</tr>
<tr>
<td><strong>Binômes</strong></td>
<td></td>
</tr>
<tr>
<td>7,799</td>
<td>6,949</td>
</tr>
<tr>
<td><strong>HP-CHWs</strong></td>
<td></td>
</tr>
<tr>
<td>3,837</td>
<td>3,392</td>
</tr>
<tr>
<td><strong>Population/all-CHWs</strong></td>
<td></td>
</tr>
<tr>
<td>169</td>
<td>158</td>
</tr>
</tbody>
</table>

Abbreviations: ASMs, agents de santé maternelle; CHWs, community health workers; HP, health promotion.

a Typologies: (1) Rural Eastern: highest relative malaria incidence, included 5/6 districts in province with lowest population density, maximum 455/km²; and (2) Rural Northern and Western: lower malaria incidence, included districts with less than national median population density of 481/km².

b Population figures based on 2012 census data.
adjusted to be specific to Zanzibar, rather than Tanzania as a whole.

In Zanzibar, this step and the following step overlapped closely. Population (1,579,849 total; 268,574 children under 5) and some demographic information in the tool was adjusted to reflect Zanzibar-specific unpublished 2018 data provided by the Office of Chief Government Statistician-Zanzibar. Time was spent specifying the package of services and specific interventions CHVs would provide, the methodology through which they would provide these (i.e., group counseling or household visits), the amount of time each integrated visit or session would take, the frequency of visits needed to have the desired impact on health outcomes or behaviors, and the population in need. The facilitation team consulted various units within the ZMOH to determine the frequency of campaigns and other ad hoc CHV activities. The delivery mechanism, frequency, and time was based on experience from previous programs and expert opinion on what each visit would look like when delivered with integrated content as specified in the package of services.

Iterative Testing of Scenarios
This step is both the shortest and the most critical in the C3 process. Testing can take the format of a workshop or iterative checks with decision makers followed by adaptation of the model by the facilitation team. During these iterative checks, decision makers are given the first findings of the modeling exercise that address their questions, can ask “what if” questions, and can be encouraged to question the prioritization of tasks for CHW cadres. Facilitation requires both the ability to “play” with the model, as well as an understanding of community health programs, standards of evidence for proposed interventions, and practical programmatic sense.

In Rwanda, based on first findings, prioritized activities for HP-CHWs were immediately developed in consultation between Rwanda community health program leadership and the facilitation team. In Zanzibar, the package of services was defined by the community health strategy committee, but some interventions were designated as core interventions and others as add-on packages for a later time. The balance of group counseling versus household visitation was intensively discussed. Based on first findings, the facilitation team then sought ZMOH and community health strategy committee members’ ideas for various scenarios, in particular, to determine financial and managerial resource availability to support a certain number of CHVs and reasonability of workload in terms of hours per week the CHVs

FIGURE 1. Iterative Steps of the Modeling Component of the C3 Process
could dedicate to their community health activities and the number of households they could each manage. Illustratively, TB direct-observation of treatment activities represented a disproportionate amount of the CHVs’ time. They were deprioritized in later scenarios to maintain adequate coverage of reproductive, maternal, newborn and child health, nutrition, and ECD interventions.

In both settings, the facilitation teams provided national leaders with a summary of the iterative steps, findings, decisions, and a final suggested scenario submitted for national program and policy decisions.

**Final Prioritizing and Decision Making**

The last step of the C3 process belongs to the policy and programmatic spheres of national and sometimes subnational leaders. It is highly contextual and not prescribed by the C3 process itself.

**FINDINGS**

**Rwanda**

The team set out to determine if expectations were realistic or could be optimized for existing CHWs, assigned 4 per village, with special interest in the new CHW for health promotion. We found that the 2 CHW cadres with long-term management history (ASMs and binômes) could reach reasonable coverage (both more than 95%) based on the estimated workload required to achieve all their tasks whereas the new cadre tasked with health promotion was overloaded as modeled, projected to achieve under 50% of assigned workload. This was true for both typologies, with only minor differences. The large discrepancy for HP-CHWs between time needed verses time available to complete assigned tasks is illustrated in Figure 2. It shows that annually, a total in excess of 1,300 hours would be required per HP-CHW to carry out the services assigned in contrast to the 632 hours available.

Within service delivery, the tool identified that the most time-consuming activities assigned to HP-CHWs all involved home visits (behavior change communication targeting malnourished children; ECD visits for priority children; and insecticide-treated net use checks), followed by village-level hygiene club meetings, community cooking demonstrations, growth monitoring and promotion, additional follow-up with malnourished children, and group activities for ECD. Although making home visits multipurpose could improve efficiency, at least in theory, it was clear

<table>
<thead>
<tr>
<th>FIGURE 2. Graph Generated by C3 Tool of Annual Time Needed Versus Time Available per Health Promotion CHW, Default Scenario, Eastern Rural Typology, Rwanda</th>
</tr>
</thead>
</table>

**In Rwanda, the tool showed that 2 CHW cadres could reach more than 95% coverage based on their workload, but a new cadre was projected to achieve less than 50% coverage.**

**Abbreviation:** CHW, community health worker.
that the scope of work for the new HP-CHWs required further refinement. A second model or scenario reducing HP-CHW activities was created to align “priority intervention” time requirements to available time and shared with community health program leadership.

Rwanda subsequently took a different path through a more comprehensive reform of the CHW program. The current plan is to train all 4 CHWs per village in the same integrated package. This work is in progress and the design has not yet been modeled or tested, though building on the models from 2019 would expedite the exercise. RBC/MOH aims for efficiencies by task sharing, including greater potential for multipurpose home visits, and by digitizing reporting.

Zanzibar

Through the iterative process previously described, the ZMOH determined that 2,200 CHVs, each serving a population of approximately 720 persons from 135 households, working on average 18 hours per week including travel time, should be able to reach 90% coverage of nearly all essential reproductive, maternal, newborn and child health, nutrition, and ECD interventions through a combination of household visits and group counseling sessions (Figure 3) The top 5 activities CHVs would spend their time on included educational group counseling sessions, integrated child health visits, and extra time on identifying and coaching caregivers on threats to optimal child development. These were acceptable to stakeholders as the top priorities for CHVs’ effort, which facilitated the final decision making to accept the proposed C3 scenario. Use of the C3 Tool also led to discussions about how to reduce CHV travel time (occupying 1/3 of available time) and adequacy of allowances for transport.

The Zanzibar community health strategy revision committee used the C3 modeling data to directly inform CHV numbers and services included in the new Community Health Strategy (2019–2025), formally launched in February 2020. In addition, the ZMOH with support from partners used the most promising scenario from C3 to conduct a separate costing exercise for the National CHV Program using United Nations Children’s Fund/Management Sciences for Health’s Community Health Planning and Costing Tool, confirming financial feasibility at national scale. Decisions in Zanzibar prioritized goals to achieve universal coverage of a service package that could be delivered within cost limitations.

**FIGURE 3.** Number of Community Health Volunteers Needed in Zanzibar to Carry Out All Activities, as Calculated Using the C3 Tool
**Time Investment and Related Considerations for Tool Use**

The time investment required to apply the C3 Tool varies by context and application. Variables include the complexity of the analyses to be undertaken and availability of supporting data, as well as factors such as the extent to which stakeholders are already organized around common purposes that tool use can both leverage and enhance. Using Zanzibar as an example, the process to collect and input data into the tool took approximately 2–3 weeks, consisting mostly of gathering existing statistics on demographics, health burden, and population in need, and then a second phase to estimate programmatic inputs such as length of visits, travel and administrative time, and frequency of campaigns. The Zanzibar team then took another 2–3 weeks to review content with stakeholders during multiple technical team meetings to validate assumptions and make revisions with wider ZMOH participation. National program managers used the tool to revise policy inputs such as the amount of time CHVs were expected to work per week and minimum acceptable levels of intervention coverage, and to remove some interventions that far exceeded CHVs’ time available. These activities punctuated and fit well within the longer process for national strategy development and approval. Although the additional costs of using C3 were not measured, they were contained by leveraging existing partnerships and working groups in relatively small gatherings for consultations. The use of a technical partner who was familiar with the tool facilitating the information gathering, review, and revisions was effective and efficient.

**DISCUSSION**

**Value of C3 for “Operational Realism”**

The literature on time allocation, workload, and CHW productivity is sparse and inconclusive from a public health standard of evidence paradigm, but making it difficult to answer questions about how many workers will be needed on average to deliver interventions using acceptable standard practice. The variation in contexts, history, and demand for services suggests that the value of global evidence may be to set limits on expectations and to propose broad guidelines for contextual adaptation of CHW programs.

In Zanzibar, contextual adaptation went all the way to the local level. The ZMOH used the C3 Tool to estimate how many CHVs were needed on average per population for its policy, establishing an acceptable range within which local leaders defined individual CHV catchment areas that reflected variations in population density and requisite travel. According to unpublished national community health system data, Zanzibar has since found the total number of CHVs required in each district has closely aligned with what was modeled and that 90% of CHVs reported being on target for key performance indicators (e.g., number of household visits). Actual time spent for some services has been greater than in the C3 model, but time savings on travel, grouping visits by household, and geography may have balanced this and the overall positive coverage achieved. The Zanzibar team had anticipated that efficiencies could be found in effective management, including use of D-tree’s digital application that all CHVs use to identify when children become “eligible” for a visit based on age and to group visits by household, contributing to confidence that the selected model scenario was within reason.

In Rwanda, the C3 exercise did not lead to an immediate policy change. However, the findings did call into question the ambitious demands put on the new community health worker cadre. Policy and CHW program adjustments are still being discussed under the Community Health Policy Review, involving a cross section of leadership and stakeholders from the Ministry of Health including RBC, as well as CHW supervisors and partners working in community health. An evolution of the complex CHW program architecture toward a single multipurpose/polyvalent volunteer cadre incentivized through performance-based financing is being deliberated, with a closer data-informed consideration of workforce size for manageable quality community health service provision and the need to mitigate workload imbalances. The process is ongoing.

CHW programs have shown tremendous value and, as mentioned previously, now benefit from WHO guidance, but their sustainability is of course resource-dependent even if they are cost-effective. If current efforts to resource and institutionalize them within national health system architectures are to continue, these programs will need to continue demonstrating added value, ultimately without dependence on development assistance mechanisms. Program impact will depend on multiple factors, but fundamentally 3 drivers, which we consider axiomatic:

1. CHW interventions must be evidence-based.
2. They must be delivered in context with appropriate quality and strength of implementation at-scale.
3. To ensure this, they must be designed based on what we call “operational realism.”
relating to the routine functioning and activities of a business or organization

and

the quality or fact of representing a person, thing, or situation accurately or in a way that is true to life.

We apply the terms here to mean that CHW program design and interventions must be feasible to implement under real-life conditions. This article focuses on 2 national examples, and we have implemented C3 exercises with 7 cadres of CHWs in 5 country settings (Egypt, Rwanda, Sierra Leone, mainland Tanzania, and Zanzibar) at different iterative stages of tool testing and development. For 5 of these 7 cadres, the C3 Tool documented expected coverage of services around or under 50%. This echoes the perceptions of many of our peers engaged in CHW programs and our assessment of the literature to-date that CHWs are frequently overtaxed. Building programs where the workforce cannot materially cover more than half of the targeted interventions and population fails the most basic sniff-test of operational realism.

The process supported by the C3 Tool does not seek to guarantee impact, but it seeks to reduce guaranteed failure and unmanageability at local levels. It may serve as a useful guard against “empty scale-up,”29 by setting realistic limits within which local managers can develop solid and impactful plans.

Complementarity With Other Tools

The C3 complements other tools that support community health and CHW program planning in the context of universal health coverage goals, each tool addressing 1 or more needs in the policy and planning process. We touch on several to highlight what the C3 contributes to this array. For example, the WHO Workload Indicators of Staffing Need tool30,31 supports generation of rich information on time use of and human resources needs for facility health workers but not for CHWs. Together C3 and WISN provide a more complete look at the time utilization of frontline health workers. New tools have also emerged or been adapted to estimate health workforce needs for surge and contact tracing in response to the coronavirus disease (COVID-19) pandemic.12-14

Previously mentioned, the Community Health Planning and Costing Tool allows users to calculate the costs of all elements of comprehensive community health services packages, including costs of start-up, training, and community-level service delivery, support, supervision, and management at all health system levels. The tool can be used to show program financing sources and gaps in current and future funding.14 In contrast, the niche of C3 is in time- and task-allocation and testing scenarios to guide optimization of the community health workforce investment. Once prioritized, the elements can be input into the Community Health Planning and Costing Tool for detailed analysis of resource needs and costing. In Zanzibar, the C3 Tool was used to identify limits of the policy, and then set the stage for use of the Community Health Planning and Costing Tool to inform costing, based on improved assumptions.

The CHW Assessment and Improvement Matrix (AIM): Updated Program Functionality Matrix35 and Lives Saved Tool,36 among other assessment and modeling tools,19 can help round out a plan. While both the CHW AIM and C3 support quality CHW program design and planning, the CHW AIM uses broader strokes across multiple program components without quantifying CHW needs or workload, the locus of C3. LiST can estimate the impact of an improved or expanded community health program by reducing morbidity and mortality but not the number of CHWs needed to implement said program.

Diffusion of an Innovation?

The C3 is a modest innovation that provides a resource previously unavailable, allowing programmers to model scenarios for task prioritization and time allocation of mixed CHW workforces. The journey of development, testing, and implementation of C3 or any method to improve operational realism (which includes costing, budgeting, and functional analysis exercises mentioned above) goes beyond this article. However, we identify 2 types of conditions for the successful adoption of the tool and its full translation into actual programmatic decisions.

The first set of conditions lies within the national systems. Zanzibar and Rwanda are at different stages of development of their community health programs, but both are on a dynamic and intentional process of structuring and optimizing these programs. This perhaps positioned them to be early adopters.

The timing of the C3 process within the full decision-making process (policy or program) also matters. Zanzibar called for the exercise at a time of planning and intentionally sought to adjust plans to lessons from C3. Rwanda has a long history with CHW programs, multiple cadres, and has
had multiple assessments and redesign steps. C3 came as 1 more analytical lens in a process of expanding the CHW workforce with a new additional cadre, while having had back-and-forth analyses about the need for the existing cadres, notably binômes who provide curative iCCM services. Different perspectives are at play in this redesign, and the current thinking has shifted to considering a universal distribution of tasks for all CHWs. Rwanda now has a template C3 model, to consider this new what-if scenario. Ultimately, the type of foundational operational thinking guided by C3 should be incorporated in all efforts to advance universal health coverage goals through CHW programs.

Given the number of countries currently reviewing, expanding, and trying to sustain CHW programs, it is surprising how often the syndrome of the “over-extended CHW” is bemoaned and yet so rarely addressed effectively. Humans and institutions behave by habit, and the habit of conducting reality checks has yet to be fully built into CHW programs. We can only conjecture that community health might remain just enough on the margins of traditional health systems planning and organizing that its core work — notably binômes who provide curative iCCM services. Different perspectives are at play in this redesign, and the current thinking has shifted to considering a universal distribution of tasks for all CHWs. Rwanda now has a template C3 model, to consider this new what-if scenario. Ultimately, the type of foundational operational thinking guided by C3 should be incorporated in all efforts to advance universal health coverage goals through CHW programs.

The second set of conditions for successful implementation lies with the facilitation team, which needs to combine 2 different skillsets: the ability to master an Excel modeling tool and the ability to keep the modeling tool as the servant of programmatic thinking. Prior exercises have shown that “gaming the model” can be a temptation in scenario testing. For example, gaming the model can mean integrating too many services within 1 timeframe for home visits of CHWs to achieve high coverage on the Excel outputs. Sound programmatic experience is required to challenge this temptation and to avoid confusing the “map” (the model) with the “territory” (real-time management).

More Research Is Needed

Although C3 is primarily a management and decision-making tool, it raises questions to be explored by research. There is the broad question of the dissemination of operational realism in CHW programs and decision making, the place of modeling tools themselves in this effort, and the role and benefit of engagement of decision makers at central versus decentralized levels, together or in different step configurations. Geographic and social context can vary substantially even within countries. How can central levels support better programming of human resources at the subnational level and ensure that field realities are reflected in implementation guidance?

The context of COVID-19 has only reemphasized questions about human resources management in community health programs, from task shifting and task sharing, to the institutionalization of resilient community health platforms able to respond adaptively to emerging threats, while maintaining essential services. For C3 or any tool designed to support decision making, the questions will be about the evolution toward “portable,” easy-to-use tools in the toolbox of country program managers.

Limitations

This article describes how a tool and process can be used to address a structural, nuts-and-bolts, operational problem in CHW programming. Although the C3 has been tested or implemented at different scales in 3 other country contexts, we report on the 2 most mature exercises.

Some limitations of the tool may reflect misunderstandings about what it is. First, C3 does not seek to precisely measure how CHWs use their time. It seeks to compile and use available
information and, when information is missing, build reasonable assumptions to guide decision making and generate rational plans. Although it may and will raise questions and suggest needed measurement efforts, its central purpose is to improve decisions at the time when policy makers and managers must make them. Consequently, we willingly admit there are wide confidence margins for C3 findings. Whether the modeled coverage of services to target populations is 45% or 55% is of limited importance if the goal is universal coverage. In simple words, “you can’t get there from here.” In the case of Zanzibar, a scenario modeled to provide 90% coverage was considered “realistic enough” to guide policy, with expectations that close management could close the coverage gap through efficiencies, and that microconditions would be the main drivers of success. In Rwanda, the expected coverage for the new CHW cadre of all desired interventions clearly signaled that no amount of smart local planning and management could guarantee meaningful impact.

Developing reasonable assumptions can range from relatively simple—conducting group or individual discussions with a diverse set of CHWs in a region—to highly complex, as we discovered. In Rwanda, we tried to contrast the burden of effort placed on CHWs in a (relatively) higher malaria prevalence region compared to a low-malaria region. Translating available malaria prevalence estimates to incidence estimates, reflecting demand for services (both facility and community), proved impossible even with advice from experts in the field. An independent publication followed our effort and spells why this is so challenging.46 We were forced to look at service statistics and make extremely broad assumptions about how differences would play out at community level given facility-level reports. This speaks to the wide confidence margins previously mentioned but also demonstrates how data-oriented approaches to management can stimulate new and meaningful questions until they are glossed over. Given the low prevalence of malaria overall in Rwanda, the differential estimates did not play an important role in estimating the plausible achievable coverage of services by CHWs (binômes). However, this issue clearly flags an area where better surveillance and use of service statistics could improve decisions.

Last, we refined and adapted the tool in each implementation country, since time allocation, target groups, and intervention strategies can vary. This is inherent to the design and purpose of the tool (i.e., guide local decisions through the messiness of contextual variables), but it also limits the comparability of intermediary data from one country to the next, while preserving comparability of the outcome measures (human resources needs and expected coverage for prioritized evidence-based interventions).

CONCLUSION

Operational realism must be central to the advancement of community health programs. The C3 Tool provides a way to analyze and understand time allocation challenges, which we believe are too often neglected and threaten the potential of CHW programs. We believe it is a promising tool that can serve the needs of political, policy, and program leaders to build more effective CHW programs at scale.

Acknowledgments: The authors would like to thank the many colleagues whose contributions to C3 Tool development and use led up to this manuscript. They include but are not limited to Ali Abdelmegeid, Mai Dawood, Ochiawumma Ibe, Injie Kafi, Catherine Mugeni, Pascal Musoni, Janvier Mungarulire, Emma Sacks, and Rachel Taylor.

Funding: This article is made possible in part by the generous support of the American people through the United States Agency for International Development (USAID) under the terms of the Cooperative Agreement AID-OAA-A-14-00028. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

Competing interests: None declared.

REFERENCES


En Français

Modélisation de l’utilisation du temps avec l’outil « C3 » pour l’analyse de la capacité et de la couverture des programmes d’agents de santé communautaires au Rwanda et à Zanzibar

Message clé

L’outil C3 soutient la planification des programmes d’ASC en permettant d’identifier de façon explicite les compromis à trouver entre capacité en ressources humaines et les services à fournir pour différents niveaux de couverture sanitaire. Les gouvernements du Rwanda et de Zanzibar ont utilisé l’outil, respectivement pour optimiser la répartition du temps des ASC et pour estimer le nombre d’ASC nécessaires pour atteindre des objectifs de couverture sanitaire universelle.

Résumé

Les programmes d’agents de santé communautaires (ASC) sont une composante essentielle des systèmes de santé, notamment dans les pays à revenu faible et intermédiaire. Cependant, lorsque les recommandations issues des politiques de santé vont au-delà de ce qui est opérationnellement réaliste, les ASCs sont surchargés, la force de mise en œuvre des interventions est diluée et les programmes ne peuvent pas fournir les résultats promis. Nous avons développé un outil de modélisation de l’utilisation du temps - l’outil d’analyse de la couverture des programmes ASC (C3: « CHW Coverage and Capacity tool ») - et l’avons adapté avec des partenaires gouvernementaux au Rwanda et à Zanzibar pour évaluer les besoins en ASC et/ou optimiser l’allocation du temps des ASC.

Au Rwanda, l’outil C3 a été utilisé pour analyser l’utilisation du temps de deux types d’ASCs bien établis d’une part, et d’un nouveau profil d’ASC, d’autre part. L’estimation de la charge de travail des deux types d’ASC déjà en place a été établie à un niveau « gérable », alors que la modélisation C3 suggérait que les nouveaux ASCs ne pourraient réaliser plus de la moitié des activités assignées. Ces résultats contribuent à informer un processus en cours d’adaptation du programme ASC dans son ensemble. A Zanzibar, l’outil C3 a été utilisé pour déterminer le nombre d’ASC nécessaires dans la mise à jour de la stratégie nationale de santé communautaire, qui devait pour la première fois inclure des ASCs. La modélisation a établi que 2 200 ASC seraient nécessaires pour atteindre une couverture d’environ 90% des services prioritaires. La stratégie nationale de santé communautaire de Zanzibar a été mise à jour sur la base de ces chiffres et officiellement lancée en février 2020.

Nous discutons des leçons de ces deux expériences. Transformer une analyse en prise de décision dépend non seulement de la volonté programmatique et de la motivation des gouvernements, mais aussi de l’existence de moments propices où processus politiques et programmatiques convergent et permettent l’optimisation des investissements dans les ASCs. Des recherches supplémentaires seront nécessaires, mais notre expérience confirme la valeur d’un outil de modélisation simple pour ancrer la planification et la programmation dans des limites réalistes pour l’utilisation du temps des ASCs.
Community Health Worker Program Sustainability in Africa: Evidence From Costing, Financing, and Geospatial Analyses in Mali

Patrick Pascal Saint-Firmin, Birama Diakite, Kevin Ward, Mitto Benard, Sara Stratton, Christine Ortiz, Arin Dutta, Seydou Traore

Key Findings
- In 2015, cost-saving opportunities of US$6.16 million were identified in 41 of 44 districts.
- Costs required for community health worker (CHW) programs can be reduced without sacrificing quality and spending can be geographically targeted to optimize service use by rural populations.

Key Implications
- Program managers and stakeholders should use geospatial analyses to reflect critically on CHW resource planning and make evidence easier to act upon.
- Key decision makers should assess what efficiency gains in funding can be achieved with geospatial targeting and mapping.

ABSTRACT
Background: In Mali, community health workers (CHWs) deliver essential community care (ECC) to rural populations. The dominance of external funding for the program threatens the sustainability of this critical workforce as donor financing decreases. This article summarizes results of analyses aimed at assisting Mali’s decision makers and leaders in initiating a transition to a sustainable CHW program supported by domestic funding through strategic and rational investment.

Methods: Data on ECC implementation norms, workforce, coverage, utilization, cost, and geospatial features were collected between 2016 and 2019. The data informed interlinked CHW financing analyses—situational, services costing, efficiency, and geospatial mapping. Analysis showed distribution of reported expenditures, estimates of required CHW funding, cost-saving options, and spatially visualized discrepancies between spending estimates and normative costs.

Results: Thirteen financing sources contributed to CHW program expenditures, 88% of which were from international donors, for a package of 23 curative, preventive, and promotive interventions. In 2015, the CHW program spent US$13.01 million; an estimated US$8.36 million would have been needed to achieve the same service volume under standard care protocols. Medicines and start-up training had US$6.88 million more than needed; supervision, program management, and recurrent training components were underfunded by US$2.2 million. Cost-saving opportunities of US$6.16 million were identified in 41 of 44 districts. Funding reallocation opportunities (after meeting technical efficiency requirements) were identified in 20 of 44 districts (US$2.56 million). Use of geospatial targeting and mapping suggests district- and village-level reallocation options for theoretical funding surpluses.

Conclusion: CHW costs can be significantly reduced without sacrificing service technical quality. Spending can be geographically targeted to optimize service use by rural populations. Efficiency analyses provide evidence to build stronger engagement, support improved decision making, efficiently prioritize resources, and target investments for sustainable financing of CHW programs.

BACKGROUND
The equitable provision of critical services to all segments of the population is an ongoing challenge around the world. Health system leaders are increasingly...
challenged to look beyond their clinical frameworks and find approaches and models that further expand the services they provide outside of the conventional hospital setting. Community health systems (CHSs) provide an alternative to traditional facility-based health systems through a set of local actors, relationships, and processes supporting health at community and household levels. Community health workers (CHWs) have been the cornerstone of CHSs playing a crucial role in providing preventive, promotive, and curative health services to local communities. Countries worldwide seek to leverage the skills, community knowledge, and cultural competency that CHWs can bring, connecting those most at risk for poor health outcomes with the formal health system.1–5 Furthermore, CHW programs are a proven, cost-effective approach compared to conventional health provider-based service delivery models.6–7

With nearly 60% of its population living in rural areas,8 sub-Saharan Africa relies on CHWs as a cost-effective alternative to traditional facility-based service delivery approaches. However, the scarcity of domestic funding for these programs hampers financial sustainability. Sub-Saharan African countries benefited from high (70.2%) development assistance disbursed to CHW-targeted projects between 2007 and 2017, with external donors accounting for nearly 46% of the average annual total funding amount.9

For the past 3 decades, Mali’s community health system has played a significant role in determining the supply of and demand for community-level health services. Populations across the country ensure that key health services are available in communities through public-private partnerships. Community-level health service delivery is built on a network of privately owned nonprofit community health centers (CHCs) founded by communities and managed by elected community health boards (CBs).10 Through a public-private partnership agreement between the central government and CBs, the Ministry of Health and Social Affairs (MOHSA) provides technical supervision and other support and the CHCs provide public health services to their catchment area. The National Federation of Community Health Boards (NFCB) was created as a central body providing regulatory oversight over and management support to CBs. The first CHC was created in 198910; as of December 2018, there were 1,368.11 The Malian government introduced CHWs to strengthen rural health care delivery with the support of international partners, following the 2009 census findings that mortality ratios for mothers and children (aged 12–59 months) were respectively 5 and 2 times higher in rural areas.12 Since then, CHWs have been delivering ECC to rural populations (i.e., those living more than 5 km from a CHC). The CHW program is funded primarily by international donors, heightening concern for the sustainability of this critical workforce as donors announce decreases in financial support.

Efficiently run CHW programs are vital in resource-limited health systems. Providing evidence to guide rational use of scarce public funds can catalyze country governments’ transition to greater domestic funding and contribute to their “journey to self-reliance.”13 However, economic analyses focusing on technical and allocative efficiencies of CHW programs in sub-Saharan Africa

Community health workers in Mali. © 2018 Souleymane Bathieno/Health Policy Plus
to inform sustainable domestic investment approaches are rare. Unreliable information about the number, location, terms of service, employment prerequisites, and modes of payment of CHWs in Mali make planning difficult. Lack of cost data further hinders adequate domestic financing of CHW programs and efficient use of available resources as communities and government entities could not rely on accurate data on the real cost of service provision components, including human resources (salary and benefits), drugs and supplies, pre- and in-service training, supervision, and other program management costs. Part of this challenge is explained by the absence of a central repository with information on financing sources for remunerations, equipment, and other program funding areas. This article describes sets of analysis conducted in a step-wise manner that holistically examine national-level CHW financing to help Mali’s decision makers initiate a realistic and sustainable program transition to domestic funding by strategic and rational investment.

**METHODS**

The U.S. Agency for International Development (USAID)-funded Health Policy Plus (HP+) project conducted the following interlinked analyses—situational, costing, efficiency, and geospatial mapping—between 2016 and 2019. These analyses covered 5 regions in southern Mali that implemented the CHW program, gathering 2015 program data.

**Objectives**

The situational analysis defined sustainability concerns raised by USAID/Mali as it prepared to decrease its support to CHWs. The situational analysis had the objective of identifying CHW program components and determining the distribution of reported expenditures and related patterns. The costing analysis followed and had the dual objectives of estimating the necessary CHW funding based on national standard care protocols and examining required program financing changes. Lastly, the combined efficiency and geospatial mapping analyses had the objectives of identifying potential cost-saving options through efficiency improvements, quantifying and spatially visualizing discrepancies between spending estimates and normative costs, and identifying geographic areas for better-targeted funding.

**Type of Data Collected and Sources**

Information was collected in-country between 2016 and 2018 using semistructured key informant interviews, questionnaires, consultative meetings with community health experts and secondary information sources. The study team used Microsoft Excel-based templates to obtain expenditure data, service input costs, and utilization data. HP+ designed questionnaires that were administered through semistructured key informant interviews to explore the landscape, opportunities, and challenges of the CHW program.

Key informants were purposively selected based on their institution’s role in the CHW program such as funding, implementation, advocacy, norm-setting, management, coordination, and policy responsibilities. Experts were chosen based on their ability to exercise legitimate authority over or influence on one of the following: the choice of CHW location, recruitment and training needs, stakeholder coordination, key program management functions (supply of medicines and equipment, statistical reporting, and supervision), and regulatory and normative decisions. Table 1 summarizes the types of information collected from primary and secondary sources—more detailed information on type of data used and a profile of experts are available in a Supplement.

**Data Analysis**

**CHW Situational Analysis**

The situational analysis identified and examined CHW program information related to workforce, health services provided, funding sources, and expenditures. Entry, cleaning, and aggregation of data were conducted manually using Microsoft Excel. The quantitative depiction of the data using descriptive statistics, presented through tabulation and graphs, included (but was not limited to) the number of active CHWs, location, remuneration, and reported program expenditures by location, funding source, and category. Workforce and program expenditure information synthesized from this analysis provided the basis for further exploration through cost modeling and geospatial mapping.

**Normative Costing of CHW Service Package**

Identifying efficiency opportunities and related financial implications requires comparing actual expenditures to the normative cost of delivering the CHW service package in compliance with national standard care protocols. To derive the normative cost of each service, we analyzed national norms and standards, calculated direct costs of the resources or ingredients required for each service (a “bottom-up” activity-based approach), and
allocated indirect costs in proportion to the share of CHW time spent on each service (a “top-down” approach). This provider perspective approach to calculating cost per service focuses on the supply-side dimension of service quality. Provider communication, bias, and other key aspects of service quality from the client’s perspective client were excluded.

The national ECC implementation guide defines the ECC package provided by CHWs. We analyzed its composition by identifying individual services and their link to public health programs.
Building from the expenditure information identified in the situational analysis, we traced the main program elements with identifiable costs needed to deliver services. Labor, medicines, and supplies were classified as direct costs entirely attributable to service delivery. Management, supervision, equipment, and training were considered indirect costs incurred regardless of whether service delivery occurs and cannot be assigned solely to a specific service. CHW equipment (thermometer, scale, bicycle, etc.) was considered an indirect cost as specific aspects, like length and frequency of use directly attributable to each service, were not measured.

Determining a standard level of inputs for the ECC package provided by CHWs involved direct measurement or estimation of the time needed to provide each individual service plus required diagnostic tests, medicines, and supplies. We combined contributions from the expert panel with existing national standard care protocols for child health (a MOHSA document) to determine or confirm standard treatment guidelines and estimate normalized normative inputs required for all ECC services. The CHW standardized treatment sheet for sick children was considered a reference to assess and compare quality of care among children and was designed to encourage efficiency through resource optimization and rational use of treatment inputs. Community health experts confirmed data from nationally published statistics. Information was collected from health authorities and implementing partners on costs of personnel supporting the program (CHWs and managers), expected frequency, and cost of training and supervision.

The analysis unit was cost per service considered from the provider perspective. We analyzed cost using the Community Health Planning and Costing Tool, which estimates unit costs of different program elements (e.g., supplies) per service multiplied by the total estimated number of services.16 This approach has been used in more than 15 countries to support analyses for community health investment cases, costing of community health packages, and integrated community case management.16–17

Expected frequency, numbers, and costs of supervision visits and meetings per year were adjusted by region. Travel time and related costs were estimated during meetings with CHW program experts. Fuel forecasts were determined based on expected geographic distances (roundtrip) and fuel consumption per 100 km by type of motor vehicle used. An average percentage mark-up on medicines for transport, storage, management, and distribution was derived from all 5 regions and applied to each unit cost. Capital costs linked to accommodation and working space provided to CHWs by communities were based on a sample of 120 villages in 15 health districts across the 5 regions.15

Program expenditure information compiled as part of the situational analysis provided the actual cost data.

**District-Level Cost Efficiency and Geospatial Mapping Analyses**

After calculating the normative cost of each service provided by CHWs, we estimated the technical efficiency of service provision within each health district using program data on the average expenditure per CHW in each region and the number of CHWs active in each district (Table 2).

\[ AE_D = \frac{AE_R}{No.\ CHWs_R} \times No.\ CHWs_D \]

where AE is actual expenditure, D is district, and R is region.

We calculated the normative cost of providing all services to the CHW-covered population in each district. This calculation used district-level service volumes reported by program implementers in 2015 and the normative cost per service for each of the 23 services. The normative cost for the covered population represents the efficient cost of providing all services delivered by CHWs in 2015 while complying with the MOHSA’s national quality standards.

\[ NC \text{ for Covered Population}_D = \sum_{S=1}^{23} (No.\ Services\ Provided_{D,S} \times NC_S) \]

where NC is normative cost, D is district, S is service.

The difference between normative cost and actual expenditure is the technical efficiency gap—how much money was spent beyond or below the normative cost.

\[ \text{Technical Efficiency Gap}_D = AE_D - NC \text{ in Coverage Area}_D \]

where AE is actual expenditure, NC is normative cost.
The normative district-level cost of full rural population coverage included the normative costs per service from the Community Health Planning and Costing Tool application, the size of the rural population, and the number of services provided per person in covered villages. The normative service cost calculation for the full rural population is based on 3 key assumptions: (1) all individuals in villages covered by CHWs who seek care would be able to access a given service; (2) current CHW service volumes meet demand (defined as the individuals in need using the services) within the covered population; and (3) the volume of services used per person would be the same within the noncovered rural population as in the covered population if CHWs were available.

\[
NC_{\text{for Rural Population}} = \frac{NC_{\text{for Covered Population}} \times \text{Covered Population}}{\text{Rural Population}}
\]

where \( NC \) is normative cost, \( D \) is district.

The allocative efficiency gap is the difference between actual expenditure and normative cost to cover the total rural population. This value represents each health district’s funding surplus or deficit after the technical efficiency gap has been addressed.

\[
\text{Allocative Efficiency Gap}_D = AE_D - NC_{\text{for Rural Population}}
\]

where \( AE \) is actual expenditure, \( NC \) is normative cost.

We analyzed the geographic distribution of community health resources for the baseline year (2015) and its relationship with normative costs using a GIS tool developed between May 2017 and March 2018 by Palladium as a part of the HP+ project.\(^{18}\) The GIS tool allowed for geospatial mapping of district-level program expenditures, district-level costs for full rural population coverage, and village-level CHW coverage. Regional program expenditures were allocated to districts in proportion to the number of CHWs in each.

The types of information needed to create maps for geospatial analysis included geocoded villages; administrative boundaries for health districts, municipalities, and communes; population; 2015 district-level program expenditure; and 2015 district-level normative cost of services used by the population. We compared expenditures supporting population use of the ECC package

\[\text{TABLE 2. Overview of the CHW Program in Mali, 2015, from Situational Analysis Results}\]

| Region          | Koulikoro | Kayes   | Mopti   | Segou   | Sikasso | Bamako District
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Target population (total living in rural areas)</td>
<td>1,477,040</td>
<td>961,289</td>
<td>1,181,486</td>
<td>1,281,147</td>
<td>1,622,344</td>
<td>N/A</td>
</tr>
<tr>
<td>Population covered by CHWs</td>
<td>869,282</td>
<td>286,779</td>
<td>680,261</td>
<td>712,351</td>
<td>648,353</td>
<td>N/A</td>
</tr>
<tr>
<td>Population covered by CHWs, of rural population, %</td>
<td>59</td>
<td>30</td>
<td>58</td>
<td>56</td>
<td>40</td>
<td>N/A</td>
</tr>
<tr>
<td>No. villages</td>
<td>1761</td>
<td>1369</td>
<td>1896</td>
<td>2003</td>
<td>1629</td>
<td>N/A</td>
</tr>
<tr>
<td>No. villages covered by CHWs</td>
<td>621</td>
<td>256</td>
<td>306</td>
<td>412</td>
<td>591</td>
<td>N/A</td>
</tr>
<tr>
<td>No. health districts covered</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>N/A</td>
</tr>
<tr>
<td>No. CHCs</td>
<td>196</td>
<td>217</td>
<td>168</td>
<td>195</td>
<td>237</td>
<td>N/A</td>
</tr>
<tr>
<td>No. CHCs affiliated with CHWs</td>
<td>161</td>
<td>143</td>
<td>146</td>
<td>172</td>
<td>230</td>
<td>N/A</td>
</tr>
<tr>
<td>No. active CHWs</td>
<td>526</td>
<td>248</td>
<td>305</td>
<td>448</td>
<td>660</td>
<td>150</td>
</tr>
<tr>
<td>CHW of total CHWs, %</td>
<td>23</td>
<td>11</td>
<td>13</td>
<td>19</td>
<td>28</td>
<td>6</td>
</tr>
<tr>
<td>No. funding sources</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Spending, USD</td>
<td>2,356,633</td>
<td>2,284,933</td>
<td>2,540,402</td>
<td>1,977,545</td>
<td>3,127,960</td>
<td>723,825</td>
</tr>
<tr>
<td>Spending of total spending, %</td>
<td>18</td>
<td>18</td>
<td>20</td>
<td>15</td>
<td>24</td>
<td>6</td>
</tr>
</tbody>
</table>

Abbreviations: CHC, community health center; CHW, community health worker.

\(^{a}\) Bamako is an atypical district that does not meet any criteria stated in the ECC national implementation guide, both in terms of services provided and the determination of the target population. For more information, please consult the CHW landscape analysis report available at: http://www.healthpolicyplus.com//nspubs/7153-7273_MaliSituationalAnalysisJuly.pdf
with corresponding normative costs to provide a visual representation of how opportunities for technical and allocative efficiencies are geospatially distributed. Maps and spatial derivatives were generated using Quantum GIS.19

## RESULTS

### CHW Situational Analysis

In 2015, the CHW program spent US$13 million to support 2,337 active CHWs affiliated with 84% of CHCs assigned to more than 2,000 villages across 44 health districts in the 5 southern regions of Mali plus the Bamako District. The program provided access to CHW-provided services to more than 3 million people living in rural areas. Thirteen different financing sources contributed to overall expenditures, 88% from implementing partners funded by international donors. Program expenditures and the number of active CHWs varied across regions (Table 2), although amounts spent between regions do not necessarily follow the number of CHWs. Three regions accounted for 70% of the active CHW workforce but just 57% of program spending.

### Costing of CHW-Provided Services

According to the national ECC implementation guide, CHWs offered 23 curative, preventive, and promotive interventions. Roles and responsibilities were defined, and guidelines were provided to ensure that delivery of these services, supervision, and reporting are integrated as a package across 5 public health programs. The ECC package is linked to services under community mobilization/behavior change communication, nutrition, reproductive health/family planning, malaria, and maternal and child health. Direct and indirect labor costs for CHWs contributed to 20% of total cost per service. Activity reporting was the most labor-intensive and expensive “service” with 95% of its cost attributed to indirects. Management of moderate acute malnutrition was the second most expensive service due to high supplies and medicines costs because of extensive use of ready-to-use supplementary food (RUSF) for child nutritional rehabilitation (Table 3). Results for all services are available in a Supplement.

The CHW program spent US$10.50 on average per service in 2015 to provide 1.24 million ECC services, 55% more than the estimated US$6.80 on average per intervention that would have been needed to achieve the same service volume if standard care protocols were followed which would reduce aggregate spending by 36% (US$8.36 million). The number of ECC services provided per CHW in 2015 varied significantly across districts, with estimates ranging between 94 to 2,287. The proportion of CHW total time available for ECC services in a year spent on direct service provision also varied widely between districts, from 3% to 43%. Comparably low shares of time spent on direct service provision were observed in similar work on integrated community case management programs in other sub-Saharan African countries.20 The CHW-to-population ratio ranges from 1 CHW to 702 to 3,478 people per CHW across districts. Funding required for ECC per CHW per year, independent of the quantity of service provided, was estimated at US$2,422 per CHW per year and represented the
fixed-cost portion of the program (salaries, supervision, training, and other similar costs). The cost of medicines and supplies varied with the number of services provided, ranging from US$51 to US$3,035 per year per CHW across the 44 districts. Total program normative cost per CHW to provide the services reported in 2015 ranged between US$2,473 and US$5,457 (the amount that theoretically should have been spent if service delivery had followed nationally established normative guidelines). Aggregating these estimates suggests that a CHW would provide, according to norms, on average 566 services at US$3,822 per year, using 17% of one’s total available time on ECC services.

Some areas of the CHW program (defined as areas with quantifiable costs related to an identifiable source) benefited from a funding surplus, while others faced a deficit. Figure 1 compares the funding needed in 2015 across program inputs if standard care protocols had been followed, with corresponding spending allocations reported by funding sources. Program input areas such as medicines and supplies, and start-up training had more funding than needed. The excess was estimated at US$6.88 million, 76% of which can be attributed to RUSF and related commodities. Supervision, program management, and recurrent training components were underfunded by US$2.2 million.

### Geospatial Results

Understanding the geographic distribution of CHW program inefficiencies and funding to need misalignments is important to assess what efficiency gains can be achieved with geospatial targeting. In Figure 2, Thiessen polygons are drawn around each covered village. Any noncovered village located within the same polygon shares the same nearest covered village. Shading in the choropleth map represents the average Euclidean distance that noncovered villages are to the closest covered village. Darker shaded polygons represent areas where the nearest covered village is further away, with distances ranging from 13.7 km to 35.8 km. Lack of access in these areas could indicate a greater need for resources to support new CHW locations, by better targeting available CHW resources to increase coverage and move darker shaded areas toward a lighter color indicating improvement.

### Significant cost-saving opportunities exist if CHW services implement technical efficiencies by adhering to published norms and guidance from the MOHSA (which we call normative spending).
In most districts, a significant portion of the rural population is not covered by a CHW. Providing services to the currently covered rural population at normative costs could free up funding to extend services to the remaining rural population (Table 4). Technical and allocative efficiency gaps for each health district within the Kayes region, illustrated via red and green cells, present opportunities for reallocation of theoretical funding surplus. Calculations for the 5 regions are available in a Supplement.

Figure 3 compares actual district-level spending on services (in US$) delivered with the estimated normative spending to show the magnitude of potential efficiency gains and resource optimization at scale (same population covered and service volume produced). Opportunities for cost saving were identified in 41 of 44 districts (indicated in green in Figure 3), varying in value between US$29,218 and US$637,935 and cumulatively representing US$6.16 million. Repurposing the funding from technical efficiency improvements within districts could cover over 2.1 million more people in rural areas without any redistribution across districts, representing an additional 32.3 percentage points of the rural population and increasing coverage in the 5 regions from 49.0% to 81.3%. Amounts spent by 3 other districts (indicated in red in Figure 3) were lower than their normative spending estimates. Districts in 4 regions spent above what was needed to reach technical efficiency requirements (based on national guidelines) meeting the use of ECC by their covered and total rural population.

Figure 4 compares actual district-level spending on services delivered to rural populations in 2015 with the estimated normative cost of population use of ECC services to cover the entire district’s rural population. Geographic distribution and magnitude of efficiency gaps in US$ are presented across all program districts at scale (same population covered, and service volume produced). Opportunities for funding reallocation were identified in 20 of 44 districts with a surplus between

---

**Figure 1.** Funding Needed Versus Expenditure by Community Health Worker Program Input in 2015, Mali

Abbreviation: CHW, community health worker.

*Capital costs include cost of providing living and working space to CHWs at the village level.
US$8,396 and US$375,395, cumulatively representing US$2.56 million. The remaining 24 districts required additional spending (according to norms) to meet the cost of ECC service use by their rural populations. Deficits across these districts varied between US$511 and US$783,839, reaching a total of US$4.56 million. Figure 5 presents an example of how the theoretical funding surplus available for reallocation can be applied to reach an optimal number of districts supporting the use of ECC services by their entire population (i.e., prioritizing districts with the smallest deficits). In this example, reallocating the funding surplus would bring 20 additional districts to full coverage of their rural population and reach more than 850,000 people, increasing rural population coverage by 13.1 percentage points (from 81.3% to 94.4%). In 13 districts with a funding deficit, 1,637 noncovered villages were located more than 5 km from any point of service (health facility or CHW). We refer to such communities as “isolated villages.” Figure 6 displays the results of prioritizing districts with villages most isolated from the health system, i.e., districts with the farthest average distance between isolated villages and the nearest covered village (based on Euclidean distance). We estimate that this approach would bring 10 additional districts to full coverage, reach rural populations located in approximately 1,468 isolated villages, and increase rural population coverage across 5 regions to 91.6% (Figure 6). The opposite approach—prioritizing districts where isolated villages are located closer to covered villages and are thus easier to reach—would bring 10 additional districts to full coverage, reach approximately 1,278 isolated villages, and increase rural population coverage...
to 92.1%. Additional maps on point of service distribution and application of geospatial targeting using Euclidean distance mapping analytics are available in a Supplement.

**DISCUSSION**

The initial situational analysis shows that compartmentalization of international donor interventions makes the CHW program in Mali vulnerable, exposing leadership and coordination issues as real challenges. Program funding and management information was asymmetric between implementing partners but most importantly between implementing partners and national/local community health stakeholders. None of the 10 (of 13 total) external funding sources identified in the situational analysis supported all program resource areas needed to operationalize CHW activities across all southern regions in 2015.

According to CHW program managers at the MOHSA, choice of CHW program geographic (region or district) or program (for remuneration, supervision) by a donor is discretionary to a donor regardless of what is being provided by others. The mapping process of funding sources for some program areas is another good example of how donor compartmentalization issues are reflected not only in the data collected but also in the approach used to access the information. Nine different funding sources were recorded in 2015 for CHW remuneration and equipment, and 5 for medicines and supplies. This information was not available at central level at the time of the study. Program data including CHW funding source, workforce, and service utilization were gathered directly at the regional level and from implementing partners and donors. Key informants consulted further underscored the lack of information sharing between donors, for example, that an implementer could continue to remunerate CHWs while being unaware that they did not have the necessary medicine and supplies to continue working effectively.

The big challenge at the moment is the lack of control over the cost and availability of medicines. — Implementing partner, October 2016

Such challenges result in a wide variety of funders, each having different mandates and interests that are not necessarily aligned with national priorities, leading to investments with no clear transition to the government or another partner, which can also cause temporary suspension of CHW services. MOHSA leadership needs to make decisions to bring expenditures on key program areas closer to less costly normative levels of

---

**TABLE 4. Technical and Allocative Efficiency Gaps in Kayes Region, Mali, 2015**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kayes</td>
<td>210,228</td>
<td>61,361</td>
<td>45</td>
<td>9,213.44</td>
<td>414,604.77</td>
<td>196,305.62</td>
<td>218,299.15</td>
<td>672,559.72</td>
</tr>
<tr>
<td>Bafoulabe</td>
<td>77,332</td>
<td>33,009</td>
<td>34</td>
<td>9,213.44</td>
<td>313,256.94</td>
<td>99,135.01</td>
<td>214,121.93</td>
<td>232,249.03</td>
</tr>
<tr>
<td>Diema</td>
<td>99,199</td>
<td>36,222</td>
<td>27</td>
<td>9,213.44</td>
<td>248,762.86</td>
<td>184,383.31</td>
<td>64,379.55</td>
<td>504,959.41</td>
</tr>
<tr>
<td>Kenieba</td>
<td>106,732</td>
<td>18,313</td>
<td>14</td>
<td>9,213.44</td>
<td>128,988.15</td>
<td>46,319.44</td>
<td>82,668.71</td>
<td>269,959.42</td>
</tr>
<tr>
<td>Kita</td>
<td>267,635</td>
<td>82,779</td>
<td>82</td>
<td>9,213.44</td>
<td>755,502.02</td>
<td>117,566.54</td>
<td>637,935.49</td>
<td>380,107.51</td>
</tr>
<tr>
<td>Nioro</td>
<td>102,444</td>
<td>14,554</td>
<td>8</td>
<td>9,213.44</td>
<td>73,707.51</td>
<td>36,937.50</td>
<td>36,770.02</td>
<td>259,998.97</td>
</tr>
<tr>
<td>Yelimane</td>
<td>42,043</td>
<td>14,584</td>
<td>13</td>
<td>9,213.44</td>
<td>119,774.71</td>
<td>21,981.85</td>
<td>97,792.86</td>
<td>63,369.65</td>
</tr>
<tr>
<td>Oussoubidiana</td>
<td>55,676</td>
<td>25,957</td>
<td>25</td>
<td>9,213.44</td>
<td>230,335.98</td>
<td>49,890.50</td>
<td>180,445.48</td>
<td>107,011.73</td>
</tr>
</tbody>
</table>

Abbreviations: CHW, community health worker; ECC, essential community care.

*Estimated by dividing the actual number of services provided by the expected number of services.*

*Total time required to provide each service is calculated by multiplying the expected time spent on service (in minutes) by the reported service volume for the year. The estimates are then converted in CHW hours.*

*Percentage of CHW time available spent on services is calculated by dividing the total time required to provide the services reported for the year and the total time available for providing EC.*
funding. Reaching this stage of efficiency in programming at the central management level requires coordination and consensus among all funding sources for reprioritizing historic spending allocations according to country-endorsed national standards.

Reflecting on why expenditures on certain program areas were significantly higher than for the normative costs is critical so that implementers or practitioners outside Mali (but in similar contexts) can also use these results. One way of ensuring that limited budgets go further is increasing efficiency, potentially by adhering to national service delivery guidelines. Our results in Mali suggest that service delivery, supervision, and medicine and supply distribution did not fully comply with standards, which led to a waste of resources. Lack of compliance to service standards by CHWs not regularly supervised might have led to input overuse which inflates consumption, making the forecast of expensive medicines and supplies, particularly RUSF, unreliable.

Management of moderate acute malnutrition is the most commodity-intensive service provided by CHWs as evidenced by a cost structure dominated by variable costs with RUSF comprising 73% of the total cost per service. Spending on RUSF is driven by its overall use which is expected to
increase proportionally as the volume of services increases. The relationship between spending on RUSF and outputs (cases of moderate acute malnutrition managed) might not be necessarily linear in practice. In addition to potential wastage at CHW level, other factors might affect use of RUSF and other medicines or supplies distributed directly to CHCs by implementing partners. Evidence from Ethiopia has shown that in certain settings micronutrient enhanced commodities can be subject to particularly high levels of leakage and misuse with products ending up for sale in shops. Limitations faced by CBs and CHCs in Mali are documented in government policy documents and could further explain the cost differences observed. The recently issued Mali Action Plan 2020-2023 states that 24% of CBs are considered not functional and few are capable of conducting effective financial control or transparent reporting of availability and use of resources at CHC level. According to members of the NFCB, implementing partners provide insufficient support to strengthen NFCB’s role and authority, preferring to engage directly with CHWs and, to a lesser extent, CBs.

Some implementing partners sought quick results at the expense of systemic integration and efficiency. —NFCB member, September 2016
The vertical nature of such approaches has also been echoed by other stakeholders concerned about its negative effects on the relationship between communities and CHWs ultimately affecting ownership of the program.

*CHWs are identified according to their donors . . . , they are not identified as an integral part of the community.*—Regional Health Office Director, October 2016

Furthermore, 1 high-ranking MOHSA civil servant interviewed indicated that new CHW-covered villages or staff replacements (which drive start-up training costs) were not necessarily controlled or recorded accurately by the government nor reported by implementing partners. This gap in coordination links back to donor compartmentalization issues and leads to asymmetric information between central management of the CHW program overseen by the MOHSA and field operations supported by implementing partners.

National ECC implementation guide and standard care protocols such as the CHW standardized treatment sheet for sick children (Table 1) offer opportunities to increase technical efficiency. The protocols prescribe less costly combinations of inputs while achieving the same number of outputs (or achieving more outputs for the same level of inputs) without sacrificing quality. Creating awareness around the existence and implementation of these norms is key to streamlining efficiency and quality across the CHW program.

Complying with standards can reduce program spending to achieve the same service volume, generating savings to be invested elsewhere in the ECC program. For example, CHW supervision, often considered one of the weakest links in CHW programs (although noted as critical for

---

**FIGURE 5.** Geographic Redistribution of Community Health Worker Program Theoretical Funding Surplus, 2015, Mali

[Map of Mali showing the redistribution of funding surplus]
CHW effectiveness and efficiency were severely underfunded in 2015, meeting only 26% of the normative cost required. While donor funding provided adequate total funding for most aspects of the CHW program, we found internal inefficiencies and misalignments of funding. Some areas got more support, as did some geographies. Other areas had access challenges. Norms were not followed, leading to inefficient spending of available resources. Mali could make better use of CHW program funding if guided by data that inform efficient use of domestic resources mobilized, while also adequately resourcing key program areas.

Given budget and health workforce constraints in lower- and middle-income countries, CHWs face challenges without receiving the needed support in providing expected services. The productivity differences were discussed with local stakeholders. These discussions generated possible explanations, including the presence of user fees and variability in population density (captured by the population-to-CHW ratio) linked to the mining industry. Although user fees are authorized in Mali, they are known to inhibit access to care in other settings. Mali is a major producer of mined gold in Africa. The presence of gold extraction sites may distort population dynamics and affect density as human activity increases significantly in these regions or districts. Enforcing national protocols for ECC services through an adequately funded supportive supervision system would allow significant cost savings by improving CHWs’ ability to comply with technical efficiency requirements that would, in turn, lead to less costly service provision.

FIGURE 6. Distance-Based Geospatial Redistribution of Community Health Worker Program Funding Surplus, 2015, Mali
Optimizing limited resources through cost savings provides opportunities to increase coverage to currently noncovered populations. Mali geospatial analyses illustrate options for decision makers. Planning can be more engaging by visually supporting identification and prioritization of districts with the highest opportunities for technical efficiency improvements. Using recognizable maps makes advocating for funding surplus reallocations and investments easier. Location data (distance and proximity) used in geospatial targeting help stakeholders reflect critically on CHW resource planning and make evidence easier to act upon. Geospatial analytics and supported interfaces facilitate analytical reasoning for decision makers by turning data into information, information into insight, and insight into practical decision making. Geospatial analytics can further help organizations anticipate and prepare for upcoming changes due to evolving spatial conditions or location-based events such as a community-level response to the COVID-19 pandemic.

Our findings in Mali are relevant to the bigger discussion around system integration and sustainability of CHW programs, given that primary health care is the key to reaching universal health coverage. In Mali, CHWs are essential to delivering that care. Those cost-saving approaches would allow Mali, with adequate political prioritization by the government, to financially sustain the CHW program. Evidence from HP+ has indicated that the total government budget from domestically generated resources increased between 2015 and 2017 by a 6 percent gross domestic product equivalent (valued at nominal value). In addition to yearly budget increases, most sectors benefited from funding increases through midyear budget adjustments. Instead, reductions were applied to health and represented the highest budget cut proportions across all government sectors (lower adjusted amounts compared to the initial authorized allocations). Public spending opportunity loss for the health sector was estimated at US$51.8 million (2015 US$) between 2015 and 2017. This amount could have sustained the entire CHW program at scale for more than 6 years.

International donor assistance is volatile and has inherent limitations, such as being temporary with ‘short-cycle’ characteristics and strings attached. High dependence on external sources of funding to support CHWs across sub-Saharan Africa and confirmed donor funding cuts in 2019 that targeted Mali CHWs, according to an official unpublished USAID letter, pose a significant threat to the financial sustainability of this frontline workforce. The current funding landscape for CHWs shows a critical need for increased domestic resource mobilization. This landscape warrants increased emphasis on outcome-based results (reflected by improved health indicators) linked to financial and system requirements to sustain CHW programs at scale and better integrate these programs into national health systems. There has been an emerging focus within the international donor community on developing a conceptual understanding of how CHW programs are designed and how they should interface with both formal and community health systems.

Fragmented funding, due in part to limited donor coordination, combined with insufficient government leadership, inhibits sustainable financing.
and contributes to inefficient spending in many countries. It hinders CHWs’ integration into national health systems, preventing stakeholders from collectively embracing horizontality through harmonized approaches to financial planning, programming, and prioritization. Robust data and results from these types of analyses offer entry points to engage government and communities to invest more in CHWs together. At the central level, findings can demonstrate that costs required for CHW-delivered interventions meeting current rural demand and unmet need for ECC services can be significantly reduced without sacrificing quality. At a local level, results give stakeholders analytical insight and understanding that spending can be geographically targeted to optimize service use by rural populations.

**Limitations**

Expenditure information self-reported by implementing partners could not be independently verified. Potential supply-side limitations of the ECC package were not considered. Assessment or recording of time required for delivering each service was made through limited direct observation and estimates relied mainly on expert opinion. Demand-side factors such as financial barriers affecting use of services in CHW-covered areas were not assessed, as information on user fees possibly charged by CHWs for some of the services provided were not collected. Costs did not include health system strengthening activities required to increase compliance with norms and standards of care. Differences affecting use of ECC services were not accounted for between CHW-covered and noncovered villages within the same health district. Elements that might explain the variation in CHW productivity such as workload, adequate supplies and equipment, and acceptance and respect from the community and health systems were not explored in our analyses. Although a useful proxy in regions where common routes are not always mapped, Euclidean distance does not consider constraints in travel such as road conditions, rivers, and terrain.

**CONCLUSION**

Mali’s CHW program is hampered by fragmentation of funding and interventions compounded by leadership challenges, noncompliance with national standards of care, and inadequate resourcing of key program areas. Results from Mali’s case show how efficiency analyses can provide an evidence base to build stronger stakeholder engagement and support improved decision making for CHW financing. Our analyses bring a level of understanding of CHW program costs and challenges that allows the Malian government and other stakeholders to prioritize resources efficiently, and thus afford targeted investments to begin sustainably financing the CHW program.

Evidence presented indicates system and program implementation changes that could be tested to suggest future adaptations. Such changes could further guide operations research in other sub-Saharan African countries to improve community health and the sustainability of CHW programs. Building CHSs from the ground up, while carefully considering local contexts, is essential to inform decisions about where, when, and how care is provided within a community. Our findings can also further contribute to global thinking and local actions around system integration. They can debunk frequent misconceptions which present CHW programs as a unidimensional human resource solution to health care access at the community level without recognizing the dynamics of CHS local actors, implementing partners, and the broader health system.

**Acknowledgments:** We would like to thank Sidi Cisse (Senior Health Policy Advisor, U.S. Agency for International Development/Mali) for his involvement and feedback during the design phase of the different analyses and support for facilitating communication with CHW program implementers. We also thank Dr. Bakary Diaara (former Secretary-General of Health in Mali) for his leadership building national interest and engagement from stakeholders. We further thank Dr. Boureima Filia (Manager of the Essential Community Care program at the Ministry of Health and Social Affairs) and his staff for establishing national CHW expert panels, collecting district-level data, and providing government-issued documents needed for the analyses. The authors also recognize community health expert consultant Dr. Adamo Diawara for his guidance and insights.

**Funding:** The original analyses on which this article is based were conducted with support from the U.S. Agency for International Development-funded Health Policy Plus project. The preparation of this manuscript was supported through the Health Policy Plus project.

**Competing interests:** None declared.

**REFERENCES**


Efficiency Analyses of Community Health Worker Program in Mali

18. Saint-Firmin P, Diakité B, Stratton S, Ortiz C.

17. Collins D, Gilmartin C, Birse S.


15. Saint-Firmin P, Diakité BD, Diawara A.

5. Goicolea I. Exploring women’s needs in an Amazon region of Brazil.


5. Goicolea I. Exploring women’s needs in an Amazon region of Brazil.


5. Goicolea I. Exploring women’s needs in an Amazon region of Brazil.


Efficiency Analyses of Community Health Worker Program in Mali

En Français

Pérennisation du Programme des Agents de Santé Communautaires en Afrique: Évidences Provenant d’Analyses de Coûts, de Financement et de Données Géospatiales au Mali

Principales constatations
- En 2015, des possibilités de réduction de coût s’élèvent à US$6,16 millions ont été identifiés au niveau de 41 des 44 districts sanitaires évalués.
- Les coûts nécessaires pour un programme ASC durable peuvent être réduits sans sacrifier la qualité et les dépenses peuvent être ciblées géographiquement afin d’optimiser l’utilisation des services par les populations rurales.

Implications clés
- Les gestionnaires de programme et les intervenants devraient utiliser les analyses géospatiales pour réfléchir de façon critique à la planification des ressources du programme ACS et se conformer plus facilement aux actions à entreprendre.
- Les principaux décideurs devraient évaluer les gains d’efficience en matière de financement qui peuvent être réalisés grâce au ciblage et à la cartographie géospatiale.

RÉSUMÉ

Contexte: Au Mali, les agents de santé communautaires (ASC) fournissent des soins essentiels dans la communauté (SEC) aux populations rurales. La prédominance du financement externe supportant ce programme menace la viabilité de cette main-d’œuvre essentielle à mesure que le financement des bailleurs diminue. Cet article résume les résultats d’analyses visant à aider les décisionnaires et dirigeants du Mali à entamer une transition réaliste vers un programme ASC durable soutenu par un financement national par des investissements stratégiques et rationnels.

Méthodes: Des données sur les normes de mise en œuvre des SEC, la main-d’œuvre ASC, la couverture, le coût et l’utilisation des services ainsi que des caractéristiques géospatiales ont été recueillies entre 2016 et 2019. Les données ont éclairé un ensemble de travaux analytiques interdépendants liés au financement du programme ASC – analyse: situationnelle, du coût des services, d’efficience et géospatiale. Les analyses ont montré la répartition des dépenses déclarées, les estimations du financement requis pour les ASC, les options de réduction de coûts et les écarts visualisés spatialement entre les estimations de dépenses et les coûts normatifs.

Résultats: Treize sources de financement ont contribué aux dépenses du programme ASC, dont 88% proviennent de bailleurs de fond internationaux, pour un ensemble de 23 interventions curatives, préventives et promotionnelles. En 2015, le programme ASC a dépensé US$13,01 millions; US$8,36 millions auraient été nécessaires pour atteindre le même volume de services en vertu des protocoles de soins standard établis par le Mali. Les médicaments et la formation initiale ont bénéficié de US$6,88 millions de plus que nécessaire; la supervision, la gestion de programme et la composante recyclage de la formation ont été sous-financées de US$2,2 millions. Des possibilités de réduction de coût de US$6,16 millions de dollars ont été identifiées dans 41 des 44 districts évalués. Des possibilités de réaffectation du financement (après avoir atteint les exigences d’efficience technique) ont été identifiées dans 20 des 44 districts évalués (US$2,56 millions). L’utilisation du ciblage et de la cartographie géospatiale suggère des options de réaffectation des excédents théoriques de financement aux niveaux des districts et des villages.

Conclusion: Les coûts du programme ASC peuvent être considérablement réduits sans sacrifier la qualité technique des services associés. Les dépenses peuvent être ciblées géographiquement afin d’optimiser l’utilisation des services par les populations rurales. Les analyses de l’efficience fournissent des données probantes pour renforcer l’engagement, appuyer l’amélioration de laprise de décisions, prioriser de façon efficiente les ressources et cibler les investissements adéquats pour un financement durable des programmes ASC.

Peer Reviewed

Received: July 31, 2020; Accepted: November 2, 2020


© Saint-Firmin et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00404
Evaluating Vertical Malaria Community Health Worker Programs as Malaria Declines: Learning From Program Evaluations in Honduras and Lao PDR

Harriet G. Napier, a Madeline Baird, b Evelyn Wong, c Eliza Walwyn-Jones, d Manuel Espinoza Garcia, e Lizeth Cartagena, f Nontokozo Mnqadi, g Viengxay Vanisaveth, h Viengphone Sengsavath, h Phoutnalong Vilay, h Kenesay Thongpiou, h Theodoor Visser, a Justin M. Cohen a

Key Findings

- Community health workers (CHWs) detect nearly 30% of all malaria cases in remaining hotspots in Lao PDR and more than 50% of all reported malaria cases in select regions of Honduras.
- Despite having dedicated funding, both countries face challenges supervising, equipping, and supporting CHWs.
- As malaria test positivity declines, expanding CHWs’ responsibilities may encourage individuals to seek care and enable CHWs to more promptly detect and treat remaining cases.

Key Implications

- National malaria programs should assess vertical CHW network design, management, and financing to identify opportunities to promote care seeking for febrile illness.
- As likelihood of malaria as the primary cause of fever decreases, providing an integrated package of services will become more critical in ensuring that patients’ needs are met.
- CHWs are a major source of malaria testing, treatment, and disease intelligence. Information systems capable of tracking their performance and progress to guide remedial action and attribute impact are essential.

ABSTRACT

Background: Across the Greater Mekong Subregion (GMS) and Central America, governments commonly employ community health workers (CHWs) to improve access to and uptake of malaria services. Many of these networks are vertical in design, organized to extend malaria-only services to those remaining communities in which malaria persists.

Methods: Between 2019 and 2020, national ministries of health (MOH) and Clinton Health Access Initiative conducted mixed-methods CHW program evaluations across the GMS and Central America. Routine surveillance and programmatic data were analyzed to quantify CHW contributions to malaria elimination objectives and identify gaps and challenges. Semistructured interviews were conducted with governmental and nongovernmental stakeholders from central to community level. This article draws comparisons between the Lao People’s Democratic Republic (PDR) and Honduras CHW program evaluation results to distill broader hypotheses about how vertical CHW programs might evolve as their primary mission nears its end.

Results: CHWs contribute substantially to malaria case detection and surveillance, diagnosing and treating 27% of malaria cases in Lao PDR and 55% in the department of Gracias a Dios, Honduras in 2019. In the same year, malaria test positivity neared less than 1% in both countries. In 2019, 80% of CHWs in Lao PDR and 74% in Gracias a Dios, Honduras did not report a single malaria case. From inception, both programs were organized as vertical (malaria-only) CHW programs reliant upon Global Fund financing for malaria commodities, training, supervision and, where applicable, remuneration.

Conclusions: Although community case management by CHWs has been highly impactful in reducing malaria cases to near zero, new challenges of acceptability and effectiveness of malaria-only service delivery, feasibility of continued vertical program management, and sustainable financing have emerged. To achieve and sustain reductions in malaria, surveillance and delivery platforms must be redesigned to encourage (and reward) care seeking based on experience of symptoms and not on a patient or caregiver’s presumptive diagnosis of disease. By expanding the roles and responsibilities of currently vertical malaria CHWs, malarial interventions can be optimized and sustained. Such a shift will also position existing community-based platforms to be resilient and responsive as epidemiology of disease and community need shift.
INTRODUCTION

Partnership with community health workers (CHWs) is paramount to achieving universal health coverage and key to accelerating progress toward disease-specific objectives. Across regions seeking to eliminate malaria, the mosquito-borne disease is increasingly concentrated within remote communities, often in locations with limited access to formal health care. Governments commonly introduce community case management for malaria by CHWs to ensure adequate coverage of malaria confirmatory diagnosis, treatment, and routine surveillance in these communities. Although the benefits of engaging CHWs to effectively extend access to care are well-documented, there continues to be debate on how their engagement should be organized. Although the World Health Organization (WHO) has recommended integration of basic services at the CHW level for nearly a decade, vertical CHW programs, organized to provide singular malaria, HIV, TB, or family planning services remain common.

Although the design and legacy of each CHW network vary, vertical malaria-focused CHW cadres across the Greater Mekong Subregion (GMS) and Central America have contributed to significant reductions in malaria in recent years. This is perhaps most apparent in the GMS, where scale-up of malaria volunteers across Cambodia, Lao People’s Democratic Republic (Lao PDR), and Myanmar has been accompanied by a reported 76% decrease in regional malaria cases between 2010 and 2018. In Cambodia, CHWs conducted more than 70% of total malaria testing in 2019. Across the GMS, multiple donors—including the Global Fund, the President’s Malaria Initiative (PMI), and national governments—finance management, training, and malaria commodities for more than 30,000 CHWs. In Cambodia and Lao PDR, village health volunteers (VHVs) offering preventive and promotional services have been an integral part of the peripheral health system for decades. Since 2004, the National Malaria Control Program (NMCP) in Lao PDR has selected, trained, and vertically managed community members to test and treat for malaria in endemic districts, often drawing from the existing VHVs. In contrast, CHW networks in Central America were established in the 1960s and are made up of thousands of vertical (malaria-only) CHWs. Across the region, these government-run cadres identify over 50% of reported malaria cases in select malaria-endemic regions of Panama and Honduras.

Alongside complementary interventions such as targeted insecticide-treated bed net distribution and indoor residual spraying, CHW programs in each region have successfully contributed to substantial declines in malaria. However, achieving and sustainably maintaining malaria elimination typically require different operational approaches than burden reduction (per the WHO malaria elimination framework). Because declines in malaria incidence are inherently accompanied by reduced demand for malaria-only services, many historic and successful vertical CHW programs risk losing relevance from a patient, health system, and donor perspective. As such, progress toward malaria elimination in many countries (Lao PDR and Honduras included) has plateaued in recent years. Despite heavy reliance on vertical malaria CHW platforms, there has been limited quantitative and qualitative analysis of the effectiveness of vertical service delivery at the community level and its capacity to sustain malaria gains in changing epidemiological environments. Routine evaluation of the performance, utilization, and perceived effectiveness of existing networks will thus be essential to ensure existing CHW programs are nimble and optimally positioned to help finish and sustain the task at hand. This article presents results from evaluations of vertical community-based malaria programs in Honduras and Lao PDR, countries where malaria incidence has declined by 90% and 75%, respectively, since 2015.

METHODS

Objectives

In 2019 and 2020, the Clinton Health Access Initiative (CHAI) collaborated with representatives from ministries of health (MOIs) in the GMS and Central America to carry out mixed-methods evaluations of government-owned malaria CHW networks. The evaluations sought to: (1) describe the demographics of the CHW cadre and contributions to malaria case management in each country; (2) document ongoing implementation of community case management programs; and (3) identify areas for network strengthening. This article presents findings from 1 country in each region to look at similarities and differences across 2 contexts: Honduras and Lao PDR. Implementation of the CHW evaluations was timed to generate recommendations for inclusion in both countries’ 2020 Global Fund malaria grant applications. This article aims to share these findings and outline common challenges and
needs that malaria elimination programs may encounter in environments of significantly reduced malaria incidence (Figure 1).

**Site Selection**
The evaluations were performed in Gracias a Dios, Honduras, (reporting 60% of total national malaria cases in 2019) and Champasak and Attapeu provinces in Lao PDR (reporting 39% of total national cases in 2019). Sites for field visits and data collection in Gracias a Dios were selected to include a mix of areas with and without active malaria transmission and in consideration of population mobility, importation of malaria from neighboring countries, and CHW activity levels. Sites for field visits in Champasak and Attapeu were selected to include a mix of governmental and nongovernmental CHW program implementers, malaria burden, and CHW activity levels. Figure 2 shows the 2 subnational geographies selected for the CHW program evaluations in Honduras and Lao PDR.

**Data Collection**
The program evaluations used qualitative and quantitative methods to assess program design,
Quantitative routine program and surveillance data were reviewed to measure CHW program performance, extension of service coverage through increasing malaria case detection and appropriate adherence to case management protocols. Quantitative data sources included district health information system (DHIS2) surveillance data and programmatic data, such as supervision and training information, collected via Google and Excel databases as part of routine network monitoring and evaluation. Qualitative methods were employed to assess perceptions of the CHW programs by multiple stakeholders. In both countries, semistructured interview guides were developed in coordination with representatives from the MOH and other partner organizations and in consideration of WHO and other (i.e., CHW Assessment and Improvement Matrix toolkit) guidance on the core components of CHW systems.19

For both evaluations, field-based interviews were conducted with representatives from multiple partners involved in the management and implementation of the CHW program. In Honduras, field visits occurred in February 2020. Interviewees included representatives of multiple partners involved in the management and implementation of the CHW program.

### Table 1. Description of Qualitative and Quantitative Methods and Indicators Used in Honduras and Lao PDR Evaluations of Government-Owned Community Health Worker Networks

<table>
<thead>
<tr>
<th></th>
<th>Honduras</th>
<th>Lao PDR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary outcomes</strong></td>
<td>Health system and community member perspectives on CHW network performance and relevance while providing malaria-only services as malaria incidence declines, across department</td>
<td>Governmental and nongovernmental perspectives on CHW performance, contribution, and program design from central to community level</td>
</tr>
<tr>
<td><strong>Quantitative data</strong></td>
<td>DHIS2 surveillance data from January 2017 to December 2019, and operational data from Excel databases related to supervision, training, and network management</td>
<td>DHIS2 surveillance data from January 2018 to December 2019, and programmatic data stored via Google Sheets and Excel databases related to CHW demographics, network stocking, training, and reporting</td>
</tr>
<tr>
<td><strong>Indicators or components included</strong></td>
<td>Total cases captured by CHW network, Proportion of cases detected by CHWs, Test positivity rate (country and study site), Total malaria tests collected across department, CHW pre/post-test training scores, Time between symptom onset and diagnosis, CHW demographic information including average CHW length of service, sex, and age, Supervisor to CHW ratio by municipality</td>
<td>Total cases captured by CHW network, Proportion of cases detected by CHWs, Test positivity rate (country and CHW*), Total malaria tests collected across country, CHW pre/post-test training scores, CHW demographic information including average CHW length of service, sex, age, and education, CHW reporting timeliness and completeness, CHW average testing activity</td>
</tr>
<tr>
<td><strong>Qualitative data</strong></td>
<td>40 stakeholder interviews and community focus groups, including in-depth interviews at ministry of health at central, regional, local levels (n=16); interviews with CHWs (n=19); focus groups with community members (n=39)</td>
<td>34 interviews, including in-depth interviews at central National Malaria Program and partners (n=8), province (n=5), district (n=5), health center (n=6), and CHW level (n=10)</td>
</tr>
<tr>
<td><strong>Indicators or components included</strong></td>
<td>6 elements of CHW systems included in questionnaire: (1) network management; (2) training; (3) supervision and supply chain; (4) reporting and network monitoring and evaluation; (5) health system linkage; (6) service provision and community participation</td>
<td>10 elements of CHW systems included in questionnaire: (1) program objectives; (2) management, leadership and governance; (3) terms of reference; (4) training; (5) payment processes; (6) supply chain; (7) supervision and performance management; (8) information management; (9) health system linkage; (10) community engagement and utilization</td>
</tr>
</tbody>
</table>

Abbreviations: CHW, community health worker; DHIS, district health information system; PDR, People’s Democratic Republic.

* Distinct indicators reviewed according to country-specific available programmatic and surveillance data.
from multiple levels of the national health system, malaria program implementers, and community members. In Lao PDR, qualitative data collection occurred in May 2019. Interviewees included governmental and nongovernmental representatives from national to village level.

Interviews were conducted by CHAI and MOH staff in local indigenous or national language (Miskito or Spanish in Honduras and Lao in Lao PDR) according to stakeholder preference. In-person translation was provided by either CHAI or MOH staff, and interview details were documented throughout data collection. In Lao PDR, 2 notetakers were used where possible. In both countries, identifying participant information was not collected, and all participants provided oral informed consent before participation.

Data Analysis

In both Honduras and Lao PDR, evaluation data were analyzed collaboratively by CHAI, MOH, and other relevant stakeholders (e.g., implementing partners). Evaluation data were originally presented as individual country CHW program reviews and incorporated into each country’s malaria Global Fund application. Lao PDR’s evaluation was also incorporated into the annual national malaria program review and subsequent strategic documents. These evaluations were conducted as routine MOH programmatic monitoring and evaluation activities and did not require in-country ethical approval.

Qualitative data analysis for Lao PDR and Honduras consisted of coding interviews collected on paper forms according to the 10 elements of CHW systems collected in the questionnaire. Numbers and percentages were then calculated for each theme to provide a general overview of response frequency. Exceptions were noted and additional nodes were added to the coding system as needed based on additional themes that emerged during review. In Lao PDR, themes were also compared against NMCP guidelines, manuals, and quantitative data collection to corroborate interview findings.

Quantitative data were cleaned and analyzed using DHIS2 and Microsoft Excel data sources. For both studies, proportions were calculated to describe key demographic characteristics of the CHW network and CHWs interviewed. We captured case and testing contribution data using national DHIS2 in both contexts, then extracted the data, and conducted descriptive analysis of proportions in Microsoft Excel 2016. In Lao PDR, additional data on CHW-reported malaria cases and reporting contribution were extracted from GoogleSheets for descriptive analysis in Microsoft Excel 2016. In Honduras, proportions for stock and supervision data captured through SurveyCTO platform were analyzed within data capture on GoogleSheets.

RESULTS

The quantitative and qualitative results were extracted from evaluation reports according to 5 overarching themes that emerged across country contexts.

CHW Demographics

Details on CHW demographics for both countries can be found in Table 2. The CHW network in Gracias a Dios, Honduras, consists of 330 trained community volunteers. The average CHW age is 41 years ranging from 18 to 75 years, with 55% of CHWs having only primary-level education and 38% having a secondary-level education. Females comprise 73% of the cadre, and CHWs have an average of 10 years’ experience. According to risk strata, malaria CHWs are expected to provide services to a range of 250 to 1,000 residents. The position is commonly passed from one generation of CHW to the next without standardized recruitment or certification criteria. The volunteers do not receive financial incentives or have set working hours.

In Lao PDR, the CHW network consists of 1,598 trained community volunteers. Malaria CHWs are expected to provide services to a range of 100 to 1,700 residents, with 94% of CHWs serving a population under 1,000. Standard recruitment criteria exist but may not be closely followed, particularly the criterion that CHWs should be aged 40 years or younger. National data collected from 913/1,598 CHWs revealed an age range between 16 and 70 years, with 53% aged between 31 and 50 years. Male CHWs make up 81% of the network. CHWs receive US$19 monthly, split between US$12 incentive and US$7 transport payments. Most (91%) CHWs reported having more than 1 year of experience, with 43% reporting 10 or more years of service. More than half (51%) of CHWs received primary education, and the rest have either secondary level education or higher. CHWs do not have set working hours and are not expected to conduct active malaria case detection.
### TABLE 2. Malaria Epidemiology, Community Health Worker System Structures, and Case Management Policies, 2019, Honduras and Lao PDR

<table>
<thead>
<tr>
<th></th>
<th>Honduras</th>
<th>Lao PDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. malaria cases</td>
<td>391</td>
<td>6690</td>
</tr>
<tr>
<td>Test positivity rate</td>
<td>0.2%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Incidence trends</td>
<td>90% decline since 2015</td>
<td>75% decline since 2015</td>
</tr>
<tr>
<td>Malaria cases detected by CHWs</td>
<td>55%</td>
<td>27%</td>
</tr>
<tr>
<td>CHWs reporting a malaria case</td>
<td>26%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Study Site Details**

<table>
<thead>
<tr>
<th>Study location</th>
<th>Gracias a Dios department</th>
<th>Champasak and Attapeu provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study site test positivity rate</td>
<td>0.6%</td>
<td>0.8%</td>
</tr>
<tr>
<td>National cases from study loca-</td>
<td>0.6%</td>
<td>0.8%</td>
</tr>
<tr>
<td>tion(s)</td>
<td>60%</td>
<td>39%</td>
</tr>
<tr>
<td>CHW network size (study site/</td>
<td>330/2,900</td>
<td>483/1,598</td>
</tr>
<tr>
<td>national)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Community Health Worker System Overview**

<table>
<thead>
<tr>
<th>Services provided by cadre</th>
<th>Curative malaria services only without paracetamol (vertical cadre)</th>
<th>Curative malaria services only with paracetamol &amp; oral rehydration salts (vertical cadre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional health services</td>
<td>Additional health services to communities, based on request from health center staff or recruitment by other vertical programs (e.g., TB, maternal and child health)</td>
<td></td>
</tr>
<tr>
<td>Case detection methods</td>
<td>Passive and active</td>
<td>Passive</td>
</tr>
<tr>
<td>Gender composition of network</td>
<td>73% female</td>
<td>81% male</td>
</tr>
<tr>
<td>Average CHW age, years</td>
<td>41</td>
<td>31–50</td>
</tr>
<tr>
<td>Minimum education level</td>
<td>Primary education</td>
<td>Primary education</td>
</tr>
<tr>
<td>CHW: population ratio</td>
<td>1: 250 to 1,000</td>
<td>1: 100 to 1,700 (94% of CHWs under 1:1000)</td>
</tr>
<tr>
<td>Date CHW cadre established</td>
<td>1960s Malaria Eradication Campaign</td>
<td>2005</td>
</tr>
<tr>
<td>CHW remuneration</td>
<td>US$0</td>
<td>US$19 monthly</td>
</tr>
<tr>
<td>Key financial and operational</td>
<td>Global Fund, Global Communities</td>
<td>Global Fund, United Nations Office for Project Services, civil society organizations</td>
</tr>
<tr>
<td>partners supporting CHW system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body in charge of network</td>
<td>Coordinated across integrated Ministry of Health units</td>
<td>National Malaria Control Program</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**National Case Management Policies for Malaria**

<table>
<thead>
<tr>
<th>Testing</th>
<th>Free malaria testing and treatment in the public sector</th>
<th>Free malaria testing and treatment in the public sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDT for all patients with fever or 2 risk factors (e.g., travel to forest and nausea), in malaria-endemic areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>• P. vivax and P. falciparum cases: chloroquine for blood-stage infections</td>
<td>• Artesinin-based combination therapy for all positive cases treated</td>
</tr>
<tr>
<td></td>
<td>• P. falciparum cases: single dose primaquine</td>
<td>• P. vivax and mixed P. vivax/ P. falciparum cases referred to health center or hospital for G6PD testing and primaquine</td>
</tr>
<tr>
<td></td>
<td>• P. vivax malaria for radical cure: either 14 or 7 days of primaquine</td>
<td></td>
</tr>
<tr>
<td>Referrals</td>
<td>Pregnancy, breastfeeding mothers, infants under 6 months of age and suspect severe malaria cases</td>
<td>Pregnancy, severe cases, P. vivax or mixed P. vivax/ P. falciparum cases, patients with malaria in the past 28 days</td>
</tr>
</tbody>
</table>

Abbreviations: CHW, community health worker; PDR, People’s Democratic Republic; RDT, rapid diagnostic test.
Both countries reported drastic reductions in malaria cases from 2015 to 2019. Malaria Case Detection and Test Positivity

Since 2015, Honduras has reported a 90% reduction in malaria cases. In 2019, the country reported a slide positivity of 0.2%, reduced from 2.4% in 2015 (capturing both active and passive case detection efforts). Lao PDR reported a 75% reduction in malaria cases between 2015 and 2019 and a decline in malaria test positivity (from active and passive case detection) from 12.6% to 1.3%.

In Gracias a Dios, 168 CHWs were trained and equipped in 2017 with malaria rapid diagnostic tests (RDTs), in addition to the 162 CHWs that were equipped to use RDTs in years prior. Between 2017 and 2019, regional MOH staff supported efforts to increase frequency of CHW supervision and duration of CHW training. Over this period, the proportion of cases detected by CHWs doubled, from 29% in 2017 to 55% in 2019. In Gracias a Dios, 26% of the CHW network reported a malaria case in 2019. Despite an increase in proportion of cases reported at the community level since 2017, delays in malaria diagnosis and treatment persisted, with 37.5% of CHW-detected cases diagnosed more than a week following symptom onset in 2019. Interviews with MOH representatives and community focus groups attributed this delay to patients’ resistance to seek care where only malaria services were offered each time they presented with fever. They also described patient preference for self-medication with locally available fever-reducing medicines to alleviate symptoms and diminishing perceived value of visiting a CHW capable of responding only to malaria. One community member stated:

“[CHWs] provide malaria tests but do not give us pills… What purpose does it serve to come to the CHW since the test always comes back negative?” — Male community member

In Champasak and Attapeu, testing by the CHW network increased by 300% between August 2018 and August 2019 following nationwide health worker training and dissemination of guidance recommending the testing of all fevers in malaria hotspots. Over this same period, the monthly proportion of total tests conducted by CHWs increased from 11% to 17%, and CHW test positivity rates decreased from 3.4% to 0.8%. Notably, of the 971 CHWs nationally with complete data from January to April 2019, 777 (80%) did not encounter a single instance of a positive malaria test. Reports of low positivity were supported by qualitative interview data. Of the 6 CHWs interviewed in Champasak, 3 mentioned seeing no cases in the past month, and 1 CHW mentioned that he had not seen a positive case in the past 3 years.

Management, Financing, and Performance Monitoring

In Lao PDR, the NMCP oversees management of the CHWs, working in coordination with implementing civil society organizations (CSOs). The NMCP is organized into specialized units dedicated to program management, epidemiological surveillance, case management, health education, and vector control. In Honduras, the malaria program is coordinated across integrated central level MOH units, including laboratory, epidemiology, and health service provision. The principal recipient of the Global Fund investment for Honduras, Global Communities, coordinates with the MOH and partners to support the CHW network.

In both Lao PDR and Honduras, Global Fund allocations finance most of the routine CHW trainings, supervision, and malaria commodities. The CHW evaluations identified network management challenges linked to dependence on narrow, external financing (primarily Global Fund) and bottlenecks to effective partner coordination. In Honduras, MOH stakeholders described challenges with planning trainings and activities that are largely dependent on the availability and accessibility of external financing. In Lao PDR, the evaluation identified a lack of regular CHW program planning and coordination mechanisms. Stakeholders identified that the absence of a central coordinating unit to facilitate CSO and NMCP coordination inhibited the prompt resolution of CHW operational challenges, such as delayed or disjointed incentive payments.

Regional or provincial level interviewees in both countries highlighted the importance of simple reporting processes and systems to effectively monitor CHW performance. In Lao PDR, CHW location and demographic data are collected at recruitment in a Google database, which, when combined with detailed CHW testing and case data on a monthly level, allow for a granular understanding of the network. Every 6 months, MOH and CSOs circulate an updated CHW location list. However, multiple interviewees described this reporting system as time-consuming, duplicative, and challenging to update with multiple information systems (i.e., DHIS2 and Google Sheets) and stringent financial reporting requirements. In
Honduras, CHW data are stored within a centrally managed DHIS2 platform and regionally managed Excel databases. Interviewees described direct field visits to CHWs as the principal means for monitoring them due to challenges with timely information flow from communities, unreliable data quality, and duplicative data collection. In both Lao PDR and Honduras, stakeholder interviews highlighted operational challenges managing multiple data sources, including difficulties with routine network monitoring and accurate data on CHW program demographics, contributions, performance, and attrition.

Supervision and Supply Chain
In Honduras, environmental control technicians (MOH staff who primarily support vector-borne disease interventions) provide monthly community-level supervision to CHWs to collect reports and restock commodities. Interviews with MOH representatives described difficulties monitoring CHW supervision and allocating sufficient resources for monthly visits. Stakeholders identified limited transport, walking distance of more than 10 hours, and a burdensome CHW to supervisor ratio (as high as 29:1) as barriers to effective supervision. Programmatic monitoring and evaluation data from visits by regional MOH staff to CHWs revealed that 18% of CHWs had a stock-out of at least 1 essential case management commodity (blood slides, malaria RDTs, or antimalarial treatments). Although interviewees described supervision improvements associated with provision of monthly transport stipends to CHW field supervisors since 2018, they emphasized the continued importance of sufficient financing for field supervisors to reliably carry out monthly CHW supervision.

In Lao PDR, provincial and district staff described that they were unable to conduct regular field-based CHW supervision due to coordination and resource gaps. Instead, monthly CHW meetings at health centers served as the primary opportunity for CHW report submission, stock replenishment, mentorship, and payment. All CHWs interviewed reported traveling to the health center the first week of each month. Strong linkages between districts, health centers, and CHWs were reported as contributing to a high average CHW reporting rate of 92% nationally. Few stock-outs of malaria commodities (artemisinin-based combination therapy, RDTs, and primaquine) were reported by CHWs. Some commodities such as gloves and first aid kits, that are neither provided nor tracked by the malaria program, were reported as inconsistently available to CHWs.

Health System Integration
In Gracias a Dios, malaria trainings are typically managed by regional MOH staff in coordination with CHW field supervisors, with limited participation from surrounding health centers. All 7 central and regional level MOH representatives interviewed stated that additional training for CHWs in other disease areas would be beneficial, yet cautioned on overburdening the volunteer network. Two MOH representatives described the benefit of integrating tasks to enhance CHW motivation and sustain community surveillance:

*With the recent reduction in cases, it will require more training of the CHW network so that they do not become demotivated.* —MOH staff, Gracias a Dios

*The redirection of trainings is important so that CHWs feel motivated to continue looking for fevers through adding other services to the network for more holistic medical attention.* —MOH staff, Gracias a Dios

In Honduras, CHWs reported little to no involvement in broader health system activities and described challenges referring patients to surrounding facilities. CHWs reported serving their communities as their principal motivation in their role and described this to be increasingly difficult due to frequent negative malaria test results. Given CHW kits in Honduras only include malaria tests and antimalarial treatment (without paracetamol), 16 of 19 (84%) CHWs interviewed reported needing additional medicines to serve in their role, and the same proportion reported the community requesting CHW services beyond malaria diagnosis and treatment. Community members alike described the importance of altering services available through the CHW network, mentioning that malaria had ceased to be a major problem in comparison to other health problems such as general fever and access to potable water. CHWs and community members stated that an integrated package of CHW services would also enhance prompt treatment seeking. One FGD member stated:

*If the CHW had a medicine kit of more medicines, [I] would go to the CHW as soon as I felt ill.* —Male community member

Community members in Honduras said because malaria was no longer a problem compared to other health problems, CHWs should provide other services.

Community members in Honduras said because malaria was no longer a problem compared to other health problems, CHWs should provide other services.
These findings echo the importance of community embeddedness in CHW program design—equipping CHWs with a certain package of services may influence patient care seeking and job satisfaction.

**DISCUSSION**

CHW program evaluations from Honduras and Lao PDR highlight CHWs’ significant contributions to malaria case management and surveillance and describe varying interactions between CHWs and their local primary health care system. Both countries struggle with reliable field-based supervision of hard-to-reach CHWs, though Lao PDR seems to have largely resolved this bottleneck by shifting primary supervision to the health facility and compensating CHWs for their transport to and from. Strong linkage of CHWs to a comprehensive primary health care clinic may also offer an effective route for improved timeliness and completeness of reporting and commodity security. Near complete reliance on a single source of financing poses threats to both programs, as does the absence (Lao PDR) or limited use (Honduras) of existing integrated MOH coordinating mechanisms. Where the work is unpaid, the CHW cadre is predominantly female, a situation observed in the existing integrated MOH coordinating mechanisms. Where the work is unpaid, the CHW cadre is predominantly female, a situation observed in the existing integrated MOH coordinating mechanisms.

In contrast to Honduras, subnational and community interviewees in Lao PDR reported that in addition to their passive case detection responsibilities, malaria CHWs are often enlisted by their communities and nearby health centers to perform additional health activities, primarily for TB, maternal and child health, vaccinations, and health promotion. In contrast to the information in the CHW database wherein 635 of 867 (73%) of CHWs self-reported as malaria-only volunteers, most CHWs interviewed reported performing other community health roles beyond malaria and being the only CHW in their village. This overlap is likely linked to the coexistence of the VHV program in many of the communities.

Although utilization data were not collected during the interviews, a minority of CHWs reported that community members visited them whenever they had a fever, and all CHWs said the most requested service was an RDT. In addition to the standard malaria diagnostics and medicines, oral rehydration salts and paracetamol are provided to all CHWs, with some CSOs providing a supplemental first aid kit. Despite serving in additional capacities within their communities, CHWs report frequently encountering patients with signs of illness they could not treat, as described in CHW case management guidelines in Table 2.

In Lao PDR, malaria training is conducted through cascade training, where central level trainers train provinces and district malaria staff, who in turn train staff at hospitals, health centers, and CHWs. Both MOH and CSO CHWs reported receiving the same training and materials, such as RDT job aids and treatment algorithms. When asked if they would benefit from additional training in qualitative interviews, half of CHWs indicated that they would benefit from more training on malaria testing, treatment, and counseling and requested additional training in other disease areas such as dengue, diarrhea, and pneumonia.

In contrast to Honduras, subnational and community interviewees in Lao PDR reported that in addition to their passive case detection responsibilities, malaria CHWs are often enlisted by their communities and nearby health centers to perform additional health activities, primarily for TB, maternal and child health, vaccinations, and health promotion. In contrast to the information in the CHW database wherein 635 of 867 (73%) of CHWs self-reported as malaria-only volunteers, most CHWs interviewed reported performing other community health roles beyond malaria and being the only CHW in their village. This overlap is likely linked to the coexistence of the VHV program in many of the communities.

Although utilization data were not collected during the interviews, a minority of CHWs reported that community members visited them whenever they had a fever, and all CHWs said the most requested service was an RDT. In addition to the standard malaria diagnostics and medicines, oral rehydration salts and paracetamol are provided to all CHWs, with some CSOs providing a supplemental first aid kit. Despite serving in additional capacities within their communities, CHWs report frequently encountering patients with signs of illness they could not treat, as described in CHW case management guidelines in Table 2.

In Lao PDR, malaria training is conducted through cascade training, where central level trainers train provinces and district malaria staff, who in turn train staff at hospitals, health centers, and CHWs. Both MOH and CSO CHWs reported receiving the same training and materials, such as RDT job aids and treatment algorithms. When asked if they would benefit from additional training in qualitative interviews, half of CHWs indicated that they would benefit from more training on malaria testing, treatment, and counseling and requested additional training in other disease areas such as dengue, diarrhea, and pneumonia.

In contrast to Honduras, subnational and community interviewees in Lao PDR reported that in addition to their passive case detection responsibilities, malaria CHWs are often enlisted by their communities and nearby health centers to perform additional health activities, primarily for TB, maternal and child health, vaccinations, and health promotion. In contrast to the information in the CHW database wherein 635 of 867 (73%) of CHWs self-reported as malaria-only volunteers, most CHWs interviewed reported performing other community health roles beyond malaria and being the only CHW in their village. This overlap is likely linked to the coexistence of the VHV program in many of the communities.

Although utilization data were not collected during the interviews, a minority of CHWs reported that community members visited them whenever they had a fever, and all CHWs said the most requested service was an RDT. In addition to the standard malaria diagnostics and medicines, oral rehydration salts and paracetamol are provided to all CHWs, with some CSOs providing a supplemental first aid kit. Despite serving in additional capacities within their communities, CHWs report frequently encountering patients with signs of illness they could not treat, as described in CHW case management guidelines in Table 2.
malaria testing by formerly malaria-only CHWs (Myanmar) and increases in both utilization of CHW services and CHW motivation (Cambodia) following an expansion of CHW services. We surmise that expanding CHW capacity to respond to other causes of illness in Honduras and strategically employing the overlap between CHWs and VHV in Lao PDR may increase the odds that community members will (1) elect to seek care from the CHW; (2) be diagnosed accurately and registered as such within national disease surveillance systems; (3) receive appropriate treatment; and (4) continue to seek health services at points of care endorsed, supported, and monitored by national programs. These conclusions are consistent with the literature on the benefits of multi-versus single-disease CHW programming from effectiveness and efficiency perspectives.24–26

Successful integration will depend on government capacity to adapt national policy and absorb costs and management structures required to sustain these networks.27,28 As malaria epidemiology shifts, resource envelopes change, making CHW program evolution essential to ensure the continued productive interaction between CHWs, community members, and the health system.25 As mentioned, malaria CHW programming in both Honduras and Lao PDR relies heavily on Global Fund financing, which by rule does not fund the nonmalarial commodities (such as oral rehydration salts or amoxicillin) that come with a shift to integrated service delivery.29 If health systems or primary donors are incapable of covering these costs, cofinancing opportunities must be identified in the mutual interest of malaria and nonmalaria gains. Interviews with MOH officials in both Honduras and Lao PDR found a high level of receptiveness to the introduction of additional disease tasks within the CHWs’ scope of work. In contrast to the highly vertical central management of the CHW network in Lao PDR, integrated CHW program management by multiple MOH departments in Honduras may offer an avenue for evolution of the longstanding malaria-only CHW network. Despite observed global encouragement by technical partners and donors, formal guidance remains limited on how health system actors can effectively transition an existing CHW program from vertical to integrated service delivery.30,31

Previous studies have focused largely on how integration of tasks can increase care seeking and confirmatory malaria testing at select points of care. This article adds to the literature by discussing system-wide considerations inherent to such a transition related to health system linkage, management, and financing. From a health system perspective, the investment required to collect and compile reports, perform supervision, and distribute commodities and compensation becomes less sustainable as malaria becomes a less urgent disease. From a donor perspective, the financing required for each malaria case captured increases steadily. As financial and administrative costs increase on a per malaria case basis, the marginal returns of the program in the eyes of donors, MOH officials, and the community begin to diminish. These issues have been insufficiently discussed in the malaria space.

Limitations
Several limitations may have affected the quality of the findings presented in this post-hoc comparative analysis. Interviews were not recorded, and interview notes were translated into English, introducing the possibility of translation error. In both Honduras and Lao PDR, the assessments were conducted under the auspices of the country’s national malaria program in partnership with CHAI as part of routine operational evaluation and management, thus were not designed to answer specific research questions nor were they designed to be compared. Interview data from both countries come from accessible, available, and MOH-recommended communities and health centers and do not represent a random sample of stakeholder opinion.

CONCLUSION
The substantial reductions in malaria witnessed in both Honduras and Lao PDR are not necessarily permanent.32 Continued vigilance against malaria by health workers and communities is required to rapidly identify imported cases, curb outbreaks, and prevent resurgence of the disease. A shift from vertical to integrated CHW programming may offer new opportunities to protect malaria progress and increase the usefulness of an existing CHW platform, but such a transition is not without its challenges. Though both vertical and integrated CHW platforms require the same basic inputs (policies, governance, financing, and data systems) and programmatic processes (recruitment, training, supervision, and compensation) as outlined by the Frontline Health project in its community health workforce performance framework, the scope and complexity of inputs and processes will change.13

As malaria epidemiology shifts, resource envelopes change, necessitating that the CHW program evolve to ensure the continued interaction between CHWs, community, and the health system.
Maintaining urgency for detecting and treating specific diseases while simultaneously sustaining integrated programs presents a significant set of operational, management, and financing uncertainties. Who within a siloed MOH will govern polyvalent programs? Will integrated programs enjoy the same dedicated financing as did their vertical predecessors? Will it be feasible to prioritize specific diseases while also fostering high comprehensive service quality and positive experience of care? How will the various elements of a CHW’s scope of work be configured, operationalized, and prioritized, particularly in contexts such as Honduras where the workforce is unpaid?\textsuperscript{30,33} How will each country’s core community health infrastructure remain simple yet dynamic, responsive, and high impact? Despite the complexity of these questions, ignoring their importance and timeliness risks atrophy of the many CHW workforces that have reduced malaria to near zero across many countries in Central America and the GMS. Even particularly successful vertical CHW programs, such as those in Honduras and Lao PDR, will need to evolve to complete their mission, sustain the gains they have achieved, and continue to advance their communities toward a healthier future.

Acknowledgments: We would like to acknowledge the following institutions and individuals for essential contributions made to evaluation planning, design, data collection, and data review: The Lao PDR, Center for Malariology, Parasitology, and Entomology; the Secretary of Health, Honduras; Ministry of Health staff at central and subnational level in both Lao PDR and Honduras; and all interviewees from central to community level. In addition, we would like to thank Vangdala Vongphachan, Ithiphone Xavyavong, Boukpong Inthirath, Kanya Ounniyom, Saykhek Chreunsouk, Kim Hanso, Sarah Park, Aqibaj Ward, Justin Losa, Agrima Ngaol, Inessa Bo, Ayoukule Abogoun, Anne Lui, from the Clinton Health Access Initiative; and Miriam Wood from the Secretary of Health, Honduras.

Funding: Clinton Health Access Initiative authors acknowledge funding support from the Bill and Melinda Gates Foundation (OPP1109772).

Competing interests: None declared.

REFERENCES

Antecedentes: En la Subregión del Gran Mekong (GMS) y Centroamérica, los gobiernos frecuentemente emplean a los colaboradores comunitarios para mejorar el acceso y uso de servicios de malaria. Muchas de esas redes son verticales en su diseño y están organizados para extender servicios de malaria en las comunidades donde persiste la transmisión autóctona de malaria.

Métodos: Entre 2019 y 2020, se llevaron a cabo evaluaciones de métodos mixtos de los programas de colaboradores por ministerios de salud nacionales para mejorar el acceso y uso de servicios de malaria. Muchas de esas redes son verticales en su diseño y están organizados para extender servicios de malaria en las comunidades donde persiste la transmisión autóctona de malaria.

Resultados: Los colaboradores contribuyen de forma significativa a la detección de casos de malaria y la vigilancia comunitaria, diagnosticando y tratando el 27% de los casos de malaria en Laos y un 35% de los casos de malaria en el departamento de Gracias a Dios, Honduras. En 2019, la tasa de positividad de pruebas de malaria se acercó a una tasa menor de un 1% en ambos países. Un 80% de colaboradores en Laos y un 74% de colaboradores en Gracias a Dios, Honduras no reportaron ningún caso de malaria en 2019. Desde su inicio, ambas programas fueron organizados como programas verticales de colaboradores que dependen del financiamiento de los fondos del Fondo Mundial para la compra de insumos, la capacitación, la supervisión y, donde es aplicable, la remuneración.

Conclusiones clave: Los programas nacionales de malaria deben evaluar el diseño, gestión y financiamiento de los programas verticales de colaboradores para poder identificar oportunidades de asegurar que los pacientes febriles sigan acudiendo a los servicios de los colaboradores. Los colaboradores sirven como un puntajo importante de provisión de servicios de diagnóstico, tratamiento e información de vigilancia de enfermedades al nivel comunitario. Las sistemas de información capaces de monitorear su desempeño son esenciales para guiar acciones correctivas y evaluar su impacto, tal como muestra la evidencia generada por los investigadores y actores que crean las políticas de salud.

En Español

Título: Evaluando el programa vertical de colaboradores comunitarios mientras disminuye la incidencia de malaria: aprendiendo de evaluaciones de programas en República Democrática Popular Laos y Honduras

Hallazgos claves
- Los colaboradores comunitarios detectan casi un 30% de todos los casos de malaria en la República Democrática Popular Laos en los focos activos de malaria, mientras en ciertas regiones seleccionadas en Honduras, los colaboradores detectan encima de un 50% de todos los casos reportados de malaria.
- A pesar de fondos dedicados a malaria, ambos países enfrentan retos con la supervisión y apoyo brindado a sus colaboradores trabajando al nivel comunitario.
- Mientras el índice de positividad disminuye a un valor menor de un 1%, la expansión de los servicios prestados por los colaboradores puede incentivar a los miembros de la comunidad a seguir acudiendo a los servicios de salud del puesto del colaborador para malaria y posibilitar que los colaboradores puedan detectar y tratar los casos de malaria de forma oportuna.

Conclusiones claves
- Los programas nacionales de malaria deben evaluar el diseño, gestión y financiamiento de los programas verticales de colaboradores para poder identificar oportunidades de asegurar que los pacientes febriles sigan acudiendo a los servicios de los colaboradores.
- A medida que reduce la probabilidad de que la malaria sea la causa principal de fiebre, la provisión de un paquete de servicios integral se vuelve más importante para asegurar que los colaboradores puedan responder a las necesidades de salud de cada paciente.
- Los colaboradores sirven como un puntajo importante de provisión de servicios de diagnóstico, tratamiento e información de vigilancia de enfermedades al nivel comunitario. Las sistemas de información capaces de monitorear su desempeño son esenciales para guiar acciones correctivas y evaluar su impacto, tal como muestra la evidencia generada por los investigadores y actores que crean las políticas de salud.

ABSTRACTO

Antecedentes: En la Subregión del Gran Mekong (GMS) y Centroamérica, los gobiernos frecuentemente emplean a los colaboradores comunitarios para mejorar el acceso y uso de servicios de malaria. Muchas de esas redes son verticales en su diseño y están organizados para extender servicios de malaria en las comunidades donde persiste la transmisión autóctona de malaria.

Métodos: Entre 2019 y 2020, se llevaron a cabo evaluaciones de métodos mixtos de los programas de colaboradores por ministerios de salud nacionales de malaria y Clinton Health Access Initiative (CHAI) en la GMS y Centroamérica. Se analizaron los datos programáticos y del sistema de vigilancia para evaluar las contribuciones de las redes de colaboradores a los objetivos de la eliminación de malaria e identificar brechas y retos en la gestión de dichas redes. Se realizaron entrevistas semiestructuradas con representantes de unidades del gobierno y no gubernamentales del nivel central hasta el nivel comunitario. Esta investigación compara los resultados de las evaluaciones del programa de colaboradores para malaria en Laos y Honduras para proponer cómo las redes verticales de colaboradores pueden evolucionar mientras los países se acercan a su meta de eliminar malaria.

Resultados: Los colaboradores contribuyen de forma significativa a la detección de casos de malaria y la vigilancia comunitaria, diagnosticando y tratando un 27% de los casos de malaria en Laos y un 35% de los casos de malaria en el departamento de Gracias a Dios, Honduras. En 2019, la tasa de positividad de pruebas de malaria se acercó a una tasa menor de un 1% en ambos países. Un 80% de colaboradores en Laos y un 74% de colaboradores en Gracias a Dios, Honduras no reportaron ningún caso de malaria en 2019. Desde su inicio, ambas programas fueron organizados como programas verticales de colaboradores que dependen del financiamiento de los fondos del Fondo Mundial para la compra de insumos, la capacitación, la supervisión y, donde es aplicable, la remuneración.
**Conclusiones:** A pesar del éxito de la estrategia de emplear a los colaboradores para proveer servicios de la gestión de casos a nivel comunitaria en reducir la incidencia de malaria, surgen nuevos retos relacionados con la aceptabilidad y eficacia de los servicios únicamente para malaria, la viabilidad de la gestión continua de un programa vertical, y el financiamiento sostenible. Para lograr y sostener la reducción en la incidencia de malaria, se requiere la reestructuración de las plataformas de provisión de servicios y vigilancia comunitaria para incentivar y recompensar a los pacientes febriles que acuden a servicios de salud del puesto del colaborador. A través de la expansión de los roles y responsabilidades de los colaboradores verticales para malaria, se puede optimizar y sostener las intervenciones de malaria. Este tipo de cambio de diseño puede preparar a las plataformas comunitarias con la resiliencia y capacidad de respuesta mientras la epidemiología de malaria y las necesidades de salud de la comunidad se van transformando.

---

**Peer Reviewed**

**Received:** July 30, 2020; **Accepted:** November 2, 2020


© Napier et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00379
Measuring Knowledge of Community Health Workers at the Last Mile in Liberia: Feasibility and Results of Clinical Vignette Assessments


Key Findings

- Administration of vignettes in a community setting in rural Liberia was feasible and effective for measuring community health worker (CHW) knowledge of case management for the 3 major causes of child mortality addressed by integrated management of childhood illness.
- Correct diagnosis and lifesaving treatment for uncomplicated malaria were high, but correct diagnosis and treatment rates for complicated conditions including pneumonia with a danger sign were low.
- Although use of existing digital and paper-based clinical decision support job aids was inconsistent, CHWs who used them had statistically significant higher rates of correct diagnosis and treatment.

Key Implications

- Improving the quality of CHW-delivered care is an important component of achieving universal health coverage, but gaps exist in how to measure knowledge and quality of delivery in remote settings.
- Clinical vignettes offer a potential approach for program implementers and policy makers to measure CHW knowledge, as a first step to incorporating assessments of the quality of CHW-delivered care into national CHW programs.

ABSTRACT

Introduction: Community health workers (CHWs) can provide lifesaving treatment for children in remote areas, but high-quality care is essential for effective delivery. Measuring the quality of community-based care in remote areas is logistically challenging. Clinical vignettes have been validated in facility settings as a proxy for competency. We assessed feasibility and effectiveness of clinical vignettes to measure CHW knowledge of integrated community case management (iCCM) in Liberia’s national CHW program.

Methods: We developed 3 vignettes to measure knowledge of iCCM illnesses (malaria, diarrhea, and pneumonia) in 4 main areas: assessment, diagnosis, treatment, and referral. Trained nurse supervisors administered the vignettes to CHWs in 3 counties in rural Liberia as part of routine program supervision between January and May 2019, collected data on CHW knowledge using a standardized checklist tool, and provided feedback and coaching to CHWs in real time after vignette administration. Proportions of vignettes correctly managed, including illness classification, treatment, and referral where necessary, were calculated. We assessed feasibility, defined as the ability of clinical supervisors to administer the vignettes integrated into their routine activities once per year for each CHW, and effectiveness, defined as the ability of the vignettes to measure the primary outcomes of CHW knowledge of diagnosis and treatment including referrals.

Results: We were able to integrate this assessment into routine supervision, facilitate real-time coaching, and collect data on iCCM knowledge among 155 CHWs through delivery of 465 vignettes. Diagnosis including severity was correct in 65%–82% of vignettes. CHWs correctly identified danger signs in 44%–50% of vignettes, correctly proposed referral to the facility in 63% of vignettes including danger signs, and chose correct lifesaving treatment in 23%–65% of vignettes. Both diagnosis and lifesaving treatment rates were highest for malaria and lowest for severe pneumonia.

Conclusion: Administration of vignettes to assess knowledge of correct iCCM case management was feasible and effective in producing results in this setting. Proportions of correct diagnosis and lifesaving treatment varied, with high proportions for uncomplicated disease, but lower for more severe cases, with accurate recognition of danger signs posing a challenge. Future work includes validation of vignettes for use with CHWs through direct observation, strengthening supportive supervision, and program interventions to address identified knowledge gaps.

Last Mile Health, Boston, MA, USA.

University of Texas Southwestern, Division of Combined Medicine and Pediatrics, Dallas, TX, USA.


Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA.

Brigham & Women’s Hospital, Harvard Medical School, Boston, MA, USA.

Georgetown University, Department of Health Systems Administration, Washington, DC, USA.

University of Washington, Department of Biostatistics, Seattle, WA, USA.

University of Washington, Department of Family Medicine, Seattle, WA, USA.

Northwestern University Feinberg School of Medicine, Chicago, IL, USA.

Co-first authors.

Correspondence to Jordan Downey (jmdowney@alum.mit.edu).
INTRODUCTION

Over the last decade, community health workers (CHWs) have played a growing role in primary health care delivery in ensuring effective, accessible care in low-resource settings. Many countries have implemented integrated community case management (iCCM) programs to train CHWs to manage malaria, diarrhea, and respiratory illness in children under 5. Studies have suggested that iCCM increases treatment seeking, decreases morbidity, and may decrease mortality in children under 5. However, in many low- and middle-income countries (LMICs), quality of care varies widely or is unknown, potentially limiting the impact of community-oriented primary health care programs. One recent review showed that health care providers, including CHWs, in 18 LMICs completed only 47% of recommended care items in evidence-based guidelines (determined through observations of consultations), with wide variation across countries. To address these quality of care challenges, the World Health Organization (WHO) and others have developed a combination of recommendations for optimizing CHW programs, including competency-based training, assessment, and certification, as well as supportive supervision.

Despite these recommendations, there is no universally accepted or validated method to measure the quality of CHW-delivered care in the field. A study of CHWs in Malawi showed that clinical vignettes estimated correct diagnosis and treatment to within 9 percentage points vs. direct observation and reexamination. There is no universally accepted or validated method to measure the quality of CHW-delivered care in the field.

A study of CHWs in Malawi showed that clinical vignettes estimated correct diagnosis and treatment to within 9 percentage points vs. direct observation and reexamination.

Last Mile Health (LMH) has partnered with the Liberia Ministry of Health since 2007 to provide primary care in remote communities in Liberia. In 2015, the Ministry of Health began to design a national community health program centered around a cadre of paid and supervised CHWs, known as community health assistants (CHAs), each of whom is recruited from the community he or she serves and supervised by a facility-based, clinically-trained Ministry of Health employee (primarily nurses). These Ministry of Health supervisors are called Community Health Services Supervisors (CHSSs). In Grand Bassa, Grand Gede, and Rivercess, counties where LMH directly supports national CHA program implementation, additional LMH clinician supervisors trained in the CHW curriculum, called

observation in the field, are more reliable, they pose logistical challenges due to the remote locations and low caseloads of many CHW work environments, making it difficult to directly observe and assess quality of care. A more logistically feasible option is gathering geographically remote CHWs in a facility setting to directly observe provision of care, but removing CHWs from the community setting in which they routinely work may change how they provide care, result in gaps in care, and overestimate quality due to the Hawthorne effect.

Vignettes are widely accepted as a measure of competency in most settings, and there is growing evidence of their validity as a proxy for measuring care delivery quality for facility-based health workers, as well as emerging evidence of their validity for measuring CHW-delivered care quality. In clinical vignettes, a trained assessor presents health care providers with an open-ended fictional clinical scenario of a sick patient who is brought for diagnosis and treatment and assesses their proposed management of the case measured based on national standards of care. A community-based study involving CHWs in Malawi showed that clinical vignettes estimated correct diagnosis and treatment to within 9 percentage points compared with direct observation and re-examination. This method offers an option for assessing CHW knowledge and potential insights into care delivery quality in their own communities even in remote rural settings where caseloads are small and access for observation is challenging. It also provides the opportunity for supportive supervision in real time based on CHW responses. However, the feasibility and utility of this method are relatively untested in remote rural CHW work environments.
quality assurance officers (QAOs), support the CHSSs by coaching them in supportive supervision designed to improve quality of care delivery.

The CHA program is currently being scaled up, with the goal of reaching the estimated 1.2 million Liberians who live farther than 5 kilometers from the nearest health facility. Although iCCM services are monitored routinely by CHSSs through review of CHW-maintained registers of care provided to patients, registers only capture the CHW’s recorded diagnosis and treatment, posing potential data quality challenges as well as an inability to measure the quality of diagnosis and related treatment delivered.

We describe the feasibility and results of using clinical vignettes to measure CHW knowledge of community-based case management of sick children under 5 in remote rural Liberia integrated into existing supportive supervision. These vignettes focus on the main illnesses for which CHWs receive iCCM training in Liberia: malaria, respiratory infection, and diarrhea. This work was designed to facilitate programmatic quality improvement through supplementing routine supportive supervision for CHWs in LMH-supported counties. It was also designed to inform the Liberia National CHA Program about potential feasible and scalable approaches to measure quality of CHW-delivered care, guide supportive supervision to address gaps in knowledge, and inform future studies to validate vignettes as a proxy for care competency. The results are also relevant for similar programs focused on ensuring that care delivered by CHWs is of the highest quality regardless of setting.

This work aimed to inform the Liberia National CHA Program about potential feasible and scalable approaches to measure quality of CHW care and guide supportive supervision to address knowledge gaps.

**METHODS**

**Liberia’s National CHA Program**

CHWs in Liberia are recruited from the communities they serve and are required to have at least a sixth-grade education level, although in some rural communities where this is not feasible, good candidates with less education may be hired. They are paid, regularly supervised by clinicians (CHSSs), and trained in 4 modules for approximately 2 weeks per module before initiating field activities. The 4 modules include: (1) registration and community-based disease surveillance; (2) reproductive, maternal, and neonatal health; (3) child health, including iCCM of common childhood illnesses; and (4) additional services including management of HIV, TB, leprosy, mental health, and first aid. CHWs are also equipped with decision support job aids to reinforce their training and help them provide services within each module. These include printed job aids, sick child data collection registers, and mobile-phone-based data collection and clinical decision support tools. Job aids include protocols for assessment, classification, and treatment; visuals to aid in symptom and medication recognition; guidance for providing health promotion education to community members; and tips and reminders for advising caregivers. CHWs who complete module 3 in child health are expected to diagnose and treat uncomplicated malaria, diarrhea, and pneumonia as defined by national protocols and to recognize and refer moderate and severe malnutrition. They are also expected to recognize danger signs that require urgent referral to a health facility. Job aids for module 3 focus on helping CHWs correctly diagnose and treat iCCM illnesses, including recognizing danger signs and appropriate referral. Although job aids are provided during training and CHW supervisors encourage their use, CHWs are not required to use them during consultations with patients.

**Study Population and Setting**

The study was completed in 3 counties (Rivercess, Grand Gedeh, and Grand Bassa) supported by LMH. QAOs are supposed to visit each CHW in their catchment area at least once per year as part of their routine supervision responsibilities. Because the information presented here was collected as part of this routine supervision, CHWs were not selected randomly but were included in this assessment if they were actively working in 1 of these counties and received a QAO visit between January 2019 and May 2019.

**Vignette Development & QAO Training**

Vignettes were developed for the 3 main illnesses treated through iCCM (malaria, diarrhea, and pneumonia) based on the WHO Health Facility Survey observation tools (used to evaluate the quality of care delivered to sick children attending outpatient facilities), and the national policy and job aids developed for the Government of Liberia’s National CHA Program. Vignettes captured knowledge in 4 main areas: assessment, diagnosis, treatment, and caregiver instructions, all of which are areas targeted by QAO coaching of the CHW in the field.

We piloted the approach with an initial set of 4 vignettes with 97 CHWs in Rivercess and Grand Gedeh counties. The initial vignettes included
In response to challenges identified in the pilot effort, we reduced the number of vignettes and revised response forms to make data collection requirements clearer.

uncomplicated malaria, acute respiratory illness with a danger sign (chest in-drawing), and uncomplicated diarrhea. The pilot was carried out by QAOs trained to administer the vignettes in their respective counties. We identified several challenges, including the length of time it took to conduct the assessment with 4 vignettes, poor quality of videos used to prompt CHW assessment of respiratory distress, and confusing design of forms used to collect data, especially on dosing selection. In response to these challenges, we revised the vignettes, reducing the number of vignettes from 4 to 3 and modifying response forms to make data collection requirements clearer to more accurately collect dosing information. Although resource constraints did not allow for creation of better quality videos, we removed the necessity of using videos for identifying danger signs by modifying the pneumonia vignette such that the danger sign was the length of time the child had a cough as opposed to the respiratory rate (although the video was still necessary for determining respiratory rate to correctly diagnose pneumonia). We also modified the initial vignettes (which included uncomplicated malaria, acute respiratory illness with a danger sign of chest in-drawing, and uncomplicated diarrhea) to address different sick child scenarios with children of different ages and illnesses. This ensured no skewing of the results by CHWs who had already completed the assessment with the original vignettes and received feedback on their performance.

The new vignettes included acute respiratory illness with a danger sign (cough for more than 14 days), diarrhea with a danger sign (mid-upper arm circumference (MUAC) in the red region), and uncomplicated malaria (Supplement 1). Two vignettes were designed to include danger signs due to CHW difficulty with recognizing danger signs identified through the pilot. Vignettes were developed through an iterative process of drafting, review by field-based staff, and revision, and were translated into Liberian English before use.

QAO training was developed based on the WHO Health Facility Survey.16 QAOs were trained on how to explain and administer the vignette, including instructing the CHW to describe or show what they would do if a real child was present, reminding the CHW to use any tools they normally use in their everyday work and role-playing the part of a caretaker. They were also trained to record the CHW’s diagnosis and treatment for each vignette using a standardized data collection tool; to mark whether the assessment, diagnosis, treatment and caregiver advice were correct; and to note which job aids the CHW used, if any.

Vignette Administration

QAOs administered each of the 3 open-ended vignettes to individual CHWs in the CHW community during their routine supervision visits. The vignettes were presented through playing the role of a sick child’s caregiver, and responses were manually recorded using a standardized data collection checklist tool. Vignettes and data collection tools were designed to collect data on CHW knowledge of assessment, diagnosis, treatment and caregiver instructions, as well as CHW use of job aids, primarily to facilitate QAO feedback to and coaching of the CHW in the field. Our primary outcomes were CHW knowledge of correct diagnosis and treatment including referral if necessary for each vignette. Secondary outcomes included CHW knowledge of assessment tasks and caregiver instructions and CHW use of job aids. CHWs were instructed before the start of the vignette to use any materials they would use in their normal practice that are components of the national program. If CHWs asked about respiratory rate or chest in-drawing, they were shown a video of a child with the respiratory status of the case to evaluate for presence of respiratory distress. If the CHW wanted to perform a rapid diagnostic test (RDT) for malaria, they were asked to explain the steps involved and demonstrate everything except the finger prick on the QAO, and QAOs provided the results appropriate for each vignette (positive for the malaria vignette, negative for the others). CHWs also had the opportunity to demonstrate their ability to correctly perform MUAC measurement to evaluate children for malnutrition, a screening procedure that they are supposed to perform during every consultation regardless of symptoms. CHWs were asked to describe the steps of the procedure and demonstrate the measurement on the QAO or another volunteer. After performing the assessment, CHWs were expected to make a diagnosis and recommend the correct medication and management of the case as it would be communicated to an actual caregiver. CHWs were also expected to refer the child to a health facility if danger signs were present; this was considered a part of correct diagnosis and treatment. After completion of all the assessments, QAOs gave CHWs feedback on their performance and coached them in improving their skills in areas that were challenging for them. All
Data were collected on paper forms and entered into a custom MySQL database by LMH staff.

**Data Analysis**

We defined feasibility as ability of QAOs to administer the vignettes integrated into their routine activities once per year for each CHW (in other words, ability to assess half of all CHWs in their catchment areas over a 6-month period), in counties directly supported by LMH.

Effectiveness was defined as the ability of the vignettes to measure the primary outcomes of CHW knowledge of diagnosis and treatment including referrals. Three indicators were used to assess knowledge for each vignette: (1) correct diagnosis, defined as assigning the correct clinical diagnosis and presence or absence of the correct danger sign; (2) correct lifesaving treatment, defined as providing lifesaving treatment including describing the correct dose for amoxicillin, artemisinin-combined treatment, and any oral rehydration solution and recommending referral if a danger sign was present; and (3) fully correct treatment, including providing correct dosing specifications for all medications including paracetamol for malaria and oral rehydration solution for diarrhea (Table 1). Correct dosing was defined based on Liberia’s national CHW policy including dose, duration, and frequency. For the vignette involving diarrhea, zinc was not included in the definition of lifesaving or fully correct treatment because Liberian national guidelines recommend immediate referral without giving zinc when a child is diagnosed with diarrhea and a danger sign.

Proportions of correct diagnosis or treatment and 95% confidence intervals (CIs) were calculated using the definitions in Table 1.

We also collected and analyzed data on several other aspects of the case management process, including assessment (gathering information on the sick child and performing diagnostic tests), use of clinical decision support job aids, and provision of anticipatory guidance and health promotion messages to caregivers. CHW clinical support job aids and training handbooks remind the user that according to national policy, CHWs should ask 8–9 information gathering questions and perform 1–5 diagnostic tests, depending on the presenting case.

We collected these data to facilitate QAO coaching and feedback in the field as part of the assessment process and to better understand common pitfalls that may lead to suboptimal case management. However, we chose not to include these tasks in definitions for correct diagnosis and treatment; the emphasis was placed on whether actual diagnosis recorded and treatment chosen was correct and not on the process followed to inform the outcomes.

The proportion of CHWs performing each potential information gathering and diagnostic test, as well as the proportion who performed each diagnostic test correctly, were calculated with 95% CIs. The proportion of CHWs appropriately advising caregivers was also calculated for each vignette and across vignettes, with 95% CIs. To understand the extent to which gaps in knowledge might be filled through better use of existing tools, we also examined the proportion of correct diagnosis and treatment decisions among those who

<table>
<thead>
<tr>
<th>Vignette</th>
<th>Case Description</th>
<th>Indicators</th>
<th>Correct Diagnosis</th>
<th>Correct Lifesaving Treatment</th>
<th>Fully Correct Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia with danger sign</td>
<td>Male, aged 4 years, presents with cough for 2 weeks</td>
<td>Pneumonia + danger sign (cough 2+ weeks)</td>
<td>Refer to facility; amoxicillin given (must be correct dose)</td>
<td>Refer to facility; amoxicillin given (must be correct dose)</td>
<td></td>
</tr>
<tr>
<td>Diarrhea with danger sign</td>
<td>Female, aged 8 months, presents with running stomach and malnutrition</td>
<td>Diarrhea + danger sign (red MUAC)</td>
<td>Refer to facility; ORS given regardless of dose</td>
<td>Refer to facility; ORS given (must be correct dose)</td>
<td></td>
</tr>
<tr>
<td>Uncomplicated malaria</td>
<td>Female, aged 2 years, presents with weakness and fever</td>
<td>Malaria</td>
<td>ACT given (must be correct dose)</td>
<td>ACT given (must be correct dose); paracetamol given (must be correct dose)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1. Clinical Vignettes and Indicators Used to Assess CHW Knowledge of Community-Based Management of Sick Children Under Age 5 in 3 Rural Counties, Liberia**

Abbreviations: ACT, artemisinin-combined treatment; CHW, community health worker; MUAC, mid-upper arm circumference; ORS, oral rehydration solution.
used or did not use job aids (Supplement 2). All analysis was carried out using Stata version 14 (StataCorp).

Ethical Considerations
Data collection tools and vignettes were reviewed and approved by institutional review boards in both the United States and Liberia as part of a routine programmatic institutional review board submission, so informed consent was not required by the review boards.

RESULTS

Vignette Administration
Between January 1, 2019 and May 15, 2019, 155 CHWs were evaluated using all 3 vignettes (total 465 vignettes): 40 (26%) in Grand Bassa County, 37 (24%) in Grand Gedeh County, and 78 (50%) in Rivercess County. As planned, QAOs were able to administer all 3 vignettes to half of all active CHWs in their respective catchment areas in a 6-month period, reflecting feasibility of assessing all CHWs once per year and integrating vignettes into routine supervision in counties managed by LMH.

Each evaluation session took approximately 2 hours to administer the 3 vignettes.

Vignette Results
The percentage of CHWs correctly diagnosing each illness are displayed in the Figure. More than 50% of CHWs (range 57%–82% based on case) determined the primary diagnosis correctly. However, CHWs correctly diagnosed the illness and severity of illness (danger signs) in only 26% of pneumonia vignettes (95% CI=20%, 34%) and only 34% of diarrhea vignettes (95% CI=27%, 42%) (Figure). The most common error was missing the presence of a danger sign or incorrectly identifying the presence of a danger sign. CHWs correctly diagnosed the danger sign in 50% (95% CI=42%, 58%) of the pneumonia vignettes and 44% (95% CI=36%, 52%) of the diarrhea vignettes.

Correct treatment rates are presented in Table 2. CHWs prescribed correct lifesaving treatment in 23% of pneumonia vignettes (95% CI=17%, 31%), 50% of diarrhea vignettes (95% CI=42%, 58%), and 65% of malaria vignettes (95% CI=57%, 72%) (Table 2). Fully correct treatment was also prescribed in 21% of diarrhea vignettes (95% CI=15%, 29%) and 28% of malaria vignettes (95% CI=21%, 35%). Since the definitions of correct lifesaving and fully correct treatment were the same for the pneumonia vignette, CHWs prescribed fully correct treatment in the same percentage of
pneumonia vignettes (23%, 95% CI=17%, 31%). In the 2 cases with danger signs, CHWs proposed referral to the facility 63% of the time for both vignettes (95% CI=55%, 70%). CHWs incorrectly identified a danger sign when there was no danger sign in 13% (95% CI=9%, 20%) of malaria vignettes.

CHW Case Management Process

Gathering Information and Diagnostic Tests

During the diarrhea vignette, 91% of CHWs (95% CI=85%, 95%) asked how long the child had diarrhea, 55% (95% CI=47%, 63%) asked how many loose stools per day, and 68% (95% CI=60%, 75%) asked if there was any blood in the stool. Only 14% of CHWs (95% CI=9%, 21%) checked for the danger sign of bilateral pitting edema indicating malnutrition. Of the 54% of CHWs (95% CI=46%, 61%) that checked the child’s MUAC, 43% (95% CI=33%, 54%) demonstrated the skill correctly. Performing this diagnostic test was essential to diagnosing the danger sign of red MUAC.

During the pneumonia vignette, 88% of CHWs (95% CI=81%, 92%) asked how long the child had been coughing, 43% (95% CI=35%, 51%) said they would count the child’s respiratory rate, and 26% (95% CI=20%, 34%) said they would check for chest in-drawing.

During the malaria vignette, 77% (95% CI=70%, 83%) asked if the child had a fever (the prompting question was “My child is weak,” which is a common presenting complaint for malaria), and 65% (95% CI=57%, 72%) asked how long the child had a fever. Although accurate malaria diagnosis was high, in 32% of malaria vignettes, the CHW did not state that they would perform an RDT (95% CI=25%, 39%). Of those who did perform an RDT, 75% (95% CI=66%, 83%) demonstrated the skill correctly.

Using Job Aids

Only 30% of CHWs (95% CI=23%, 37%) used job aids in all 3 cases, and average job aid use across

---

**Table 2. Treatment Recommended by CHWs During Clinical Vignettes Assessing the Correct Management of Sick Children Under 5 in 3 Rural Counties, Liberia**

<table>
<thead>
<tr>
<th>Vignette and Correct Treatment Activity</th>
<th>Activity Type</th>
<th>Percentage of Vignettes in Which CHWs Recommended Activity, % (95% CI) (N=155)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia with danger sign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment with amoxicillin</td>
<td>Lifesaving</td>
<td>62 (54, 69)</td>
</tr>
<tr>
<td>Correct amoxicillin dose</td>
<td>Lifesaving</td>
<td>39 (32, 47)</td>
</tr>
<tr>
<td>Referral to the facility</td>
<td>Lifesaving</td>
<td>63 (55, 70)</td>
</tr>
<tr>
<td>Overall correct lifesaving treatment</td>
<td>Lifesaving</td>
<td>23 (17, 31)</td>
</tr>
<tr>
<td>Overall fully correct treatment</td>
<td>Fully correct</td>
<td>23 (17, 31)</td>
</tr>
<tr>
<td>Diarrhea with danger sign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment with ORS</td>
<td>Lifesaving</td>
<td>78 (71, 84)</td>
</tr>
<tr>
<td>Correct ORS dose</td>
<td>Fully correct</td>
<td>46 (39, 54)</td>
</tr>
<tr>
<td>Referral to the facility</td>
<td>Lifesaving</td>
<td>63 (55, 70)</td>
</tr>
<tr>
<td>Overall correct lifesaving treatment</td>
<td>Lifesaving</td>
<td>50 (42, 58)</td>
</tr>
<tr>
<td>Overall fully correct treatment</td>
<td>Fully correct</td>
<td>21 (15, 29)</td>
</tr>
<tr>
<td>Uncomplicated malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment with ACT</td>
<td>Lifesaving</td>
<td>74 (67, 81)</td>
</tr>
<tr>
<td>Correct ACT dose</td>
<td>Lifesaving</td>
<td>65 (57, 72)</td>
</tr>
<tr>
<td>Treatment with paracetamol</td>
<td>Fully correct</td>
<td>73 (65, 79)</td>
</tr>
<tr>
<td>Correct paracetamol dose</td>
<td>Fully correct</td>
<td>39 (32, 47)</td>
</tr>
<tr>
<td>Overall correct lifesaving treatment</td>
<td>Lifesaving</td>
<td>65 (57, 72)</td>
</tr>
<tr>
<td>Overall fully correct treatment</td>
<td>Fully correct</td>
<td>28 (21, 35)</td>
</tr>
</tbody>
</table>

Abbreviations: ACT, artemisinin-combined treatment; CHW, community health worker; ORS, oral rehydration solution.
The vignettes effectively identified gaps in CHW knowledge of correct care provision for common childhood illnesses.

CHWs used job aids in 43% of vignettes; for those that used job aids, correct diagnosis and correct lifesaving treatment was significantly higher compared to those who didn’t use them.

CHWs used job aids in 43% of vignettes; for those that used job aids, correct diagnosis and correct lifesaving treatment was 43% (95% CI=38%, 47%). Correct diagnosis was 15–33 percentage points higher and correct lifesaving treatment was 12–30 percentage points higher for CHWs who used job aids versus those who did not use job aids. These differences were statistically significant for correct diagnosis and correct lifesaving treatment for all vignettes (P values ranged from <.001 for correct diagnosis in the diarrhea vignette to .0362 for correct lifesaving treatment in the pneumonia vignette).

**Giving Advice to Caregivers**
CHWs advised the caregiver on how to give treatment at home in 45% of vignettes (95% CI=40%, 50%) and discussed follow-up with the caregiver in 46% (95% CI=41%, 51%) of vignettes (Supplement 2 includes full details).

## DISCUSSION

We found that administration of vignettes in the field was feasible and effective for producing information on CHW knowledge of case management for the 3 main areas of iCCM diagnosis and treatment in their scope, in counties supported by LMH. The vignettes effectively identified a number of gaps in CHW knowledge of correct care provision for common childhood illnesses under the national CHA program in rural Liberia. Although correct diagnosis and lifesaving treatment for uncomplicated malaria was high, recognition of correct danger signs and the ability to verbally describe correct dosage (in the absence of identifying regimens by visual cues such as medication packaging or color) were areas where additional support is needed. One possible reason for these low results is insufficient use of provided national program job aids and digital clinical support tools designed to remind CHWs of correct dosages and management. CHWs used provided digital or paper-based job aids in only 43% of vignettes, and correct diagnosis and treatment proportions were higher among CHWs who used their nationally distributed job aids than among those who did not. This highlights an opportunity to improve care through existing resources by understanding and addressing barriers to job aid use.

Assessing CHW knowledge using clinical vignettes was feasible in this setting, as administered by QAOs in counties supported by LMH. Given these results, these vignettes have been incorporated into regular program monitoring for geographies where LMH is supporting implementation within these counties, representing an important step forward for measurement of CHW quality of care in remote settings where caseloads are small and resources are limited. While the assessments using clinical vignettes did prolong routine supervision, it was possible to integrate these assessments into routine QAO activities without significantly decreasing the frequency of regular supervision carried out and provided an opportunity for real time feedback and program improvement. For example, some of the errors in dosing were found to be related to recent transitions from syrup to pill form of paracetamol and amoxicillin resulting in confusion about how to describe the correct dose. Although this was a problem for only some CHWs, especially those who had been previously trained in dosing syrup forms of these medications, additional training was conducted for all CHWs to support correct dosing, and revised job aids were distributed. Correct MUAC measurement techniques were also challenging for many CHWs, and additional training was conducted to improve these skills. There were also technical challenges identified. The videos used to allow CHWs to evaluate respiratory rate and to determine the diagnosis of pneumonia were found to be poor quality, which may have contributed to the low rates of correct diagnosis in the pneumonia case. New higher-quality videos are in development for future use.

Our findings on CHW knowledge of iCCM case management are similar to findings by Cardemil et al., who evaluated quality of care through case scenarios in Malawi, similar to our clinical vignettes in structure and content. Correct treatment for severe illness as measured by case scenarios ranged from 37% for scenarios involving children presenting with fast breathing (versus 23% in our results) to 70% for scenarios involving children presenting with diarrhea (versus 50% in our results) and was 95% for uncomplicated fever (versus 65% for our results). Factors that may contribute to higher quality of sick child care by CHWs in Malawi include that CHWs in Malawi have more training on average and are required to have higher educational attainment (tenth grade or higher versus sixth grade) compared to Liberian CHWs.

Our findings are also similar to a number of studies that evaluated CHW quality of care for iCCM illnesses in children under 5 using direct observation. For example, incorrect diagnosis of a danger sign was seen in a study by Kelly et al. in 1 district in Kenya from 1998 to 2001 using direct observation and reexamination, which found that the proportions of children receiving correct adequate treatment ranged from 35.5% to 57.8% for children with a severe classification, compared
to 23%–50% in our assessment. In a study in Tanzania also using direct observation and reexamination, CHWs were found to correctly refer children to a facility for danger signs only 66% of the time compared to 63% in our cohort. A similar study in Uganda found that an antibiotic was correctly prescribed for pneumonia only 40% of the time, somewhat lower than our rate of 62%. However, the same study also found higher CHW performance (87%–97% correct) in assessing respiratory rate, RDT use, correct illness classification, and correct antimalarial prescription when CHW performance was compared to a gold standard pediatrician’s assessment, classification, and prescription. This is higher than our correct diagnosis of malaria and pneumonia (82% and 65%, respectively) and our correct antimalarial prescription of 65%. Although there were similarities between these studies and our findings, recruitment and training of CHWs varied between studies and study country settings, which are important factors that may have had an influence on quality of care (Supplement 3 includes full details of reviewed studies).

CHW knowledge of diagnosis and treatment of severe pneumonia with the presence of a danger sign was lower than for other vignettes, reflecting significant challenges with managing childhood pneumonia. In addition to the evidence presented here that supports management of severe illness by CHWs as a common challenge, there is also evidence of meaningful gaps in quality of facility-based childhood pneumonia management in LMICs. An assessment comparing facility-based care and CHW-delivered care for iCCM diseases in rural Uganda found that only 54% of children treated for pneumonia by any provider were appropriately assessed or treated, and only 62% of episodes of any iCCM illness were appropriately treated by public health facilities. In an assessment of facility-based quality of care in rural Zambia, only 21% of children with pneumonia received an appropriate diagnosis, and less than half of those diagnosed received appropriate antibiotic treatment. These findings highlight the importance of measuring and improving quality of iCCM care by both facility and community-based providers, with a particular emphasis on severe pneumonia.

**Limitations**

Our study has several limitations. Clinical vignettes in our setting may not accurately reflect quality of care CHWs are delivering. Vignettes may overestimate true rates of correct diagnosis and treatment. For example, the study by Cardemil et al. compared quality of care results obtained through case scenarios to those obtained through direct observation and reexamination and showed that estimates of correct treatment for uncomplicated fever and diarrhea as measured through case scenarios were 9 percentage points higher than estimates obtained through direct observation and reexamination. This gap was even larger for cases involving fast breathing and severe illness, which may indicate that vignettes are an appropriate tool for estimating CHW performance for uncomplicated illness but less appropriate for cases involving fast breathing and severe illness. Vignettes may also underestimate quality of care provided, as routine steps such as performing a MUAC screen and looking for other danger signs may be more likely forgotten in a vignette setting. Additionally, CHWs may know medications by sight (such as color-coded dosing for ACT or blister packs facilitating correct dosing) but may not be able to describe specific doses. We took steps to minimize error by designing open-ended vignettes, training QAOs on vignette administration including role-playing a caretaker, and ensuring that all relevant skills were assessed using simulation or other methods when feasible (malaria diagnosis through either RDT administration up to blood draw or detailed description of the skill and ability to correctly perform malnutrition screening through demonstration of MUAC measurement skills on the QAO).

Because the assessment is carried out as part of routine programmatic activities, CHWs are chosen for the assessment based on QAO work plans and are not randomly selected. This may mean our results on quality of care are not generalizable to other CHWs in LMH-supported counties or in Liberia more broadly. Because this was a programmatic quality improvement exercise, we did not collect information on CHW demographics, so it was not possible for us to comment on how factors like age, educational level, and length of training might lead to variations in CHW performance.

Furthermore, the assessment was completed by LMH employees (QAOs) as opposed to supervisors hired by the Ministry of Health because resource constraints did not allow for hiring and training of equivalent Ministry of Health supervisors as part of this assessment. Therefore, feasibility of implementation at national scale throughout Liberia was not assessed, although the results can inform a future assessment of this. This potentially limits the generalizability of the feasibility results,
Given that this cadre of supervisors is not currently available to other counties in Liberia and a similar cadre in other CHW programs in other LMICs may not be able to spend the required 2 hours for administration and follow-up. Finally, CHWs were not familiar with the use of clinical vignettes, and some errors may reflect lack of experience with the assessment method, although this was not noted as a challenge in the work by Cardemil et al.

Given the limited number of studies evaluating the quality of CHW-delivered care in a community setting, more research is needed globally on the feasibility and accuracy of methods used to measure this quality of care. Research on quality improvement mechanisms for CHW programs is also urgently needed to respond to these results. The resulting deeper understanding of the quality of CHW-delivered care, underlying challenges, and mechanisms for improvement can help implementers develop and sustain programs that provide more patient-centered care and lead to better health outcomes. Although there are limitations to using clinical vignettes to evaluate quality of CHW-delivered care, our results combined with the global evidence suggest that clinical vignettes can be used to assess CHW knowledge in many different country and disease contexts. They can be adapted to test knowledge of either major causes of morbidity and mortality, or for rare presentations that may be difficult to assess through direct observation. Vignettes should be designed to evaluate case management according to national guidelines, including the scope of the CHW’s role and the specific protocols CHWs use, and updated when treatment protocols change.

CONCLUSION

To improve programmatic quality, our next steps include continuous refinement of this method based on the limitations and lessons learned laid out above, including creation of higher-quality videos and ongoing training for QAOs in vignette administration and coaching. In addition, we are planning to validate this method as an accurate measure of quality of care delivery through a study comparing direct observation and vignettes. With Liberia’s Ministry of Health, we are also exploring ways this assessment can be incorporated into broader programmatic supervision, as well as testing a smartphone-enabled, multimedia learning management system with iCCM-focused (e.g., malaria, malnutrition) training modules to enhance CHW competencies.\(^{23,24}\) The results will help inform Liberia’s national program on optimal ways to measure and improve CHW competency moving forward and contribute to the global knowledge base for best practices in assessing quality of CHW care in remote or rural settings.

In conclusion, we believe that vignettes are a valuable tool for assessing CHW knowledge of iCCM case management and may serve as a proxy for competency when direct observation of care provision is not feasible to identify in real time gaps in knowledge, potential gaps in practice, and targets for in-the-field coaching. As CHW programs expand to provide primary care delivered by frontline workers in remote settings, contributing to achieving universal health care, feasible and integrated performance measurement to inform supportive supervision is critical to ensuring high quality care.

Acknowledgments: We would like to express our gratitude to the quality assurance officers who administered (and continue to administer) these vignettes and collected the data used in this analysis. Additionally, we would like to thank the data entry officers and others involved in entering data collected through paper forms, as well as the CHWs and supervisors who participated (and continue to participate) in this assessment.

Competing interests: None declared.

REFERENCES


Implementation of a Community Transport Strategy to Reduce Delays in Seeking Obstetric Care in Rural Mozambique

Felizarda Amosse, Helena Boene, Mai-Lei Woo Kinshella, Sharta Drebit, Sumedha Sharma, Prestige Tatenda Makanga, Anifa Való, Laura A. Magee, Peter von Dadelszen, Marianne Vidler, Esperança Sevene, Khátia Munguambe, the Community Level Interventions for Pre-eclampsia (CLIP) Working Group*

Key Findings

- It was feasible to implement a community-based transport program in rural areas with no external input of vehicles, fuel, personnel, or maintenance. However, lack of available transporters, barriers to fulfill requirements to opening and managing bank accounts, inequities in affordability of the scheme, and tensions regarding views on how to manage funds were implementation challenges identified that require further support.

- Positive impacts of program implementation included streamlining the process of identifying transport options and collaborators in the community, pre-negotiating travel prices to increase affordability, raising community attention to the role of transport in reducing delays in health care seeking, and raising awareness on the importance of early recognition of warning signs and prompt care seeking.

Key Implications

- Our community-based transport program uniquely emphasized community ownership and leadership at all stages. Decisions were built by consensus within each community, which allowed for flexibility to local conditions and supported local skill and capacity building for financial management.

- Transport schemes cannot be implemented in isolation from the wider health system strengthening efforts. This scheme used existing referral pathways rather than creating entirely new processes to help sustainability.

Key Findings

- It was feasible to implement a community-based transport program in rural areas with no external input of vehicles, fuel, personnel, or maintenance. However, lack of available transporters, barriers to fulfill requirements to opening and managing bank accounts, inequities in affordability of the scheme, and tensions regarding views on how to manage funds were implementation challenges identified that require further support.

- Positive impacts of program implementation included streamlining the process of identifying transport options and collaborators in the community, pre-negotiating travel prices to increase affordability, raising community attention to the role of transport in reducing delays in health care seeking, and raising awareness on the importance of early recognition of warning signs and prompt care seeking.

Key Implications

- Our community-based transport program uniquely emphasized community ownership and leadership at all stages. Decisions were built by consensus within each community, which allowed for flexibility to local conditions and supported local skill and capacity building for financial management.

- Transport schemes cannot be implemented in isolation from the wider health system strengthening efforts. This scheme used existing referral pathways rather than creating entirely new processes to help sustainability.

ABSTRACT

Introduction: Delays due to long distances to health facilities, poor road infrastructure, and lack of affordable transport options contribute to the burden of maternal deaths in Mozambique. This study aimed to assess the implementation and uptake of an innovative community-based transport program to improve access to emergency obstetric care in southern Mozambique.

Methods: From April 2016 to February 2017, a community transport strategy was implemented as part of the Community Level Interventions for Pre-eclampsia Trial. The study aimed to reduce maternal and perinatal mortality and morbidity by 20% in intervention clusters in Maputo and Gaza Provinces, Mozambique, by involving community health workers in the identification and referral of pregnant and puerperal women at risk. Based on a community-based participatory needs assessment, the transport program was implemented with the trial. Demographics, conditions requiring transportation, means of transport used, route, and outcomes were collected during implementation. Data were entered into a REDCap database.

Results: Fifty-seven neighborhoods contributed to the needs assessment; of those, 13 (23%) implemented the transport program. Neighborhoods were selected based on their expression of interest and ability to contribute financially to the program (US$0.33 per family per month). In each selected neighborhood, a community management committee was created, training in small-scale financial management was conducted, and monitoring tools were provided. Twenty people from 9 neighborhoods benefited from the transport program, 70% were pregnant and postpartum women.

Conclusion: These results demonstrate that it was feasible to implement a community-based transport program with no external input of vehicles, fuel, personnel, and maintenance. However, high cost and a lack of acceptable transport options in some communities continue to impede access to obstetric health care services and the ability for timely follow-up. When strengthening capacities of community health workers to promptly assist and refer emergency cases, it is crucial to encourage local transport programs and transportation infrastructure among minimally resourced communities to support access and engagement with health systems.

* Community Level Interventions for Pre-eclampsia Trial Working Group authors are listed in Supplement 1.

Correspondence to Khátia Munguambe (khatia.munguambe@manhica.net).
BACKGROUND

Annually, approximately 18 million women in Africa give birth at home without medical assistance. If complications arise, transport to a health facility is often unavailable or of poor quality. In Mozambique, the maternal mortality rate is 289 deaths per 100,000 live births in 2017 and is associated with hemorrhage, hypertensive disorders, and sepsis. The 3 delays in seeking, accessing, and receiving appropriate and quality maternal health care contribute to many of these deaths. Maternal deaths in Mozambique are concentrated in rural communities where poverty rates are high. Rural communities have limited access to health services because of distance, lack of transport, and poor roads, contributing to delays for pregnant and postpartum women accessing care. These factors contribute to delays for pregnant and postpartum women accessing care, which is particularly dangerous in emergencies where every delay increases the risk of stillbirth, neonatal, or maternal death. A study from Maputo and Gaza Provinces in Southern Mozambique found that owning a private vehicle was rare, and rural women walked on average half an hour—up to 2 hours for the most isolated communities—to reach the nearest main road where public transport could be found. Increased isolation was significantly associated with higher rates of adverse maternal and perinatal outcomes.

Community health worker (CHW) programs support delivering maternal and child health care in resource-limited settings and provide a valuable link between communities and facility-based health services. The 2018 World Health Organization (WHO) guidelines on health policy and system support to optimize CHW programs highlighted the need to better embed CHWs into health systems and for CHWs to provide timely and appropriate referral from the community to the health facility. As such, access to emergency transport for pregnant and postpartum women is essential in preventing maternal deaths. A study in Ghana emphasized concerns about unreliable transport to seek health care, especially in emergencies, and highlighted the need for policies to solve rural transport problems to improve maternal health. With increasing attention to the mobilization of local resources to improve access to services, a community-based action research study in Haiti suggested that in addition to the 3 delays, there was a fourth delay related to mobilization of human and financial resources, such as community transport programs, to reduce maternal deaths. In a systematic review of studies conducted in Bangladesh, Ghana, India, Malawi, Nepal, Nigeria, Sierra Leone, and Tanzania, community loans for emergency transport increased the utilization of health facilities for delivery and emergency obstetric care.

Given that delays reaching health facilities in case of emergency care in low- and middle-income countries can be reduced through the implementation of transport programs, there is a need to research questions on whether and how best these programs can operate under real-life situations taking into account the existing community health and primary health care (PHC) programs and respective referral systems. Such programs can include direct provision of transport for pregnant women in need of emergency obstetric care in an appropriate health care facility. This study aimed to describe the implementation process of a community transport program to reduce delays in accessing emergency obstetric care in southern Mozambique.

METHODS

The community transport program was embedded within the larger Community-Level Interventions for Pre-eclampsia (CLIP) in Mozambique Trial (National Clinical Trials #01911494), which aimed to reduce maternal and perinatal mortality and morbidity by strengthening CHWs’ capacity to identify high-risk pregnancies and refer them to the health facility when needed. The CHWs in the CLIP Trial, known as agentes polivalentes elementares in Mozambique, belonged to the existing CHW program and received extra training as part of the trial. In turn, the trial was aligned with the existing referral system between the community and health facilities, whereby CHWs transfer patients that require higher levels of assistance by using referral slips that record the date, person’s name, age, residence, referral facility, reported signs and symptoms, and first aid or care provided, and CHW name.

Formative research preceding the CLIP Trial, which used an ethnographic approach to investigate the problem of access to care, revealed that the lack of transport was a major contributor to poor referrals and hence low access to health care. In the same study, accounts from women of reproductive age, pregnant women, household decision makers, and health care providers in these communities revealed that even where transport was available in the form of minibuses or agricultural tractors, it was restricted to main roads or prohibitively expensive to arrange privately.
on a case-by-case basis for most women. Consequently, many residents had to walk long distances to access transport—a challenge during obstetric emergencies—or simply did not travel to the health facilities. Although ambulances were available to support referrals between facilities, there was no formal structured system providing transport from the community to health centers, mainly because of the physical distance between the communities and the health facilities. The transport program was designed to help facilitate the timely referral of pregnant women with obstetric emergencies to the nearest primary health facilities.

Study Area
The study area included Malehice, Chaimit, Chissano, Messano, Três de Fevereiro, Ilha Josina, and Calanga administrative posts from Maputo and Gaza Provinces in southern Mozambique (Figure 1), which were also part of the CLIP Trial. The study area is largely rural with agriculture, fishing, cattle breeding, and informal trade as the main resident income sources. During the rainy season from approximately November to March, some areas are severely affected by road blocks due to floods, particularly Ilha Josina and Calanga.

Program Context and Procedures
A community-based participatory needs assessment was conducted to inform the community transport plan and to support the creation of a community fund to cover transport costs. While community financing programs to support transport for emergency referral have been used in other areas in sub-Saharan Africa, this concept was novel to this region. There were existing microfinance programs for non-health purposes in the communities, so members were familiar with the practice.

As part of the rapport-building stage, contacts were first made with the community chief in each administrative post to obtain permission for the proposed activities. Subsequently, neighborhood chiefs (known as secretários dos bairros) were contacted to support scheduling of the activities with community members. The first activity consisted of 3 rounds of meetings: initial meetings to
assess needs and raise awareness about the community transport program, mobilization meetings with interested communities to prepare for implementation, and follow-up meetings with communities who implemented the program. Community meetings, as part of community engagement activities for the CLIP Trial, included pregnant women, women of reproductive age, partners and husbands, mothers and mothers-in-law, and the community in general and were conducted at the circulos (the usual community gathering location). These meetings included discussions regarding launching the program; encouraging community contributions to the fund; sharing the list of transporters and management committee members; and presenting updates on uses, finances, and savings within the transport program. These community meetings occurred throughout the project and most meetings were conducted in Changana, the predominant local language. During the phase-out stage of the CLIP trial, a final round of community meetings was held to reflect upon the program achievements, and involved CHWs, selected community members, PHC facility staff, owners of the transport program vehicles and community leaders.

Data Collection
Assessment of the transport program implementation utilized a mixed-methods approach. Both quantitative and qualitative data were collected using structured forms (referred to as logs). Quantitative data included demographic characteristics of meeting attendees and information associated with the management of funds and qualitative data included information on all medical complaints that required transport, transport methods used, transport users’ and stakeholders’ testimonials. Meeting details, including location, number of participants, and their backgrounds and messages discussed were also captured, including facilitator reflections and community feedback.

Data collection was conducted by a team comprising a social scientist, a community liaison officer, 3 mobilizers, and 4 health activists employed by the CLIP Trial, separate from CHWs in the neighborhoods. All data collectors were fluent in both Portuguese and Changana.

Data Management and Analysis
All data were sent to the Manhiça Health Research Center for data entry to a REDCap database (Nashville, TN, USA). Before data entry, all logs were checked for quality by study team members who conducted data collection. Missing data, outliers, and discrepancies were queried to maximize data integrity. Data analyses were performed using RStudio software version 3.4.1 (RStudio Inc, Boston, MA, USA) to generate frequency distributions of categorical variables. The analysis separated general community meetings and meetings where transport issues were discussed, the latter of which is the focus of this article. Demographic characteristics of the participants and the study variables of interest are presented using descriptive statistics. Qualitative data was also entered on a REDCap database and underwent content analysis using NVivo 12 (QSR International, Melbourne, Australia). Content analysis is a widely used method of qualitative analysis that includes organizing information based on emergent themes from the text and sorting themes into categories to further understand how issues are related.

Ethical Considerations
Approval for the CLIP Trial was obtained from the Institutional Bioethics Review Boards of Centro de Investigação em Saúde da Manhiça (CISM, CIBSCISM/038/14), the Mozambique National Bioethics for Health Committee (219/CNBS/14) and the University of British Columbia (UBC, H12-03497). Written informed consent was obtained from households participating in the CLIP Trial.

RESULTS
Needs Assessment
During the needs assessment stage, 97 community dialogue sessions were held in 57 neighborhoods involving 2,456 participants between October 2015 and March 2016. These sessions involved discussion on the acceptability and feasibility of the community transport program, considering specific local conditions. Over half (35/57) of the communities engaged in the dialogues showed interest in the program and were invited to the subsequent step of establishing a community-based transport program.

Community Mobilization and Preparation for Implementation
Create management committees: Initially, community health committees and primary health facilities were responsible for fund management. However, after consultation with the provincial health directorate and community members, it was requested that the fund be managed by people...
chosen by the community. Consequently, each neighborhood chose 3 to 4 individuals to be in a management committee to manage funds and implement the transport program. Communities were supported by CLIP trial staff in the creation of the committee. Committees were responsible for opening a bank account, collecting money from contributing households, depositing and withdrawing funds, and monitoring use of the fund. All committee members had to be literate, have adequate identification documentation, and be trusted by the community. Literacy and identification documentation were essential requirements for opening a bank account.

Open bank accounts: When opening bank accounts, the study team provided support, including transport, to the management committees. Establishing bank accounts for a specific community activity required complex and lengthy procedures, which entailed multiple trips to the banks located in the urban centers. Issues encountered included the cost of preparing documentation like personal identification, personal income taxes declaration, and other bank account requirements. If a member could not read or write, they had to obtain a power of attorney for someone else to sign on their behalf.

Prepare agreements with local transporters and management committees: Each participating neighborhood created a list of all local transporters including all community members who owned a means of transport (vehicles and tractors). Some communities required particular modes of transport, such as Calanga where a tractor was necessary to travel over sand. A meeting was held with each potential transporter to prepare a transportation agreement and to negotiate remuneration for the services provided. Transporters were sensitized about the need and benefits of the program and encouraged to provide discounted travel costs as a contribution and support to their communities. As a result of the sensitization, it was agreed that remuneration would cover only the cost of fuel. Costs were reduced on average US$5.12 per journey (Supplement 2 Table S2).

The CLIP Trial provided start-up funds. As an institutional procedure, an agreement was established between the funder (Manhiça Health Research Center) and the management committees representing each participating community.

In the 35 neighborhoods, CLIP staff conducted community involvement meetings to explain the steps to prepare for the program as follows.
**Provide training:** Training was provided to committee management members, CHWs, nurses, and transporters on the management and procedures of the transport program including assessing eligibility for beneficiaries based on emergency conditions and filling out transport vouchers. Building on the existing referral slip system used by CHWs, transport vouchers served to confirm the use of transport and facilitate payment. The voucher recorded the date, CHW signatures, nurse’s name who assisted the patient, and transporter’s name. During training sessions, roles and responsibilities were clarified.

- Management committee: The local management committees comprised entrusted community members to manage the transport fund. In addition, the committee provided oversight to ensure the fund was being used appropriately for eligible health emergencies (Box).
- Local transport providers: Private transport providers in the communities were engaged to transport patients in 1-way trips to the nearest health facility when requested by the management committees.
- CHWs identified emergencies and eligible patients for transport (Box).
- Nurses working at local health facilities received transported patients and confirmed transport vouchers that patients carried.

**Distribute supply materials:** Start-up materials were distributed to management committees. These supplies included boxes to store small amounts of money for emergencies, vouchers for patients, and monitoring forms to log all transportation events.

**Program Implementation and Launch**

After the preparation process, a round of meetings were held to disseminate the key contacts, including the local transporters. These meetings also launched the program and the mutually agreed upon procedures (Figure 2).

Meeting participants were mostly women (81%), between age 26 and 50 years (Table). Fifty-four percent of the attendees were married or cohabiting with their partners, and 39% reported to be Christian. Meeting participants had a low level of education, 22% never studied, and 22% had completed only the primary level of education.

**Uptake of the Community Transport Program**

Of the 35 interested neighborhoods, 9 neighborhoods initially joined the community transport program. Testimonials from beneficiaries were shared at CLIP community engagement meetings. After witnessing the success of the program in those neighborhoods, 5 more neighborhoods requested to join the program. Of these, 4 were added to the program; 1 was unable to join because it did not meet the minimum required community contribution.

Ultimately, 13 neighborhoods implemented the community transport program based on their willingness to participate and ability to contribute financially. This financial contribution was a requirement to consider the program operational in each neighborhood. The contribution amounted to an average of US$0.33 (ranging from US$0.07 to US$0.72) per family per month. Additionally, to support the start-up costs, the CLIP Trial provided seed funds, which ranged from US$35.29 to US$286.79, based on the predicted number of obstetric emergencies within the neighborhood for the duration of the CLIP Trial (Supplement 2, Table S3). These funds were used only for transport; community management committees volunteered their time, and CLIP supported administration of the program.

Each of the 13 neighborhoods received a safety box to keep small amounts of money at hand for emergencies. Additionally, 8 participating neighborhoods successfully opened bank accounts to safely keep larger amounts. There were no neighborhoods that dropped from the program during the study period.

During the implementation of the transport program (from April 2016 to February 2017), the transport funds were utilized on 20 occasions in 10 neighborhoods. A majority of the cases were for obstetric emergencies and 70% of the beneficiaries were pregnant or postpartum women (Figure 3).

---

**BOX. Eligibility for Transport Program Use**

- A resident of the neighborhood
- A member of a household that contributed to the community transport fund
- An obstetric emergency, confirmed by community health worker (CHW)
- Serious medical condition, confirmed by CHW (pregnant and postpartum woman, children, and the elderly were prioritized)
Although the program was initially designed to support transport for obstetric emergencies, community feedback during implementation led to broadening the scope to include other contributing family members. However, the focus remained on pregnant and postpartum women. No transport events were prevented due to weather conditions.

Transport was provided to 11 pregnant and 3 postpartum women for cases of labor pains, hypertension, convulsions, hemorrhage, a suicide attempt, and fever (Figure 4). There were no maternal deaths registered among those who benefited from the community transport program. Additionally, there was 1 child, 3 nonpregnant women, and 2 men who

| TABLE. Community Mobilization Meeting Participant Characteristics, Southern Mozambique |
|----------------------------------------|----------------------------------------|
|                                       | Participants in Interested Neighborhoods (N=1002) | Participants in Implementing Neighborhoods (N=434) |
| Gender, no. (%)                        |                                       |
| Female                                 | 811 (80.9)                              | 352 (81.1) |
| Male                                   | 191 (19.1)                              | 82 (18.9)  |
| Age                                    |                                       |
| Age, median (interquartile range)      | 35.0 (25.0, 49.0)                       | 35.00 (27.0, 48.0) |
| ≤ 20 years, no. (%)                    | 140 (14.0)                              | 56 (12.9)  |
| 21–25 years, no. (%)                   | 137 (13.7)                              | 45 (10.4)  |
| 26–35 years, no. (%)                   | 246 (24.6)                              | 125 (28.8) |
| 36–50 years, no. (%)                   | 248 (24.8)                              | 125 (28.8) |
| ≥ 51 years, no. (%)                    | 231 (23.1)                              | 83 (19.1)  |
| Education level, no. (%)               |                                       |
| No education                           | 222 (22.2)                              | 116 (26.7) |
| Primary level                          | 224 (22.4)                              | 104 (24.0) |
| Secondary level                        | 46 (4.6)                                | 9 (2.1)    |
| Higher education                       | 5 (0.5)                                 | 0 (0.0)    |
| Don’t know                             | 1 (0.1)                                 | 0 (0.0)    |
| Other                                  | 504 (50.3)                              | 205 (47.2) |
| Marital status, no. (%)                |                                       |
| Married/marital union                  | 545 (54.4)                              | 217 (50.0) |
| Divorced/separated                     | 19 (1.9)                                | 0 (0.0)    |
| Single                                 | 358 (35.7)                              | 171 (39.4) |
| Widowed                                | 71 (7.1)                                | 46 (10.6)  |
| Other                                  | 9 (0.9)                                 | 0 (0.0)    |
| Religion, no. (%)                      |                                       |
| Christian–Protestant/Evangelic         | 452 (45.1)                              | 246 (56.7) |
| Catholic                               | 239 (23.9)                              | 108 (24.9) |
| Atheist/Agnostic                       | 38 (3.8)                                | 16 (3.7)   |
| Hindu                                  | 1 (0.1)                                 | 0 (0.0)    |
| Islamic                                | 1 (0.1)                                 | 0 (0.0)    |
| Other                                  | 271 (27.0)                              | 64 (14.7)  |
received transport for health conditions including severe diarrhea, vomiting, and fever.

In all cases, the transporter provided the voucher signed by the nurse to the management committee after the transfer and received the appropriate remuneration.

**Qualitative Data**

**Positive Experiences and Benefits**

One pregnant woman began to have contractions in the middle of the night. Early the following morning, her mother-in-law contacted the management committee to request transport. The mother-in-law shared that the transporter arrived quickly and took the woman to the health facility where she was assisted immediately. The woman had a normal delivery, and both mother and baby were well. She was discharged the following day and returned home via minibus paid for by her husband:

> I felt very good about being transported to the hospital by the transport program when I needed, and I would like to encourage the community to continue contributing the money for the funds because it helps people a lot. I hope this project continues to help more people. I’m very grateful to the management committee who called the transporter and if it were not for this I would have given birth at home. I will continue to contribute to the fund because I saw the importance of it. —Pregnant woman who used community transport system, Chissano, Gaza Province

Another woman suffered from postpartum hypertension. A few days after delivery, she was

---

**FIGURE 3.** Number of Individuals Transported in the Community Transport Program by Target Group, Southern Mozambique (N=20)

**FIGURE 4.** Number of Individuals Who Requested Community Transport by Condition That Triggered Request, Southern Mozambique (N=20)
Challenges to Implementation and Delivery of the Transport Strategy

Community members shared some of the challenges encountered during mobilization and follow-up meetings. Although most neighborhoods were able to develop a list of local transporters, some experienced difficulty collecting this information and had a lack of local transporters.

The leaders were very happy but said there is only 1 tractor in the community... and the owner uses it on his farm, and it is not possible to take the community to the hospital. —From a meeting with neighborhood chiefs and small business owners in Calanga, Maputo Province

Additional challenges included the highly bureaucratic process of opening bank accounts, which was limited to those who were literate, had the required identification and documents, and had personal income tax documentation. Because of this process, many community members could not participate in the management committee. From the perspective of CHW supervisors and directors of health facilities, it was important to distance CHWs and nurses from fund management so that there was no interference with the provision of clinical care. Further, there was tension over who benefited from the funds and how it was managed in the community. Men, in particular, highlighted how a community transport fund to support obstetric emergencies would not benefit them.

The participants complained a lot about the issue of contributing to the fund, considering that the money would only benefit the pregnant women... Some ladies who were present said that they would not contribute because they do not or will not have children, so they would be contributing in vain. —From a meeting with neighborhood chiefs and small business owners in Malehice, Gaza Province

Tensions emerged between those who did and those who did not contribute within the same neighborhood.

The participants were not pleased by the fact that most people are not contributing to the fund. —From a meeting with community members in Messano, Gaza Province

Furthermore, inconsistent contributions challenged the sustainability of the transport program. Community management committees reported that there were difficulties in collecting contributions. This was sometimes related to the high burden of poverty among the neighborhoods. During implementation, the communities reported suffering from consequences of the droughts and shared that they already had trouble feeding their families and did not have extra funds to contribute.

Challenges to implementation included lack of available transporters, barriers to opening bank accounts that limited participation, and tension on how to manage funds.

Women who benefited from the community transport program often shared positive stories about their experience. Women and families were excited to share their experiences and encourage others to participate in the program. Women and families appreciated the initiative and encouraged others to join the program.

One of the elders said that this mobilization will be very important for many women... One of the elders spoke of money for transportation in the event of an emergency... They suggested everyone should contribute. —From a meeting with elders and women of reproductive age in Malehice, Gaza Province

There is transport that helps people in emergencies, but the price (of transport) is very high, and people who cannot afford the transport use the hand cart to take their relative to the health facility. There are times when a person dies for lack of money to pay for transport. —From a mobilization meeting with neighborhood chiefs, small business owners, partners, and husbands in Malehice, Gaza Province

Challenges to Implementation and Delivery of the Transport Strategy

Community members shared some of the challenges encountered during mobilization and follow-up visits by a CHW who found that she was very weak and not feeling well. The CHW recognized that she was hypertensive and recommended administration of an antihypertensive (methyldopa), seizure prophylaxis (magnesium sulfate), and referral to the nearest health facility as part of the CLIP Trial procedures. The CHW called the local transporter, who arrived quickly and took the woman to the nearest health facility. Upon arrival, the nurse assessed the woman and confirmed the hypertension diagnosis. The woman was later discharged. Because the transporter had already left, the woman paid for a minibus to return home. Notes taken by the facilitator during a general community meeting described how this woman’s mother-in-law shared the story with others to encourage participation in the program.

One mother-in-law said that the transport fund is working because her daughter-in-law was sick after delivery, and the driver had to be called to take her to the nearest health facility. After being taken care of, she improved and is well. All thanks to the transport fund of the community. She stresses that they must continue to contribute for the benefit of the community. —From a general community meeting, Messano, Gaza Province

Women who benefited from the community transport program often shared positive stories about their experience. Women and families were excited to share their experiences and encourage others to participate in the program. Women and families appreciated the initiative and encouraged others to join the program.

One of the elders said that this mobilization will be very important for many women... One of the elders spoke of money for transportation in the event of an emergency... They suggested everyone should contribute. —From a meeting with elders and women of reproductive age in Malehice, Gaza Province

There is transport that helps people in emergencies, but the price (of transport) is very high, and people who cannot afford the transport use the hand cart to take their relative to the health facility. There are times when a person dies for lack of money to pay for transport. —From a mobilization meeting with neighborhood chiefs, small business owners, partners, and husbands in Malehice, Gaza Province

The participants were not pleased by the fact that most people are not contributing to the fund. —From a meeting with community members in Messano, Gaza Province

Tensions emerged between those who did and those who did not contribute within the same neighborhood.

The participants were not pleased by the fact that most people are not contributing to the fund. —From a meeting with community members in Messano, Gaza Province

Furthermore, inconsistent contributions challenged the sustainability of the transport program. Community management committees reported that there were difficulties in collecting contributions. This was sometimes related to the high burden of poverty among the neighborhoods. During implementation, the communities reported suffering from consequences of the droughts and shared that they already had trouble feeding their families and did not have extra funds to contribute.
As for the emergency transport fund, they said they would like but what hinders is the hunger that has been going on because it has not been easy even to eat.—From a meeting with husbands and partners in Chaimite, Gaza Province

The ultimate challenge was ensuring a smooth phase-out while motivating communities to continue with the program beyond the timespan of the CLIP trial. During the phase-out visits to each community, community leaders, particularly the heads of administrative posts in Gaza province, showed willingness to supervise the program implementation themselves. One of them, who possessed a vehicle herself, realized only during the phase-out stage that she could have played the role of a transporter, to which the CLIP team’s response was to encourage the practice.

## DISCUSSION

This assessment illustrates participative community-based efforts to address the lack of transport from the community to health facilities in rural Mozambique in the view of assuring a continuum of care, which is a gap already identified by formative research and existing literature. A detailed preparation process with participating communities, local ownership, and leadership was emphasized, along with local resource mobilization to develop community solutions to a local problem. The community transport program supported 14 pregnant and postpartum women from 13 rural and remote neighborhoods to access emergency health services along with 6 other members of the same communities over 10 months of its implementation. These individuals would not otherwise have had access to prompt, adequate health services. The program also encouraged saving funds for health emergencies; strengthened the existing relationship between CHWs and PHC nurses and their respective communities and health facilities; strengthened the capacity for community mobilization; and helped raise awareness about maternal, newborn, and child care with a focus on prevention and prompt health care seeking behaviors and the need for birth preparedness. Health promotion, particularly regarding maternal, newborn, and child health, is already part of the mandate of CHWs and PHC nurses. Although there was significant community interest and beneficiaries spoke highly of the program, administrative and socioeconomic limitations prohibited rapid expansion.

Other community transport programs have been tried elsewhere. In Nigeria, Shehu et al. reported on mobilizing a local union of transport providers to provide timely and affordable transport for women with obstetric complications as well as other members of the community for emergency care. Costs were shared between the research team, who provided seed funding to purchase fuel, and community members, who provided maintenance funding. The Nigerian program transported 29 women with obstetric emergencies over 1 year, and community response was positive as it dramatically reduced waiting times to organize transport (the second delay). The authors concluded that the strategy could support physical and financial access to obstetric care. Ensr et al. used a quasi-experimental approach to investigate the effect of a complex community-based intervention that included community transport in Zambia. Working through existing government-established Safe Motherhood Action Groups, community volunteers were trained and provided with locally appropriate transport to health facilities. The percentage of women who used emergency transport significantly increased by 12.4%–18.7% (P<0.001) from under 10 women at baseline to 66–149 with the 10–15 month intervention, depending on different districts. Although both of these studies were community-based and involved community members, they were not owned by community members. Additionally, the vehicles from the Zambian study were not provided by the community but purchased for the transport program, which may have decreased the sense of local ownership and impaired sustainability.

Organized on the principle of associativism (collective cooperation), which highlights cooperative and collaborative partnership making within communities for collective action to improve conditions, this program uniquely emphasized community ownership and leadership at all stages. Core values of this initiative included ensuring community consensus and getting members of the community management committee to open bank accounts to keep funds, as well as ensuring solidarity, participation, unity, cooperation, and the focus on common objectives. The CLIP research team provided technical assistance to the program, but decisions were built by consensus within each community, which allowed for flexibility to local conditions and supported local skill and capacity building for financial management. With the abovementioned focus on community ownership, management committee members were trained to be able to continue the program after the project.

Lessons Learned

Lessons learned in designing and implementing the transport program in the CLIP trial in
Although national guidelines point to CHWs linking the community to the PHC facility through clear referral pathways, details are lacking on how to make this process cost-effective and timely, particularly for patients in remote areas. Mozambique included that in many of the cases, successful implementation depended on availability of transport, interest, and willingness of the community to manage the program, as well as affordability of the family contributions. Communities already close to primary health centers, such as Três de Fevereiro, were less inclined to participate. Additionally, communities that did not have close access to a bank had fears on holding large sums of money in neighborhood settings. However, with introduction of mobile money innovations like M-Pesa, these concerns may be lessened. There were fears that CHWs and nurses may inaccurately manage the funds; therefore, community-based management committees were essential. The involvement of community leaders and stakeholders to build trust in the program was critical. Lastly, it was found that very poor communities were least interested in the program, which emphasizes that any individual program needs to be embedded into other poverty reduction strategies. Consequently, advocacy involving the Ministry of Gender, Children and Social Affairs and the Ministry of Transport and Communications in addition to the Ministry of Health, as well as engagement with other partners like nongovernmental organizations is needed. Based on such a cross-sector approach, the government could play a valuable role in providing overarching directives to support coordination of the various poverty reduction and health strengthening programs.

The Community Health Worker Performance Measurement Framework highlights that the ability to facilitate referrals from the community to the health facility while maintaining continuity of care and counter-referrals from the health facility back to the CHWs is essential for effective community health. While previous research has reported on challenges to referral systems between levels of care in sub-Saharan Africa, transportation between health facilities did not seem to be a major issue in this study, provided that in Mozambique ambulances only serve to transport people between health facilities. Community members in this study especially highlighted the lack of transport between the community and primary health facilities, despite the fact that this referral pathway is expected within the framework of the national health services. The national guidelines point to clear referral pathways of patients to and between health facilities and places the CHWs as the interface between the community and the PHC facility in the referral process. However, there is a lack of detail on possible ways to make this process effective and timely, particularly in cases where the mobility of the patient is compromised by distance, physical incapacity to walk to the health facility, and other barriers. This policy gap can serve as an opportunity to fill it in with concrete suggestions based on evidence such as that brought up by the current study. In this way, addition of a community transport element to the existing referral system would not be a burden but a complement to the referral system. Likewise this would not be a drastic addition to the current PHC strengthening program (2017–2023), which already seeks to improve indicators such as institutional deliveries; health facilities providing basic and comprehensive emergency obstetric and newborn care; and trained and active CHWs, all of which could be enhanced by improved referral circuits.

Though some transport challenges persisted, the program implementation had positive impacts including streamlining the process of identifying transport options and collaborators in the community, pre-negotiating travel prices to increase affordability, and raising community attention to the role of transport in reducing delays in health care seeking. Sharing stories of successful facility births and well-being of mothers and babies as a result of the new transport program contributed to building momentum and increased attention to maternal health in the community.

The community transport program developed with the Mozambique CLIP Trial illustrates the importance of transport in ensuring maternal and child health by leveraging an existing referral system. Without access to transport from the community level to health facilities CHW performance and associated health outcomes may be compromised. During the dissemination of these findings, the Mozambican Ministry of Health officials revealed their interest in adopting a bicycle-ambulance program in other regions of the country. They valued and showed openness to adopt the community ownership and management aspect of the program to support sustainability. At the local level, administrative post chiefs’ enthusiasm further served as encouragement to support advocacy for programs of this nature to be replicated, yet adjusted to local realities also aligned with the much commended decentralization of some aspects of governance in Mozambique.

A strength of the study was the close working relationship between the CLIP Trial staff and the community and respective community leaders, cultivation of leadership and collaboration among the local management committees, collaboration of multiple local stakeholder groups, and the constant feedback which allowed for adjustments to
the program. Future areas for exploration include understanding the impacts of seasonality on referral patterns, the added value of transport programs for back-referrals, and the specific needs of extremely underserved communities.

**Limitations**

A limitation of the study was the relatively low participation of eligible neighborhoods (13 of 57), in part due to the complex and lengthy procedures to open a bank account and the short study period. This may mean that the participating communities were not representative of the region and limits the transferability of our findings through some of the broader challenges highlighted in this study regarding transport infrastructure that are common across the region. Although the CLIP trial activities in the community relied only on CHWs, communities are also served by matrons, traditional birth attendants, and traditional healers. To increase the number of beneficiaries, the transport program would need to reach these health care providers to cover the wider community.

Data were collected by staff who supported the facilitation of the program, thus there may be some bias to reporting positive results, as often is the criticism of action research study design. Because the transport program was embedded in the CLIP Trial, there was overlap in the staff for training and supervision, thus there is limited information on the specific costing of external management to start the program. Furthermore, the time between transport request and when it was made available was not systematically recorded, though all were able to reach care within the recommended 4 hours for urgent referrals recommended in the CLIP Trial.

Another limitation of the study was that the participation in the program depended on local capacity to raise money and fulfill the requirements for the administrative processes. With rates of poverty between 12% (Maputo Province) and 44% (Gaza Province), this could explain the observed low contributions even when community members were highly interested in the transport program. Families needed to prioritize the multitude of problems faced in their daily lives. The immediate challenge of securing adequate food for their households shared by some participants took priority over contributions to a community fund for preventative measures. This hindered both the ability for neighborhoods to join the program and the sustainability of the fund among participating neighborhoods. As a result, whole communities, although highly motivated, were denied joining this program due to lack of capacity to provide the minimum contribution.

Additionally, some communities had poor road access and lack of transport options, which are key pillars for the program to take effect. Previous mapping of access to maternal health services found that approximately 85% of the roads are unpaved, hard to traverse in the rainy season and unpassable during seasonal flooding. The extreme case was Calanga administrative post, which is very sandy with poor quality roads and heavily affected by the rains. As illustrated in the results, community leaders from Calanga expressed interest in the program but were also quick to report the lack of transport options available and poor road infrastructure that hindered the feasibility of the program.

While the community transport program was developed to help mitigate challenges in accessing care, emergency transport provided was often 1-way to health facilities, which could have also contributed to some of the nonadherence to the program. Faced with limited funds, community management committees decided to prioritize emergency transport to PHC facilities and not the other way, reasoning that once the person had been assisted at the facility, their health either would have stabilized, therefore the return home would not be as dramatic, or they would require further referral to higher-level facilities by ambulance instead. However, paying for transport back to the community emerged as a potential barrier that should be further investigated and addressed.

Further, communities that faced challenges implementing the transport program were often those with a low density of health facilities. This also raises the importance of assessing health services coverage and readiness to meet the potential higher demand for health services created by improvements in the referral systems from communities to health facilities. In this study, health facilities managed to provide prompt assistance in response to this demand, but this may not be always the case in similar settings.

**CONCLUSION**

The gap created by lack of transport within the existing referral system between the community and the PHC facility poses a barrier to access to emergency obstetric care in southern Mozambique. In strengthening capacities for community health and the role of CHWs, it is crucial to encourage local transport programs and transport infrastructure in poorly-resourced communities to support access and
engagement with health systems. The community transport program developed as part of the Mozambique CLIP Trial illustrated that it was feasible to implement such a program to address not only emergency obstetric care needs but also health problems. The program was implemented with no external input of vehicles, fuel, personnel, or maintenance and with minimum requirements within the communities. The transport program facilitated several emergency cases that would not have otherwise had prompt access to health care.

However, there were numerous challenges such as appropriate members of the community to manage the fund, unfavorable terrain, few available transport options, and poverty. Addressing these challenges is recommended to ensure the strategy is sustainable. This includes increasing community awareness and leadership to maximize demand and decrease the cost per family, establishing agreements with banking systems that make processes more flexible, and raising awareness and interest among potential implementing partners in health, public works, and nongovernmental organizations to support community efforts and infrastructure. Among such partners, there is a need to assign or create capacity to perform rapid needs assessments before implementation to account for communities’ specific needs with particular attention to existing infrastructure, socioeconomic inequities within communities, gender and cultural norms, existing knowledge and awareness about care seeking, as well as geographical and climatic challenges.

Acknowledgments: The authors would like to thank all the study participants and the Community Level Intervention for Pre-eclampsia Working Group. We gratefully acknowledge the community committees and local transporters for their engagement and leadership. We also acknowledge the support of Centro de Investigação em Saúde da Manhiça, University of British Columbia, Maputo Provincial Health Department, Gaza Provincial Health Department, Faculty of Medicine of the Eduardo Mondlane University, Ministry of Health, National Direction for Public Health, and Community Health Workers Programme.

Funding: This work is part of the University of British Columbia PRE-EMPT (Pre-eclampsia/Eclampsia, Monitoring, Prevention and Treatment) initiative supported by the Bill & Melinda Gates Foundation (Grant number: OPP1017337). Centro de Investigación em Saúde da Manhiça is funded by Agencia Española de Cooperación Internacional para el Desarrollo.

Competing interests: None declared.

■ REFERENCES
Principais achados
Saúde pode ajudar a melhorar os resultados de saúde materno-infantil. Implementar um esquema de transporte baseado na comunidade na zona rural de Moçambique para apoiar encaminhamentos para unidades de saúde pode ajudar a melhorar os resultados de saúde materno-infantil.

Mensagem chave: Incentivar programas de transporte local e infraestrutura de transporte em comunidades com poucos recursos pode ajudar a melhorar o acesso à comunidade e fortalecer o envolvimento com os sistemas de saúde. A mobilização de recursos e liderança da comunidade para implementar um esquema de transporte baseado na comunidade na zona rural de Moçambique para apoiar encaminhamentos para unidades de saúde pode ajudar a melhorar os resultados de saúde materno-infantil.

Princípios chaves

- Foi viável implementar um programa de transporte de base comunitária em zonas rurais sem qualquer recurso externo em termos de veículos, combustível, pessoal ou manutenção. Contudo, a falta de transportadores disponíveis, barreiras para cumprir os requisitos para a abertura e gestão de contas bancárias, as iniquidades na acessibilidade dos custos do programa e tensões relativas a opiniões sobre a forma de gerir os fundos foram os desafios identificados na implementação e que requerem apoio adicional.

- Os impactos positivos da implementação do programa incluíram a racionalização do processo de identificação de opções de transporte e de colaboradores na comunidade, a pré-negociação dos custos das viagens para aumentar a acessibilidade dos mesmos e uma comunidade prestando mais atenção ao papel do transporte na redução dos atrasos na procura de cuidados de saúde e sensibilizada para o reconhecimento precoce dos sinais de perigo e a rápida procura de cuidados.

Princípios Implicações

- O nosso programa de transporte baseado na comunidade enfatizou de forma única a apropriação e liderança da comunidade em todas as suas fases. As decisões foram construídas por consenso na sede de cada comunidade, o que permitiu flexibilidade perante as condições locais e apoio o desenvolvimento de competências e capacidades locais para a gestão financeira.

- A implementação dos esquemas de transporte não pode estar alheia aos esforços de fortalecimento do sistema de saúde em geral. Este esquema utilizou mecanismos de referência existentes, em vez de criar processos interamente novos, de modo a assegurar a sustentabilidade.

Resumo

Introdução: Atrasos resultantes de longas distâncias percorridas para as unidades sanitárias, infra-estruturas rodoviárias deficitárias e falta de opções de transporte acessíveis contribuíram para o peso das mortes maternas em Moçambique. Este estudo teve como objectivo avaliar a implementação e adoção de um esquema de transporte inovador baseado na comunidade para melhorar o acesso aos cuidados obstétricos de emergência no sul de Moçambique.

Métodos: De Abril de 2016 a Fevereiro de 2017 foi implementado um esquema de transporte como parte do ensaio de Intervenções a Nível Comunitário para a Pré-eclâmpsia (CLIP), que visava avaliar a redução da mortalidade e morbidade materna e perinatal em 20% nos conglomerados de intervenção nas províncias de Maputo e Gaza, Moçambique através do envolvimento dos Agentes Polivalentes Elementares na identificação e encaminhamento das mulheres grávidas e puérperas em risco. O esquema de transporte foi desenvolvido com base numa avaliação participativa das necessidades da comunidade. Durante a implementação do esquema de transporte foram recolhidos dados demográficos, das condições que requeriam transporte, os meios de transporte utilizados, os itinerários e as desfechos de cada caso. Os dados foram introduzidos numa base de dados em REDCap.

Resultados: Cinquenta e sete bairros participaram na avaliação das necessidades; dos quais, 13 (23%) implementaram o esquema de transporte. Os bairros foram selecionados com base na demonstração de interesse e capacidade de contribuir financeiramente para o esquema (US$0,33 por família, por mês). Em cada bairro selecionado foi criado um comitê de gestão comunitário que recebeu formação em gestão financeira de...
pequena escala e acesso aos instrumentos para monitoria do funcionamento do esquema. Vinte pessoas de 9 bairros beneficiaram-se do esquema de transporte, das quais 70% eram mulheres grávidas ou puérperas.

Conclusão: Estes resultados demonstraram que foi viável implementar um esquema de transporte baseado na comunidade, sem qualquer contributo externo em veículos, combustível, pessoal e manutenção. Contudo, o custo e a falta de opções de transporte aceitáveis continuam a dificultar o acesso aos serviços de saúde obstétricos e a capacidade de seguimento atempado. Ao reforçar as capacidades dos Agentes Polivalentes Elementares para prestar assistência e encaminhar rapidamente os casos de emergência, é crucial encorajar esquemas e infraestruturas locais de transporte em comunidades com recursos mínimos para apoiar o acesso e fortalecer o envolvimento com os sistemas de saúde.

Peer Reviewed

Received: August 31, 2020; Accepted: January 18, 2021


© Amosse et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00511
Volunteer Community Health and Agriculture Workers Help Reduce Childhood Malnutrition in Tajikistan

Roman Yorick, a Faridun Khudonazarov, a Andrew J. Gall, b Karah Fazekas Pedersen, b Jennifer Wesson b

Key Findings
- Through social and behavior change communication activities, this nutrition-specific and nutrition-sensitive project that included interventions in maternal, newborn, and child health (MNCH); water, sanitation, and hygiene (WASH); and agricultural practices improved dietary diversity of women and children in Tajikistan.
- Community volunteers specializing in agriculture or MNCH and WASH are an effective workforce for improving individual knowledge, attitudes, and practices that result in better nutrition.
- Demonstrating sustainable improvement in children’s nutritional status over a 5-year project presents a significant challenge.

Key Implications
- Policy makers and donors should consider long-term multifaceted approaches to improving nutrition of women and children that include health, agriculture, and WASH interventions.
- Program managers should consider community volunteers as an effective change instrument that requires continued technical support and motivation, as well as training to replace dropouts.
- Implementers should be ready to adapt their interventions to address local family structure, power dynamics, beliefs, traditions, and myths surrounding nutrition of women and children.

ABSTRACT
Childhood malnutrition is a nationally-recognized problem in Tajikistan. In 2017, 6% of children under 5 years were wasted and 18% were stunted. Through the Tajikistan Health and Nutrition Activity (THNA), funded by the U.S. Agency for International Development’s Feed the Future, IntraHealth International trained 1,370 volunteer community health workers (CHWs) and 500 community agricultural workers (CAWs) in 500 rural communities to improve nutrition among children and pregnant and breastfeeding women. CHWs and CAWs mutually encourage health behavior change, reinforce better agricultural practices, and promote maternal and child health and nutritious diets through household visits, community events, and peer support groups. CHWs refer children with malnutrition and diarrhea and pregnant women who are not registered for antenatal care to health facilities. THNA supported CHWs/CAWs through peer learning, refresher trainings, supportive supervision, and quarterly material incentives. We observed gains in knowledge, attitudes, and practices across health; nutrition; water, sanitation, and hygiene (WASH); and agriculture in target communities. From 2016 to 2019, we observed statistically significant (P < .05) improvements in children receiving a minimum acceptable diet; children with diarrhea receiving more liquids; women making 4 or more antenatal care visits; women reporting improved WASH; and farmers demonstrating improved agricultural practices. A February 2020 screening of 94.6% of children under 5 years in target communities found the prevalence of children with signs of wasting at 2.2%. Partnerships between CHWs, CAWs, and rural health workers facilitated these results. Paired agricultural and health interventions proved successful in improving nutrition of children and may be applicable in other contexts. Although effective in delivering interventions, CHWs/CAWs experience attrition, need motivation, and require intensive support. Assuming responsibility for this community-based volunteer workforce presents a major challenge for Tajikistan’s national and local governments.

BACKGROUND
Malnutrition has life-threatening, lifetime, and generational consequences for children in low- and middle-income countries, where almost half of all children under 5 years reside. Globally, 65% of children who are stunted and 73% of those who are wasted live in these countries. In Tajikistan, the most impoverished country in Central Asia, childhood malnutrition is a nationally
Programs that integrate agricultural and community education and behavior change interventions show promise on impacting child nutritional status.

recognized problem, compounded by anemia in women of reproductive age and children under 5 years and diarrhea due to poor water, sanitation, and hygiene (WASH). Although much progress has been made in recent years in the nutritional status of children in the country, 6% of children under 5 years were wasted in 2017 (down from 10% in 2012) and 18% were stunted (down from 26% in 2012).2,3

Rural farming communities in Tajikistan are disproportionately poorer, more food insecure, and undernourished compared to other communities.5 Khatlon province—where rural farming communities make up 83% of the population of approximately 3,274,9004—has the highest rates in the country of under-5 mortality (40 per 1,000 live births in 2017; down from 61 in 2012) and stunting (19% in 2017, down from 27% in 2012).2,3 In addition, 25% of women in Khatlon are not achieving dietary diversity (compared to 20% nationally); 47% of women are anemic (41% nationally) and 46% of young children aged 6–23 months are anemic (42% nationally).3

Pathways to preventing and mitigating malnutrition include adequate maternal nutrition before and during pregnancy and lactation; optimal breastfeeding in the first 2 years of life; access to and consumption of nutritious, diverse, and safe foods; a healthy environment, including access to basic health care and WASH; and opportunities for safe physical activity.1 To address these pathways, evidence to date suggests long-term integrated, multisectoral programming that is both nutrition specific and nutrition sensitive are needed.1,5 Programmatic efforts that integrate agricultural and community education and behavior change interventions show promise, suggesting greater impacts on child nutritional status when programs incorporate health and WASH interventions, as well as micronutrient-fortified products.5–7 Recent randomized program evaluation studies suggest educational activities that complement agricultural initiatives reflect positive changes to both anthropomorphic measures and childhood anemia.6,8 However, a series of reviews on agricultural interventions’ effect on nutrition outcomes for children, such as stunting, wasting, or underweight, showed mixed or inconclusive results.5,6–11 and measures of dietary diversity among women or children tended to increase.9–11 Several reviews have suggested that mixed or inconclusive results were due to weak study designs and evaluations.6,10,12

The Tajikistan Health and Nutrition Activity (THNA), funded by the U.S. Agency for International Development’s (USAID) Feed the Future and led by IntraHealth International, implemented an integrated community agriculture and health intervention to improve the health and nutrition of women and children in 12 districts of Khatlon (Figure 1). We developed a comprehensive community volunteer strategy based on evidence that equipped, trained, and supported community health workers (CHWs) could promote health and provide high-quality care in remote and poor regions.13,14 THNA trained 1,370 CHWs and 500 volunteer community agricultural workers (CAWs), jointly referred to as community volunteers, in 500 rural communities. Although data are presented starting from 2016, THNA significantly changed its approach to community-based work in 2018. Thus, the article describes THNA’s implementation approach from 2018 to June 2020 and uses 2016 data as a baseline.

PROGRAM DESCRIPTION

THNA addressed underlying and immediate malnutrition factors through an integrated multifaceted approach of working with community volunteers to improve the quality of maternal, newborn, and child health (MNCH) services; increase access to nutritious foods and reduce the burden of infectious and parasitic diseases; and strengthen WASH infrastructure.

Community Volunteer Engagement and Management

THNA worked with community volunteers to provide MNCH services and nutrition or agricultural education and serve as change agents for the following reasons: (1) behavior change is best achieved through direct individual or small-group interventions; (2) the project’s large number of target districts, communities, and individuals; and (3) the shortage of other change agents, such as government health providers or local nongovernmental organizations. THNA conducted comprehensive selection and training processes and supported volunteers in their work through monthly peer-learning sessions at the district level and regular supportive supervision visits at the community level based on the volunteers’ needs.

Selection and Training

THNA transitioned some community volunteers from a previous community-based project (2011–2015) where they worked as “community health educators” on both MNCH and agricultural topics. There were no other volunteer-based activities in THNA districts before 2011. THNA offered to retrain “community health educators” either as CHWs or CAWs and recruited additional community volunteers to increase coverage. Criteria for community volunteer recruitment

| Figure 1: Selection and Training Process |
included: at least secondary school education; self-motivation and interest in community volunteer work; ability to devote at least 8 hours a week; good networking and communication skills; positive relationships with neighbors, village leaders, and health providers; not being currently employed as a health worker (for CHWs); and availability to travel 1 day a month to the district center for peer-learning meetings. Women made up the majority of THNA community volunteers (89%), with a median age of 46 years.

THNA provided an initial training for CHWs over 5 days on all relevant topics and trained CAWs for a total of 8 days, 2 days per quarter, on seasonal topics relevant to the upcoming agricultural season (Table 1). All volunteer trainings were participatory, combining development of practical skills with acquisition of new knowledge. We assessed trainees’ knowledge through pre- and post-tests; those achieving at least 80% on the post-test received certificates of achievement, those who did not pass had the option to take the course again. Initially, THNA had an annual attrition rate of 17%. With the addition of repeated training courses and clearer expectations on time and responsibilities, the annual attrition rate dropped from 17% to 1%.

Abbreviation: FTF, Feed the Future.
attrition rate of CAWs and CHWs dropped to 1% in the last project year.

**Monthly Peer-Learning Sessions**

THNA conducted more than 40 peer-learning sessions, with 20–25 community volunteers each, separately for CHWs and CAWs, at the end of every month. The goals of these sessions included sharing of successes and challenges, finding solutions to common problems, testing knowledge through quizzes and providing refresher trainings based on the results, teaching new knowledge and skills through interactive training sessions, analyzing results of the previous month’s work, and collecting data reports on the current month. Select rural health workers, village leaders, and staff of government public health institutions (healthy lifestyle centers) also participated in these meetings.

**Supportive Supervision Visits**

THNA staff selected villages and volunteers for supportive supervision based on achievements. Valid high achievements deserved analysis and potential sharing of “golden nuggets” with other volunteers. Low achievements necessitated support to address challenges and improve performance. Such challenges included lack of support from the village head or government health worker and volunteers’ poor communication skills or lack of experience. Other volunteers also received supportive supervision visits on an as-needed basis.

**Incentives for Community Volunteers**

At each meeting, THNA staff recognized individual volunteers for high achievements in the previous month (e.g., number of children with malnutrition identified, number of households visited) and awarded them small nonmonetary prizes, up to US$5 in value. Over the years, THNA organized 2 cross-district competitions among volunteers to determine and recognize those with the strongest knowledge and skills and highest achievements. The project recognized district and regional winners with certificates and small nonmonetary awards. All community volunteers, regardless of their achievements, received a quarterly material incentive worth about US$15 (e.g., umbrellas, blankets, and steam pots).

**Health and Nutrition and Agriculture Interventions**

**Household Visits**

Household visits provided the main mode of community volunteer activity. On average, each CHW visited 20 households per month, and each CAW visited 25 households, specifically targeting households with children under 2 years and children with malnutrition or other known medical conditions; low-income households and incomplete families; and households with pregnant women.

---

**TABLE 1. THNA Community Volunteer Training Topics, Khatlon Region, Tajikistan**

<table>
<thead>
<tr>
<th>Community Health Worker Training</th>
<th>Community Agricultural Worker Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication skills and principles of adult learning</td>
<td>Fall</td>
</tr>
<tr>
<td>2. Safe WASH principles</td>
<td>1. Communication skills and principles of adult learning</td>
</tr>
<tr>
<td>3. Principles of healthy nutrition, including micronutrients</td>
<td>2. Poultry care and dairy production (home cheese-making)</td>
</tr>
<tr>
<td>4. Exclusive breastfeeding and complementary feeding of children</td>
<td>Winter</td>
</tr>
<tr>
<td>5. Childhood malnutrition; child growth monitoring and promotion</td>
<td>3. Household budgeting</td>
</tr>
<tr>
<td>7. Antenatal care, nutrition, and danger signs during pregnancy</td>
<td></td>
</tr>
<tr>
<td>8. Conducting household visits, and THNA data collection requirements</td>
<td></td>
</tr>
<tr>
<td>9. Cooking demonstrations</td>
<td></td>
</tr>
<tr>
<td>10. Facilitating and leading peer support groups on various topics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Home garden management:</td>
</tr>
<tr>
<td></td>
<td>● Crop rotation</td>
</tr>
<tr>
<td></td>
<td>● Disease management</td>
</tr>
<tr>
<td></td>
<td>● Irrigation</td>
</tr>
<tr>
<td></td>
<td>● Pest management</td>
</tr>
<tr>
<td></td>
<td>6. Soil fertility (composting)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summer</td>
</tr>
<tr>
<td></td>
<td>7. Post-harvest technologies (food preservation and storage)</td>
</tr>
</tbody>
</table>

**Abbreviations:** THNA, Tajikistan Health and Nutrition Activity, WASH, water, sanitation, and hygiene.
and with newlyweds to counsel them on antenatal care and nutrition of pregnant women. During visits, community volunteers provided individual or small group educational sessions and practical training on MNCH, nutrition, WASH, or agricultural topics relevant to the specific household, using visual aids, videos, and information materials. CHWs also identified and referred pregnant women not registered for antenatal care and children with signs of malnutrition and/or with diarrhea to primary health centers. CHWs routinely screened children for signs of malnutrition using mid-upper arm circumference (MUAC) tapes. A total of 1,852 children were referred over 18 months in 2018–2019.

**Child Growth and Promotion Campaign**
The 2017 Demographic and Health Survey (DHS) found 6% of children under 5 years wasted in THNA target districts. To gauge the current child nutritional status in target communities, in February 2020, THNA organized a child growth and promotion campaign in which CHWs and CAWs partnered with government health workers to identify true prevalence of malnutrition through a cross-sectional survey of all children aged 6–59 months. All community volunteers, as well as rural health workers, received training in using MUAC tapes. Over a month, they conducted household visits and measured 94.6% of 111,313 children under 5 years registered with health facilities, identifying 2,437 children (2.2%) with signs of malnutrition.

**Small Group Practical Training on Agricultural Topics**
Each CAW reached an average of 140 individuals every month with small group trainings on seasonally appropriate agricultural topics. CAWs provided their training during household visits, lunch breaks during field work, community events, or work projects for public good, such as removing garbage or cleaning an irrigation or drainage channel.

**Cooking Demonstrations**
In Tajikistan, many beliefs and prejudices prevent pregnant women, breastfeeding women, and children aged 6 months and older from receiving nutritious foods. CHWs and CAWs jointly facilitated at least 1 cooking demonstration a month to promote age-appropriate nutritious recipes from the THNA recipe book, as well as WASH principles. Each demonstration covered 2 recipes for different target groups and included an educational session on a health and nutrition topic. CAWs also provided sessions on safely preparing home preserves of different fruits and vegetables and preventing botulism.

**Peer Support Groups**
Peer support group meetings, an innovative format in the Tajikistan context, provided a monthly platform for community members to share positive experiences on MNCH and nutrition, reinforce desired behaviors, and find solutions to common challenges. In 2020, CHWs facilitated 624 peer support groups in 491 villages.

**Community Events**
In rural Tajikistan, traditions of folk theater are very strong, and dramatic sketches performed by community members are quite popular. To raise awareness and education on nutrition and related topics, THNA staff, CHWs, and CAWs co-organized larger public events in villages. Taking into account issues most relevant to the host community, THNA staff prepared original scenarios for these events, which included dramatic sketches (role-plays), songs, quizzes, child drawing competitions, and poem recitation. Community events were devoted to WASH and marketing of ventilated improved pit latrines, exclusive and continuing breastfeeding, and marketing of new crops (e.g., broccoli, bok choy, okra, sweet potatoes).

**Health Fairs**
THNA organized health fairs to bring specialty health services into the most remote rural communities, which under normal circumstances only have a nurse and/or a midwife on duty. For these events, THNA provided transportation and disposable supplies for a pediatrician, obstetrician/gynecologist, lab technician, and ultrasound specialist to travel to a remote village and provide services. CHWs invited women and children and provided group and individual MNCH and nutrition counseling for women waiting in line. Health fairs helped register pregnant women for antenatal care and identify women who have pre-eclampsia and children who are malnourished and refer them for care.

**Referrals and Linkages**
THNA worked in partnership with the regional government department of health and its rural health facilities present in 337 of 500 target villages. CHWs referred pregnant women, children with signs of malnutrition, and children with diarrhea to local health facilities. In turn, government
health workers referred women and children to CHWs for community follow-up and care. CHWs met with rural health providers once a month or more often, if needed, to reconcile the list of referred clients and coordinate activities.

**METHODS**

To assess the results and adjust the course of community-based interventions, THNA conducted 3 rounds of a recurring agricultural practices survey (RAPS) and 5 rounds of a recurring household survey (RHS). RAPS and RHS used the longitudinal sentinel community surveillance methodology to detect changes in knowledge, attitudes, and practices over time through repeated cycles of household interviews in select “sentinel” communities.

**Recurring Agricultural Practices Survey**

The RAPS assessed exposure to THNA activities and the change in self-reported and observed agricultural practices in 10 villages through 3 annual surveys (September 2017, 2018, and 2019). THNA purposively selected the villages to represent communities from each of the 4 geographic subregions of its Feed the Future zone of influence (ZOI). Within each village, interviewers randomly selected households to reach 100 per district, for a total sample size of 400 households.

THNA selected and trained interviewers from among its staff and CAWs (who were not deployed to the districts in which they worked). The interviewers randomized households in every community by flipping a coin to choose the direction on a street and then going into every fourth household. THNA used a geopositioning service to record daily movements of the interviewers and advise on sections of the village that were not covered. Exposure to THNA agricultural activities was the only eligibility criterion.

Interviewers used a structured interview tool installed on a tablet and conducted interviews in Tajik or Uzbek, depending on respondents’ language preference. Data from the tablet were uploaded to an online Kobo Collect database later when a wireless Internet connection was available. We analyzed data in MS Excel (Office 365 version) and STATA (15.1). We calculated statistical significance of observed differences, between round 1 and round 3 in surveyed villages (baseline-endline analysis). To determine statistical significance, we used a conservative logistic regression model to avoid false positives.

**Recurring Household Survey**

The RHS followed a panel of 4 THNA communities, collecting data every 6 months (rounds 1–4 in 2016–2018) and a year later (round 5 in 2019). THNA purposively selected the 4 villages at the beginning of the project to represent communities from each of the 4 geographic subregions of the ZOI. In round 5, THNA added 2 comparison communities outside of the ZOI in districts with similar socioeconomic characteristics and no prior or concurrent interventions implemented similar to THNA. Selection criteria included the perceived economic status of the district (3 “better-off” and 3 “poorer” districts), the size of the village (200–250 households), and the distance to the district’s center (40–50 km). Within each village, interviewers randomly selected 60 households, for a total sample size of 240 households in the THNA districts and 120 households in the comparison districts.

Respondents included mothers aged 18 years or older, who had participated in THNA activities, and who had at least 1 child under 5 years present in the household at the time of the survey. If more than 1 woman in a household met selection criteria, the interviewer randomly selected the woman to be interviewed by flipping a coin. For anthropometry measurements, interviewers measured all children under 5 years of the selected mother. When asking questions about behaviors and practices, the interviewers focused on the youngest child.

The interviewers used structured questionnaires to assess respondents’ knowledge, attitudes, and self-reported practices regarding MNCH, nutrition, and WASH. Interviews were conducted in Tajik or Uzbek depending on the respondents’ preference. We analyzed data in MS Excel (Office 365 version) and STATA (15.1). We calculated statistical significance of observed differences, first between round 1 and round 5 in intervention villages (baseline-endline analysis), and second between round 5 comparison villages and intervention villages (control-treatment analysis). We used a conservative logistic regression model to avoid false positives.

**PROGRAM RESULTS**

**Survey Participants Demographics**

The 2 samples were different based upon the design of the survey (Table 2). RAPS participants could be men, but the vast majority were women (96%, 88%, 95%, respectively). All of the RHS respondents were women. The age groups were more evenly distributed in the RAPS sample. One-third of the RHS respondents were aged
18–29 years and two-thirds were aged 30–44 years, which can be explained by the selection criterion that the woman had to have a child under 5 years. There were no differences in the characteristics of the women in the intervention and comparison communities.

TABLE 2. Demographics of Recurring Agricultural Practices Survey and Recurring Household Survey Respondents, Khatlon Region, Tajikistan

<table>
<thead>
<tr>
<th>Respondents’ Age</th>
<th>Recurring Agricultural Practices Survey</th>
<th>Recurring Household Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18–29 Years, %</td>
<td>30–44 Years, %</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>September 2017 (N=400)</td>
<td>31</td>
<td>18</td>
</tr>
<tr>
<td>September 2018 (N=360)</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>September 2019 (N=404)</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Intervention Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 2016 (N=242)</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>May 2017 (N=240)</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>November 2017 (N=240)</td>
<td>66</td>
<td>34</td>
</tr>
<tr>
<td>June 2018 (N=249)</td>
<td>69</td>
<td>30</td>
</tr>
<tr>
<td>June 2019 (N=244)</td>
<td>67</td>
<td>33</td>
</tr>
<tr>
<td>Comparison Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 2019 (N=120)</td>
<td>66</td>
<td>33</td>
</tr>
</tbody>
</table>

Improved Agricultural Technology

According to the RAPS, nearly all respondents (96%–97%) were exposed to information on post-harvest handling and storage of fruits and vegetables, but there was virtually no change over time in its application (Figure 2). Between

FIGURE 2. Percentage of Recurring Agricultural Practices Survey Respondents Applying Improved Agricultural Technologies, Between 2017 and 2019, Khatlon Region, Tajikistan
2017 and 2019, we observed a moderate increase in the coverage of topics on home cheesemaking and soil fertility (composting). The biggest increases \((P<.01)\) occurred in coverage on the topics of irrigation, cultural practices (crop rotation), disease and pest management, and on livestock management under the poultry care and vaccination topic. The self-reported use of improved agricultural practices remained high throughout the 3 survey rounds, between 93\%–100\%.

Application of at least 1 improved agricultural practice, as confirmed by interviewer observation, increased from 84\% in 2016 to 100\% in 2019. Significant increases \((P<.01)\) in the application of improved agricultural technologies were found in irrigation, disease management and pest management, livestock management (poultry care), cultural practices (crop rotation), and in soil fertility (composting, \(P<.05\)) (Figure 2). Moderate but not significant improvements were found in dairy production (cheesemaking).

The percentage of respondents applying multiple improved agricultural practices also increased over time. In 2017, we found 29\% of respondents had applied more than 2 improved agricultural practices, and none had applied more than 6 practices. In 2019, 76\% of respondents applied more than 2 improved practices, and 30\% applied more than 6.

**Feeding Practices and Dietary Diversity**

The proportion of children with minimum acceptable diets increased 2-fold for breastfed children and 3-fold for non-breastfed children, despite having started at very similar proportions (Figure 3). Breastfed children lost ground between June 2018 and June 2019. The differences between intervention and comparison villages were dramatic both for breastfed and non-breastfed children and significant for the non-breastfed group \((P<.05)\). For non-breastfed children, the result was statistically significant for both the baseline-endline and control-treatment analysis. Table 3 shows comparisons of key RHS data with DHS 2017 data for feeding patterns and other indicators.

Women’s nutrition practices did not improve as significantly as those of the children, but there was some degree of improvement. Between 2016–2019, women’s minimum dietary diversity increased slightly from 84\% to 90\%. In 2019, women’s dietary diversity was 19 percentage points higher in intervention villages than in comparison villages (71\%), but it was not a statistically significant difference. However, THNA data on minimum dietary diversity in women are still higher than those of DHS 2017 for the ZOI districts (80\%). There was little change in the average number of food groups consumed between 2016 (6.2) and 2019 (6.7).

The percentage of women who reported giving more fluids to a child with diarrhea in the 2 weeks preceding the survey increased significantly \((P<.02)\) between 2016 (33\%) and 2019 (80\%). The percentage of women who reported giving a child more or the same amount of food during diarrhea also increased (2016, 36\%; 2019, 55\%), but the improvement was not statistically significant. The increase in fluids was statistically
significant for the baseline-endline analysis. The increase in food was not statistically significant in either analysis. Both of these indicators are much higher in THNA target villages compared to DHS 2017 data (27% for increased fluids and 10% for increased food). Our measurements of exclusive breastfeeding practice were flawed and inconsistent, so we are unable to analyze that data with rigor and report on that topic. In Tajikistan’s hot climate, the belief in the need of breastfed children for additional liquids is prevalent and persistent

**TABLE 3.** Recurring Household Survey Data Compared to Tajikistan Demographic Health Survey Data, Khatlon Region, Tajikistan

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive breastfeeding 0-5 months, %</td>
<td>-</td>
<td>50</td>
<td>72</td>
</tr>
<tr>
<td>Continuous breastfeeding, %</td>
<td>68</td>
<td>78</td>
<td>71</td>
</tr>
<tr>
<td>Minimum acceptable diet in children aged 6–23 months, %</td>
<td>Breastfed 18</td>
<td>19</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Non-breastfed 16</td>
<td>3</td>
<td>53(^{a,b,c})</td>
</tr>
<tr>
<td>Child feeding practices during diarrhea, %</td>
<td>More fluids 33</td>
<td>63</td>
<td>80(^{a,b})</td>
</tr>
<tr>
<td></td>
<td>More food 36</td>
<td>21</td>
<td>55</td>
</tr>
<tr>
<td>Women achieving minimum dietary diversity, %</td>
<td>84</td>
<td>71</td>
<td>90</td>
</tr>
</tbody>
</table>

**Water, Sanitation, and Hygiene**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Households with soap present at handwashing station, %</td>
<td>48</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Soap use after defecation, %</td>
<td>24</td>
<td>37</td>
<td>88(^{a,b})</td>
</tr>
<tr>
<td>Soap use after cleaning a child, %</td>
<td>19</td>
<td>65</td>
<td>80(^{a,b})</td>
</tr>
<tr>
<td>Soap use before feeding a child, %</td>
<td>22</td>
<td>25</td>
<td>69(^{a,b})</td>
</tr>
<tr>
<td>Soap use before preparing food, %</td>
<td>21</td>
<td>45</td>
<td>82(^{a,b})</td>
</tr>
<tr>
<td>Soap use before eating, %</td>
<td>24</td>
<td>8(^{*})</td>
<td>78(^{a,b})</td>
</tr>
</tbody>
</table>

**Health Seeking Behaviors**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of antenatal care visits for previous pregnancy</td>
<td>3.6</td>
<td>4.0</td>
<td>5.7</td>
</tr>
<tr>
<td>Women who had 4+ antenatal care visits, %</td>
<td>57</td>
<td>48</td>
<td>86(^{a,b})</td>
</tr>
<tr>
<td>Women participating in their health care decision making, %</td>
<td>4</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

**Knowledge on Women and Children’s Nutrition**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Women who know of the need of a pregnant woman to eat more, %</td>
<td>64</td>
<td>49</td>
<td>89(^{a,b,c})</td>
</tr>
<tr>
<td>Women who know that breastfeeding women should eat more, %</td>
<td>77</td>
<td>66</td>
<td>99(^{a,b,c})</td>
</tr>
<tr>
<td>Women who know that a baby should receive more breastmilk during diarrhea %</td>
<td>44</td>
<td>28</td>
<td>93(^{a,b,c})</td>
</tr>
</tbody>
</table>

\(^{a}\) Results are statistically significant at \(P<.05\), utilizing a conservative logistic regression model.

\(^{b}\) Result is significant compared to Round 1 (baseline/endline analysis).

\(^{c}\) Result is significant compared to comparison villages (treatment/control analysis).

even among government health workers. In the first 3 RHS rounds, the question on exclusive breastfeeding did not specify that it excludes additional liquids, which yielded a very high prevalence of exclusive breastfeeding. In the last 2 RHS rounds, THNA clarified the survey question and received more realistic results.

**Water, Sanitation, and Hygiene**

The percentage of women who reported washing hands with soap after defecation (\(P<.01\), after
cleaning the child \( (P<.01) \), before feeding the child \( (P<.05) \), before preparing food \( (P<.05) \), and before eating increased between 2016 and 2019 (Figure 4). Women in THNA villages reported washing hands with soap more frequently than women in comparison villages, but the only statistically significant difference was in using soap before eating \( (P<.01) \).

Observed presence of soap at handwashing stations may be influenced by seasonal factors. After the start of the rainy season (October-November), households may not keep soap at handwashing stations that are outdoors. If seasonality is excluded (considering only May-June), there is no identifiable trend in the presence of soap. In 2019, interviewers observed soap less often than would be expected from the proportions of households claiming to be using soap for nearly every category of soap use. In comparison villages in 2019, soap was present less often than in intervention villages, although the difference was not statistically significant based on our analyses.

**Health-Seeking Behaviors**

Between 2016 and 2019, we observed an upward trend in antenatal care visits by women in intervention villages. The average number of visits increased from 3.6 to 5.7, which is an improvement, but still short of the 7 antenatal care visits that are recommended by Tajikistan’s national guidelines. The percentage of women who attended at least 4 antenatal care visits increased from 57% in 2016 to 86% in 2019. Antenatal care attendance in 2019 was significantly higher in intervention villages than comparison villages according to our treatment-control analysis (86% vs. 48%, \( P<.05 \)).

**Knowledge on Women’s and Children’s Nutrition**

Between 2016 and 2019, the percentage of respondents in intervention villages who knew that women should eat more during pregnancy increased from 64% to 89% \( (P<.05) \). The percentage of respondents who knew that breastfeeding women should eat more than usual increased from 77% to 99% \( (P<.05) \). Respondents also improved knowledge on breastfeeding during diarrhea episodes, an improvement from 44% to 93%. Respondents in intervention villages had statistically significantly higher knowledge in all these categories than respondents in comparison villages.

**DISCUSSION**

THNA combined community-based agricultural, MNCH, nutrition, and WASH interventions using community volunteers, a unique model in the Central Asia region and other low- or middle-income countries. The fact that all community-based interventions were implemented by community volunteers was key given the large number of target districts, villages, and beneficiaries and the shortage of...
alternative social and behavior change communication conduits, such as nongovernmental organizations or government health workers. Village communities in the focus districts responded well to individual and small group social and behavior change communication interventions implemented through the volunteers, as evidenced by the large number of community contacts and the changes we observed in behaviors. A recent global evidence review of nutrition-sensitive agricultural interventions found just 2 rigorous evaluations of interventions that included behavior change elements led by community volunteers. Both of these interventions demonstrated promising effects on child nutrition and other indicators, although neither could demonstrate positive changes in addressing stunting among children, similar to other nutrition-sensitive interventions examined in the review. Given THNA’s results in using a community volunteer model and the limited number of similar interventions in the literature that nevertheless showed promising results, more evaluations of carefully designed integrated, multisectoral community-led or community volunteer agriculture, nutrition, and health interventions that leverage existing community health structures in resource-constrained settings are needed.

A major challenge for THNA was engaging men in MNCH and nutrition issues. In traditional Tajik families, men are the main breadwinners, and many of them travel within the country or abroad for work. Younger women (unmarried daughters and daughters-in-law) complete most household chores, provide childcare, and assist men in field work. It is mostly older women who have the time to devote to community volunteer work. Older women (mothers-in-law) are the ultimate decision makers in their families, particularly when men are away for work. The high proportion of older women who served as community volunteers (53% were aged 45 years or older) strengthened the influence and social status of volunteers. We learned that all community-based activities had to start by engaging older women. Without their buy-in and support, participation of younger women would not be allowed, including speaking to volunteers during household visits or attending cooking demonstrations or peer support groups.

I am grateful to the project, because you changed the attitude of my mother-in-law! Before, she was stingy and would not let me eat enough, and was angry when I spent too much time breastfeeding. Now, she started caring for my health and nutrition, lets me breastfeed the child as long as necessary, and allowed me to participate in cooking demonstrations and peer support group meetings. —Daughter-in-law

Peer support groups—a novel and innovative concept in Tajik villages—were designed to highlight positive behaviors; demonstrate to other group members the successes of their fellow village members in antenatal care, exclusive breastfeeding (EBF), complementary feeding, and other topics; and support group members by sharing experiences in overcoming challenges.

Volunteers shared that their families expect them to bring something home in return for the time and effort spent on community work. We believe the incentives we provided are part of the reason for our low attrition rates. At the same time, the volunteers’ main motivation was the status they received in their villages. This included the ability to travel once a month to the district center for an important meeting or having an unofficial title of “doctor’s assistant” in the village.

Despite their relatively small number (1 per village regardless of its size), CAWs demonstrated high coverage of beneficiaries with information and demonstrations of improved agricultural practices. As a result, the number of practices applied increased significantly over time. By contrast, CHWs were not able to regularly cover all 100 households they were assigned. Coverage depended on their communication skills and ability to step outside their comfort zone to work with difficult and less welcoming households. By joining forces with CAWs and facility health workers, CHWs were able to overcome some of these barriers. Additional training on communication skills and allocation of fewer households per volunteer may be necessary to improve their effectiveness.

Improved agricultural practices, according to THNA’s theory of change, increased the variety of foods available to women and children, thus allowing for the increased dietary diversity demonstrated through the RHS. Increased agricultural production might have also contributed to improved diets of women and children through increased income and accessibility of different foods through purchasing. However, we did not assess changes in household income. The use of post-harvest technologies was high at the start of THNA, potentially because of households’ exposure to this topic from the previous maternal and child health activity. Most households already applied these technologies, and it was hard to improve on this already high uptake.

CHWs significantly improved the knowledge of women of reproductive age on nutrition of...
pregnant and breastfeeding women and children. To improve child nutrition, THNA continuously worked on increasing the prevalence of EBF of children aged 6 months or younger, which was at a low 36% nationwide in 2017. Giving children under 6 months clear liquids, such as water or tea, in addition to breast milk is a widespread practice, not usually distinguished from EBF and promoted, even by many pediatricians, due to Tajikistan’s hot climate. Because of measurement issues, THNA was not able to demonstrate an improvement in EBF in its target villages. In the first 4 rounds of the RHS, children receiving liquids in addition to breast milk were counted as exclusively breastfed, demonstrating a false EBF prevalence of more than 80%. In the last round of the RHS in 2019, this mistake was corrected, and this last measurement of 72% can be considered accurate. Compared to the 50% in comparison villages, THNA might have made an improvement in EBF in target villages, but the difference was not significant given the size of the comparison group.

Demonstrating an improvement in nutritional status of children under 5 years on a large scale has been challenging for similar projects. Measurement fluctuations also suggest the influence of some seasonal factors, such as abundant and lean seasons and diarrheal seasons. Similar to other nutrition-sensitive agriculture projects, THNA demonstrated statistically significant improvements in dietary diversity in non-breastfed children aged 6–23 months, and the minimum acceptable diet in non-breastfed children aged 6–23 months. These dietary improvements may be a prerequisite for improvement in the nutritional status of children, which may require more than 4 years of observation to register. Improvements in minimum dietary diversity and minimum acceptable diet in breastfed children were more modest than those in non-breastfed children, potentially because women who did not discontinue breastfeeding after the child had reached 6 months paid less attention to complementary feeding and the diversity of food the child received in addition to breast milk.

Cross-sectional data from the 2020 growth monitoring and promotion campaign by CHWs with the use of MUAC tapes may be a proxy demonstration of the decreased prevalence of wasting in children under 5 years. We found a much lower prevalence of abnormal MUAC measurements than expected given DHS 2017 data on wasting, but the measurement methodologies are very different (MUAC vs. weight and height). Identification rates of children with signs of malnutrition by CHWs during their regular work was lower than those during the growth monitoring and promotion campaign. One of the reasons may be that CHWs were not able to regularly cover all 100 households they had been assigned. Regular growth monitoring and promotion campaigns by community volunteers and government health workers should have been routine practice, but THNA did not test implementation of this campaign approach until the last few months of the project.

THNA used 2 evaluation tools to gauge its progress and adapt its interventions: RAPS and RHS. RAPS was annual, and the RHS was originally designed as a semiannual household survey with 67 questions mimicking those from the national DHS for comparison purposes. However, THNA found semiannual surveys too frequent to analyze the results, revise and pilot adapted interventions, roll out to 12 districts and hundreds of volunteers, and see any changes in 6 months. Therefore, the fifth RHS round was shortened to the most actionable questions (n=46) and switched to an annual schedule.

**Sustainability**

To foster continued activities of CAWs and CHWs beyond the project timeline, THNA partnered with the government healthy lifestyle centers (HLSCs), which exist at the national, regional, and district levels. Since 2017, HLSCs are authorized by the Ministry of Health and Social Protection of the Population (MOHSPP) to coordinate the work of CHWs. Until recently, no national framework for recruiting, training, and supporting CHWs existed. To encourage HLSCs’ further continuation of THNA activities, HLSC and THNA staff served as cotrainers for THNA’s community volunteers. In addition, HLSC staff engaged in THNA program analysis and planning, co-facilitated monthly volunteer peer-learning sessions, and co-facilitated all community-based events. Maintaining these CHW functions beyond THNA’s timeline will be a challenge for the government HLSCs given the shortage of resources.

THNA engaged with MOHSPP through the national-level working groups on MNCH and nutrition. THNA advocated for a specific role and responsibilities assigned for community volunteers in the government health system, and additional resources required for HLSCs for facilitating the work of community volunteers. These resources are necessary, at a minimum, for training community volunteers and travel by HLSC staff to the communities for mentoring and supervision. However, the MOHSPP still relies on international donors for supporting community volunteer
work. For example, IntraHealth will facilitate the work of the existing CAWs and recruit additional ones within the new 5-year USAID Agriculture and Land Governance Activity, which will work closely with the Ministry of Agriculture.

**Limitations**

THNA focused largely on program implementation and lacked the robust evaluation activities to assess the synergistic effects of improved agricultural practices and MNCH and WASH behaviors on children’s nutritional status. We originally designed RAPS and RHS as sentinel surveillance to fine-tune project interventions and gauge their effects. The sample design was not sized to detect moderate differences in results. Therefore, RAPS and RHS results are not representative of all 500 target villages or the whole ZOI. To improve our analysis, we added a comparison group to the last RHS round, but the group was not large enough to detect statistical significance of moderate size differences. Most of the practices in the RHS were self-reported, except for the observed availability of soap at handwashing stations; therefore, the results may be skewed to socially desirable responses. RAPS made a distinction between the reported and observed improved agricultural practices to overcome this limitation. The final rounds of RAPS and RHS in 2020 had to be canceled because of the COVID-19 pandemic.

**Applicability to Other Geographical Contexts**

THNA’s experience may be applicable for improving MNCH and nutrition in traditional agricultural villages facing combined challenges of poverty, low variety of nutritious foods, poor WASH conditions, and hierarchical family structures where women’s and children’s health and nutrition needs are not high priority. These conditions are present in other countries in Central Asia, Southeast Asia, Africa, and Central America.

**CONCLUSION**

THNA demonstrated that volunteer CAWs and CHWs can improve MNCH and nutrition through changing agricultural practices and social behavior in antenatal care, nutrition of women of reproductive age and children under 5 years, and WASH practices.

CAWs and CHWs effectively implemented these interventions with intensive support from a USAID technical assistance project. Such interventions and community volunteer models need to be adapted to the local context. Although successful in delivering interventions, CHWs and CAWs experience attrition, need motivation, and require significant support. Assuming responsibility for this community-based volunteer workforce presents a major challenge for Tajikistan’s national and local governments given limited government resources and the ongoing COVID-19 pandemic.

**Acknowledgments:** The authors would like to thank the following individuals for their contribution to implementation of THNA, and to documentation and evaluation of its results: Alo Tabarov; Manjuda Maksudkhojaeva; Gulgum Janboboeva, Khairinissa Akhmedova; Ranagul Husanova; Lalakhon Madazimova; Nasirjon Qadirov; Lola Dagarova; Askar Kadyrov; Jahangul Rodaev, Marhaba Fozilova, Rahima Holimova, Zamira Jaborova, Manjuda Karimova, Jamoliddin Khashimov, Azimjon Rahimov, Havasmon Rahmatulloeva, Mohbana Rozimurodova, Mushkinnos Sharipova, Boymat Tavarov, and Sohibjonal Tosheva; THNA administrative and support staff, and all community volunteers who made THNA a success.

**Funding:** THNA and this article were made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future Initiative (Cooperative Agreement No. AID-176-LA-15-00001). The contents of this article are the responsibility of IntraHealth International and do not necessarily reflect the views of USAID or the United States Government.

**Competing interests:** None declared.

**REFERENCES**


5. Ruel MT, Quisumbing AR, Balagamwala M. Nutrition-sensitive agriculture: what have we learned so far? Glob Food Sec. 2018;17:128-153. CrossRef


8. Olney DK, Pedelemba A, Ruel MT, Dillon A. A 2-year integrated agriculture and nutrition and health behavior change communication program targeted to women in Burkina Faso reduces anemia, wasting, and diarrhea in children 3-12.9 months of age at baseline: a
Community Volunteers Help Reduce Childhood Malnutrition in Tajikistan


16. Wordofa MG, Sassi M. Impact of agricultural interventions on food and nutrition security in Ethiopia: uncovering pathways linking agriculture to improved nutrition. Cogent Food Agric. 2020; 6 (1). CrossRef

Peer Reviewed

Received: June 17, 2020; Accepted: November 2, 2020


© Yorick et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00325
Using Human-Centered Design to Adapt Supply Chains and Digital Solutions for Community Health Volunteers in Nomadic Communities of Northern Kenya

Sarah R. Andersson, a Sarah Hassanen, b Amos M. Momanyi, c Danielson K. Onyango, c Daniel K. Gatwechi, d Mercy N. Lutukai, c Karen O. Aura, d Alex M. Mungai, d Yasmin K. Chandani c

Key Findings

- Human-centered design (HCD) offers a methodology for engaging seminomadic and nomadic communities with complex social and cultural barriers in designing innovative digital health and supply chain solutions. A reliable supply chain for essential and reproductive health commodities for community health volunteers will improve access and contribute to the overall health and well-being of the community, especially women and children.

- Exploratory research using HCD methodologies uncovered opportunities for innovation by building on informal behaviors already in place to overcome barriers, such as strengthening the role of supervisors to support community health volunteers in completing their reports.

Key Implications

- Program managers should consider using HCD approaches when designing health, digital, or supply chain interventions for complex sociocultural settings, especially when traditional health interventions have not been successful.

ABSTRACT

Background: Unreliable and nonexistent supply chain procedures and processes are one of the primary barriers to achieving functional community health units in nomadic communities in the arid/semiarid counties of Kenya.

Methods: We used a human-centered design (HCD) approach to engage communities and community health volunteers (CHVs) in redesigning a proven data-centric supply chain approach that included a digital solution, called cStock, for this challenging context. We conducted the HCD process in 4 phases: (1) understanding intent, (2) research and insights, (3) ideation and prototyping, and (4) supply chain design and requirements building. Data collection used qualitative methods and involved a range of stakeholders including CHVs, supervisors, and local beneficiaries. CHVs and their supervisors also participated in cStock usability testing. Drawing on insights and personas generated from the research, stakeholders ideated and codesigned supply chain tools.

Results: The research identified critical insights for informing the redesign of cStock for nomadic communities. These insights were categorized into supply chain, information systems, human resources, behaviors, service delivery infrastructure, and connectivity. Four supply chain data solutions were designed, prototyped, tested, and iterated: a stock recording paper-based form, a user-friendly cStock application, a supervisor cStock application, and an unstructured supplementary service data reporting system using feature phones.

Conclusions: Using the HCD process incorporated the perspective of CHVs and their communities and provided key insights to inform the design of the supply chain and adapt cStock. The process helped make cStock to be inclusive and have the potential to have a meaningful impact on strengthening the supply chain for seminomadic and nomadic communities in northern Kenya. A strong supply chain for these CHVs will increase access to essential and reproductive health commodities and contribute to improving the overall health and well-being of these communities, especially women and children.

INTRODUCTION

Community health volunteers (CHVs) in Kenya play a critical role in improving the health of populations and extending health care to communities. In Kenya’s...
progress in improving reproductive health outcomes have not been consistent across all of its 47 counties, as depicted in Figure 1. Modern contraceptive prevalence rate (mCPR) in the northern arid/semi-arid lands (ASAL) inhabited by nomadic communities is still very low, ranging from 2% to 10%.3

Seminomadic and nomadic people face multiple barriers to health care access, including geographic isolation, lifestyle, sociocultural dynamics, and logistical, political, and economic factors.4 Providing health care to nomadic people is known to be extremely complex, with barriers that include both external (geographic isolation, sociocultural dynamics, and logistical and political factors) and internal factors (lifestyle, norms, practices, and perceptions). A systematic review by Ali et al. identified a combination of fixed and mobile services can be effective in addressing the reproductive health needs of nomadic populations.5 The introduction of volunteer CHVs within these populations can improve the connections between nomadic communities and the health system and facilitate their access to modern health systems, especially reproductive health care.6

In recent years, the Kenyan Ministry of Health and county governments have been working with other nongovernmental organizations (NGOs) to strengthen the design of community health units for nomadic communities in the northern ASAL counties of Kenya, as part of the overall community health strategy. This strategy focuses on providing girls and women with family planning and reproductive health services to address the inequity in reproductive health outcomes, such as the low mCPR (Figure 1). However, the success of these community health units depends on sustainable, regular access to health commodities.7,8 NGOs supporting the government to strengthen community health services in the ASAL communities identified that unreliable and nonexistent supply chain procedures and processes are one of the primary risks to achieving a functioning community health unit. The Supply Chain Alternatives for Last Mile Equity (SCALE) project, described in this article, was designed to address this risk by designing sustainable, scalable supply chain solutions for the unique challenges of this population in line with the county government efforts to improve the health and well-being of these communities through a community health strategy that is specific to the needs of this population.

Community health programs globally are often hindered by poor availability of health commodities.9 Evaluations across multiple Eastern

![Unreliable and nonexistent supply chain procedures and processes are one of the primary risks to achieving a functioning community health unit.](image)

**FIGURE 1. S-Curve for Modern Contraceptive Prevalence Rate in Kenya, by County**

![S-Curve for Modern Contraceptive Prevalence Rate in Kenya, by County](image)

---

*From the 2014 Kenya Demographic and Health Survey.*
and Southern African countries shows that community health supply chains are rarely designed deliberately or purposefully for the community level context and often lack appropriate procedures for inventory management, replenishment, and data recording and reporting. Often there is little to no visibility at the national or subnational levels into stock levels at the community level, and data are not used for decision making, which leads to inadequate stock for community-based distribution, facility level stock-outs, and product wastage.\textsuperscript{10}

Previous experience in designing supply chains for community health workers found that the “gold standard” is a supply chain design that combines a demand-based resupply with real-time reporting, such as a mobile system that makes stock data visible to all levels of the health system simultaneously to enable rapid decision making. The findings also highlight the importance of strengthening capacity to use the data for monitoring supply chain performance and promoting local problem solving based on data through the implementation of data review meetings.\textsuperscript{10}

The SCALE design team identified cStock, a proven supply chain approach for CHVs, as a starting point for designing a system for these nomadic CHVs. Originally implemented in Malawi, cStock was later redesigned for Siaya County, Kenya (Box 1). The approach combines a simple digital solution that is flexible enough to support areas of low cellular network and offline data entry.\textsuperscript{11,12} The tool is designed to support supply chain best practices, such as demand-based resupply, and provides dashboards to facilitate system-wide data visibility and transparency. The approach also includes data review meetings that strengthen the use of data and local problem solving for supply chain challenges.\textsuperscript{11}

Recognizing that the context in the northern ASAL counties of Kenya was likely to be vastly different from the context in which cStock has previously been implemented, we considered redesigning cStock with this new group of users to be critical to the project’s success. The design team expected the differences to include lower literacy including digital literacy, migration interrupting access and timing of resupply, and unknown social and cultural behaviors that could impact CHVs’ relationship to their supervisors and the health system that might impact the supply chain.

Human-centered design (HCD) offered an approach that could help the design team understand and address the social and cultural barriers by engaging the CHVs and these communities in the redesign. HCD sees users as an essential source of knowledge of their lives and contexts and emphasizes iterative end-user involvement during all stages of the design process. The HCD approach enabled the design team to understand how to incorporate supply chain best practices into a community health model for remote areas and adapt the design of digital technology solutions for this challenging and complex context.

METHODS

HCD is not explicitly a research methodology but incorporates a series of mixed qualitative methods to achieve design objectives.\textsuperscript{13} HCD is a multistage problem solving process that requires designers to conduct research to understand the users and subsequently test solutions in real-world scenarios with actual users. The HCD process for this 3-year project took more than 7 months (February to August 2019) in 4 phases: (1) understanding intent, 1 month; (2) research and insights, 3 months; (3) ideation and prototyping, 2 months; and (4) supply chain design and requirements building, 1 month (Figure 2). Recognizing the context was challenging, we expected from the project’s outset that the first year would be dedicated to designing the intervention and that it would take time to understand and design a suitable system.

1. Understanding Intent

The intent phase resulted in a 1-page intent statement, documenting the shared understanding among the design team of the broad questions, objectives, target groups, approach, risks, and

\textbf{BOX 1. cStock in Malawi and Kenya}

In Malawi, cStock was introduced in 2010 and is a simple short message service (SMS)-based reporting and resupply system. CHVs report stock data through their personal mobile phones to a web-based dashboard, where resupply quantities are automatically calculated based on past consumption and a request is sent to supervisors.

In Siaya County, Kenya, in 2017, cStock was redesigned to include a smartphone application as well as SMS, as smartphone use increased across the region. CHVs are able to use either method for reporting data depending on their access to smartphones and data coverage. cStock was embedded within the national health management information system, and data can be accessed on dashboards at all levels of the health system.
The intent identified was to design a supply chain and digital solution that addresses the CHV challenges, facilitate their commodity management responsibilities, and recognize the broader cultural and societal beliefs, norms, and rituals. This statement was used as a living document and iterated upon throughout the project.

Then, the design team developed personas based on our target community for this project: CHVs, women of reproductive age, community leaders, and husbands. The design team was primarily composed of Kenyans with representation from our target regions. Through the personas, the design team captured what they thought they knew about the motivations, challenges, and beliefs of the community based on their personal experience. The personas were used to create lines of inquiry for the research, and research guides and tools were designed for each persona group. The design team continued to iterate on the personas throughout the research phase and refine their personas during their insight generation sessions to ensure they reflected the types of people they talked to (Box 2).

### 2. Research and Insights

Data were collected in 2 of the 4 project counties, Wajir and Samburu. The research centered on 4
objectives to understand: (1) infrastructure, access, capabilities, and the current state of the health system; (2) decision making, knowledge, and sources of influence; (3) gender dynamics and cultural norms; and (4) technology awareness, capabilities, preferences, and usage.

A combination of methods was used, including one-on-one semistructured interviews; observation and shadowing of supply chain actors, end-users, and county beneficiaries; and usability testing using the original cStock application from Siaya County. For both interviews and observations, a mixture of research guides and user mapping activities was used to help generate deeper insights.

We conducted interviews with 1 national MOH representative, 34 people in Samburu Central and East, and 27 people in Wajir Central and East (Table 1). The interviews were conducted in a location of the participant’s choosing, such as health facilities, CHVs’ houses, and walking with CHVs during community visits. Interviews began with trust-building techniques such as asking personal questions. Open-ended questions were used to discuss job requirements and challenges, supply chain challenges, health behaviors and preferences, and social networks and preferences in communication. Interviews also incorporated storytelling to bring out the nuances of the participants’ lives, work, and motivators. “Day in the life” mapping tools were used; these included templates to map out daily routines and network mapping templates to map important nodes within their social networks.

Observation was used to validate the findings from interviews by noting any differences between words and actions. This provides insight into relevant behaviors that the individual could not articulate. The design team conducted immersive observations of participants within their natural environments in an unobtrusive manner for periods ranging from several hours to half or three-quarters of a day at a time. Team members followed CHVs on their community visits, including into remote mountainous regions in Samburu and seminomadic settlements in Wajir, staying in the background and taking the time to gain empathy, garner insight, and put themselves into users’ shoes to incorporate their observations into the design phase. It is understood that participants likely alter behavior while being observed, however, this method in conjunction with usability testing and structured interviews can cross check data across methodologies and their limitations.

Our team also observed the usability of the original cStock app with CHVs in migratory communities. Usability testing guides with expected scenarios were developed to guide the testing. The design team loaded the original cStock application onto their personal phone and handed the phone to the CHV to observe how they navigated the application. A similar process was observed using short message service (SMS). Table 2 describes the original solutions and Table 3 outlines the scenarios used for the different rounds of usability testing.

Data from interviews, observations, and usability testing were analyzed using a HCD technique called “insight generation” — a set of data that clusters around an observation and gives a new (or validated) perspective. For example, an insight on the CHV supervisor’s role in reporting captured that CHVs verbally reported to their supervisors, who would then complete the report on the CHV’s behalf; in other situations, the CHVs entered the data, but the supervisor validated the

### Table 1. Participants Interviewed for Research on Designing Supply Chain Solution for Community Health, 2 Counties in Kenya

<table>
<thead>
<tr>
<th>Category</th>
<th>Samburu Central and East County (N=34), No.</th>
<th>Wajir Central and West County (N=27), No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>County and subcounty health management team members</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Health care workers including CHVs, CHV supervisors, health facility in-charges, nurses, and family planning coordinators</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Project partners</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Community members including WRA, matriarchs, husbands of WRAs, and community and religious leaders</td>
<td>17</td>
<td>5</td>
</tr>
</tbody>
</table>

Abbreviations: CHV, community health volunteer; WRA, women of reproductive age.
### TABLE 2. Four Key Supply Chain Solutions Designed for Community Health, 2 Counties in Kenya

<table>
<thead>
<tr>
<th>Supply Chain Solution</th>
<th>Old Solution</th>
<th>Problems Addressed</th>
</tr>
</thead>
</table>
| 1. Paper-based stock record: redesigned to be highly visual, with circles for tallying, illustrations of the product and disease/condition | Paper-based stock record used in Siaya County, Kenya, that was in English with no illustrations | CHVs’ low literacy levels  
CHVs verbally reporting to supervisors  
CHVs incorrectly recording data  
Lack of standardized tool used by all communities to report on logistics data |
| 2. cStock smartphone application: Redesign of the application that includes simplified navigation, context appropriate language, audio prompts, and visual cues | Original cStock smartphone application designed for Siaya County, Kenya | CHVs’ illiteracy and language barriers  
CHVs’ lack of understanding of supply chain terms and concepts  
CHVs’ login challenges/user friendliness |
| 3. CHV supervisor smartphone application: New cStock application for the CHV supervisors designed to be used to enter data for low literacy CHVs and to validate data plus allow for alternative supply arrangements during migration | Informal processes already in place | CHVs’ with low tech capacity and low literacy levels had difficulty with data entry and data quality monitoring  
Supervisors previously reporting on CHVs’ behalf but in a nonsystemized way |
| 4. USSD reporting system: Hybrid USSD and SMS reporting structure to be used by CHVs to report on supply chain data via a feature phone, eventually reiterated to be only USSD reporting | SMS only system used in Siaya County, Kenya | Some CHVs lacking smart phones  
CHVs’ challenges entering symbols for structured SMS option  
CHVs’ difficulty with case-sensitive SMS structure  
USSD only option has a time-out feature |

Abbreviations: CHV, community health volunteer; SMS, short message service; USSD, unstructured supplementary service data.

### TABLE 3. Usability Testing Scenarios for Original Supply Chain Tools and 4 New or Redesigned Supply Chain Solutions for Community Health, 2 Counties in Kenya

<table>
<thead>
<tr>
<th>Supply Chain Solutions</th>
<th>Usability Testing Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Original Tools</td>
</tr>
<tr>
<td>Paper-based stock record</td>
<td>Printed original form used in Siaya County, provided CHVs with mock data and asked to fill out the form with minimal instructions</td>
</tr>
<tr>
<td>cStock smartphone application</td>
<td>Uploaded original cStock application onto researcher’s phone. Provided CHVs with mock data and asked them to complete form with minimal instructions</td>
</tr>
<tr>
<td>CHV supervisor smartphone application</td>
<td>Not applicable</td>
</tr>
<tr>
<td>USSD reporting system</td>
<td>Provided CHVs with mock data and job aids for SMS and asked them to follow instructions to send SMS</td>
</tr>
</tbody>
</table>

Abbreviations: CHV, community health volunteer; SMS, short message service; USSD, unstructured supplementary service data.
data. Through a process of rapid synthesis in the field and extended office-based synthesis, the design team “made sense” of the data by connecting and consolidating the raw data into meaningful insights. Each individual captured their observations from the field research on sticky notes, without any analysis or interpretation. The design team then found themes by grouping similar insights together. Once observations were captured into themes, the design team identified similarities and differences across the counties and developed targeted insights that guided the designers to ask questions about the design and to devise innovative strategies.

3. Ideation and Prototyping

A 2-day ideation and prototyping workshop was held to validate, iterate, and create solutions based on the findings. The workshop brought together 35 representatives from a variety of stakeholder groups to redesign cStock: government officials, national medical stores, county pharmacists, digital solution providers, industry experts, implementing partners, and project staff. The facilitators shared insights and the refined user personas to bring the users’ voices into the process and closely reflect their needs in the design of the prototypes.

Based on the findings, the workshop participants identified 3 of the existing tools used in Siaya County required redesigning and 1 new tool needed to be designed to support supply chain data collection and strengthen supply chain monitoring and decision making. The participants used a prototype development worksheet to draw their designs. The participants were also given storyboard templates, wireframes for both unstructured supplementary service data (USSD) and smartphones, and pictures of already existing tools such as paper-based forms and the existing cStock application. Table 3 outlines the 4 solutions.

After the workshop, the design team developed higher-fidelity prototypes using different software and tools. One prototype of a paper-based stock record was developed in Excel and printed so users could be observed completing the form. For the 2 smartphone apps, clickable prototypes were developed using JustinMind software, which enables developers to create a prototype that simulates how the app would function on a phone, which in turn, enables the design team to observe the user experience. The prototype of the hybrid SMS/USSD system using feature phones (earlier-generation phones with button keypad) was illustrated on paper, and pre-populated messages were loaded on a real phone. The CHVs were instructed to enter messages in a feature phone provided by the design team. Depending on the user’s choice, the design team would send an SMS of what a real message response might look like.

Usability testing was then conducted using the high-fidelity prototypes of the 4 new and redesigned tools. The testing was conducted in Samburu East in 4 rural community units that tend to migrate more often and in areas of low internet connectivity and included 27 CHV supervisors and CHVs. Table 2 shows the scenarios used in usability testing.

4. Supply Chain System Design and Requirements Building

The HCD research focused on paper-based and digital tools for improving supply chain data visibility, recognizing that good supply chain data for decision making are essential for a strong supply chain. In addition to using the HCD approach, it was essential to design the supply chain procedures and processes to align the flow of community-level data and health commodities. A supply chain design methodology typically includes 4 key activities: scoping, analysis, design, and implementation.

HCD provided the required information for the scoping and analysis phases of supply chain design. As the supply process from the national warehouse to health facilities is well-established in Kenya, the focus was primarily on the last step in the supply chain—from health facility to CHV. The design team held a separate 2-day workshop with stakeholders including national-level representatives, county pharmacists, community health coordinators, and partner organizations. Using the personas for CHVs and facility-level staff generated earlier through the HCD process, the participants mapped how information and health products would flow from the central warehouse to the CHVs, taking into consideration any unique requirements for migration. The supply chain design provided the inventory rules needed to develop the requirements for rebuilding the cStock application.

RESULTS

1. Understanding Intent

The design team agreed the intent of the research was to understand how to design a supply chain and digital solution that addressed the challenges
of nomadic CHVs; facilitated their commodity management responsibilities; and recognized the broader cultural and societal beliefs, norms, and rituals. Personas were developed by the design team that included motivations, challenges, and beliefs. One example of a common assumption was that children and livestock were primary motivators for decision making in this community, and that women had a limited role in decision making especially regarding health and family planning.

2. Research and Insights

The research team identified insight summaries or themes that were derived from more detailed insights (Table 4). The insights are categorized into behavioral, supply chain, information system, human resources, service delivery infrastructure, and connectivity. Insights include specific insights for CHVs but also general insights for community members recognizing that CHVs are also members of the communities, and these constraints impact their ability to perform their role as a CHV.

Behavioral Insights

Behavioral insights played an important role in understanding migration behaviors across the 2 counties, elucidating similarities and differences. Migration behaviors are a key consideration for the design of the supply chain and the digital tools as it is important to design for the different locations where a CHV might be based. Communities in both contexts migrate in search of water and pastures. In Samburu, however, men move with their animals, leaving their women and children behind, meaning that CHVs will also likely stay behind. In Wajir, nomadic communities live in isolation from the general population; and once a decision to migrate is made, the whole community moves and establishes a settlement in the new location. Members from the community do visit nearby centers to trade and get basic supplies, offering opportunities to also collect health products. Nomadic migration has dramatically declined as members from the communities have children in school and take on casual jobs to earn a living. Mobile phones are the main mode of communication between the people who move and those left behind. Insight into health-seeking behavior explained that among nomadic communities, visiting health facilities is a collective (and rarely women-led) decision, requiring community endorsement before the visit to the facility. Insights into health-seeking behavior are noted; although they are less important to the design of digital solutions, these insights highlighted the importance of CHVs especially regarding accessing family planning for the women in this community.

Supply Chain Insights

These insights described key drivers and causes of stock imbalances—under- and overstocking—at health facilities that will be or are responsible for resupplying CHVs. One reason for stock imbalances at the health facility is that staff were not always using past logistics data (consumption and stock on hand) to calculate supply requirements, and as a result, the county pharmacists reported that they do not always trust the accuracy of the report.

A reason for low stocks was insufficient county-level budget allocations that resulted in an undersupply of commodities to facilities. Some overstocking of contraceptives was explained as being due to low demand, which sometimes resulted in expiries. These products are considered public health priority products and provided free (counties do not have to purchase them) and have in the past been distributed to the counties from the central stores regardless of demand. As partners work to address the factors behind low demand, the supply chain needs to be ready with good data visibility to respond to changing demand.

Information System Insights

Information system insights described poor use of national reporting tools for both service and supply chain data. Low literacy combined with the complexity of tools and insufficient quantities of forms resulted in low levels of reporting. Oral reporting is common, and CHVs rely on their children to help complete reports. Currently, no standardized CHV supply chain reporting tool exists that all communities use to report logistics data. The capacity to analyze and visualize data was inconsistent at supervisory and management levels of the system. Counties do not have the budget and capacity to maintain separate information systems and use the national health information system.

Human Resource Insights

Human resource insights reflected both common challenges across the public health system and those exacerbated by or unique to ASAL counties. Norms and standards in recruitment policies and processes were inconsistently applied. Both ASAL counties were characterized by severe shortages and inadequate distribution of health care
<table>
<thead>
<tr>
<th>Behavioral Insights</th>
<th>Relevance to Design</th>
<th>Illustrative Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomadic migration has dramatically declined due to the need for education, health, and demarcation of land.</td>
<td>Migration was less of an issue than originally assumed and some simple design considerations were required for resupplying CHVs during migration.</td>
<td>“People move in search of pastures and water. They move within the sub-county and rarely outside.” — County Health Management Team member, Wajir. “Communities here no longer migrate, land is being partitioned and allocated to the community.” — CHV, Samburu</td>
</tr>
<tr>
<td>In some communities, only men move with their animals, leaving their women and children behind.</td>
<td>As women and children were left behind, CHVs will also remain.</td>
<td>“I usually migrate and leave my wives in this home. When I migrate I take 1 wife . . . , I usually take the wife that doesn’t have any young children. I haven’t migrated for 5 years.” — Husband of women of reproductive age, Samburu</td>
</tr>
<tr>
<td>Members from the community do visit nearby centers to trade and get basic supplies.</td>
<td>In many situations, CHVs within these nomadic communities will have access to health facilities to collect supplies even if migrating.</td>
<td></td>
</tr>
<tr>
<td>Mobile phones are the main mode of communication between the people that move and the ones that are left behind.</td>
<td>The use of mobile phones is increasingly common and important for these communities.</td>
<td></td>
</tr>
<tr>
<td>Supply Chain Insights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health facilities, which will be or are responsible for resupplying CHVs, have stock-outs and overstocks.</td>
<td>Stock imbalances at facilities will result in stock imbalances with CHVs.</td>
<td>“Sometimes they make a blind order when they are in town.” — Subcounty Pharmacist, Samburu</td>
</tr>
<tr>
<td>Health facility staff do not routinely use data (demand data) to calculate supply requirements.</td>
<td>Health facilities need to have access and include CHV data in calculating their requests.</td>
<td></td>
</tr>
<tr>
<td>Insufficient county level budget allocations result in an undersupply of commodities to facilities.</td>
<td>A current lack of data visibility does not support transparency and accountability.</td>
<td>“There is too little allocation of funds to commodities, and this is demoralizing to health care workers.” — Subcounty health management team member, Samburu</td>
</tr>
<tr>
<td>Family planning products are supplied to the counties from the national medical stores even though demand is low, resulting in overstocking and expiries.</td>
<td>When counties do not request commodities, it can result in national level programs pushing out commodities.</td>
<td>“The uptake of FP is not high. We do not have supply chain issues for FP. We are generally overstocked rather than understocked” — Subcounty health management team member, Wajir</td>
</tr>
<tr>
<td>Information System Insights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of standardized supply chain reporting forms has resulted in ad hoc processes.</td>
<td>Standardized recording and reporting of supply chain data is critical for making data available to higher levels.</td>
<td>“I record commodities like condoms in a notebook, but other reports I do are MOH 513, 514, and MOH 100.” — CHV, Samburu</td>
</tr>
<tr>
<td>Service-related forms were in place but poorly used due to their complexity and unavailability.</td>
<td>Reporting forms must be suitable for low literacy CHVs to ensure complete and timely reporting.</td>
<td>“Some of the CHVs know how to read and write. The ones that don’t know how come to me, and I do it for them (reporting) like their end of month report.” — CHV supervisor, Wajir</td>
</tr>
<tr>
<td>Some county and subcounty level but very few facility-level staff have skills to visualize and analyze data.</td>
<td>Facility staff need to be trained to use the data reported by CHVs to inform resupply and ensure CHVs get the commodities they need.</td>
<td></td>
</tr>
</tbody>
</table>

Continued
workers at facility and community levels. Human resource shortages are exacerbated during the rainy seasons when the communities migrate closer to the towns, resulting in long queues at health facilities and burnout among health care workers. High attrition among CHVs, who receive inadequate support and stipends, affects service provision at the community level. In both counties, CHV training often relies on externally funded activities, and recognition and award systems are in place but do not always function, even for health facility staff.

**System-Related Insights**

System-related insights described the reality of current structures and where opportunities and gaps existed. Mobile clinics have been set up in both counties to support nomadic and seminomadic communities at strategic locations, such as community watering points. At the time of research, most clinics were either not operational or not fully utilized due to inadequate funding and support. However, efforts to strengthen these clinics is underway and could supply CHVs with supplies in the future. In contexts where communication is constrained by distance, connectivity, and other inhibiting factors, meetings tend to happen with or without external partner support. However, community-level meetings may occur irregularly due to connectivity challenges and the distances CHVs must travel.
**Connectivity Insights**

Connectivity insights showed that 63% of the CHVs engaged during the first round of usability testing in the research phase had or regularly used a feature phone, 27% used a smartphone, and 9% did not use any type of phone. It should be noted this project did not include funds for procurement of devices so only existing devices could be used. Network connectivity was poor, and electricity to charge phones was sporadic. Many CHVs would travel to the nearest urban centers and facilities to charge their phones. Some facilities had no access to telecom services at all. Use of WhatsApp was high among facility staff, but they reached CHVs via phone calls. A few CHVs had smartphones issued by partners but struggled to use them for anything other than voice communication with family and friends.

**Usability Testing Insights**

Learnings evolved through the iterative process for usability testing (Table 2). During the research phase, the design team conducted usability testing using the original cStock application. Findings showed that the original app was not intuitive. Users struggled to navigate the multiple complicated steps and required guidance. CHVs had limited understanding of English and Kiswahili, and so they did not understand the language used in the app. Users had even more challenges with the SMS version of cStock and struggled to write structured messages that required letters, numbers, and symbols for sending reports.

We observed that usability varied by literacy levels among the participants. Literate CHVs were able to use the application, whereas those with low literacy struggled. Literacy levels also determined CHVs’ ability to complete paper-based tools and understand supply chain terminology. CHV supervisors and health facility staff demonstrated higher technology capabilities but had limited knowledge of the supply chain and ability to interpret simple data visuals, such as graphs and tables.

**3. Ideation and Prototyping**

The ideation and prototyping workshop resulted in 4 principles for design.

1. For the system to be sustainable, it had to be applicable for all CHVs across Kenya; these counties alone do not have the capacity or budget to maintain the software. CHVs would need to use personal phones as procuring devices was not possible; county budgets are limited and maintaining broken or lost devices over the long term was not feasible.

2. Poor connectivity and limited power sources would not allow real-time data entry. Thus, the solution could not be entirely digital, and paper-based tools would be necessary. However, the paper-based forms could be designed to be more intuitive and appropriate for the variations in skill levels.

3. Illiteracy was high among these CHVs in these counties, and supervisors needed to be able to play a more active role in supporting CHVs.

4. The digital solution needed to be as intuitive as possible and should not require major changes to behaviors and attitudes.

The workshop also led to the development of 2 models for data flow and 4 supply chain tools to improve data availability and use. In Model 1, supervisors enter or validate supply chain data on CHVs’ behalf, using a supervisor’s cStock application. In Model 2, CHVs with sufficient literacy enter the data directly into a smartphone application or USSD (Figure 3). The participants agreed that the goal should be to graduate all CHVs from Model 1 to Model 2 over time. Model 1 would be a temporary solution. After the initial training, the CHV supervisor would use monthly meetings to conduct on-the-job training to all CHVs with an eventual goal that all CHVs will enter their data either via USSD or the application. The 4 supply chain solutions as previously mentioned were a paper-based stock recording form; a redesigned, user-friendly cStock app; a supervisor version of the cStock app; and a SMS/USSD hybrid reporting prototype (Table 3).

When high-fidelity prototypes of the supply chain solutions were developed, a second round of usability testing revealed that the redesigned smartphone application was easier to use than the previous cStock. Users found it intuitive and were able to learn how to use it relatively quickly. CHVs had the most difficulty using the SMS/USSD prototype, even when they were more familiar with a feature phone. Across literacy levels, most users found it confusing to enter data in the structured manner required to report by SMS/USSD and switch between SMS and USSD. Responding to this finding, the design team decided to remove the SMS portion of the fourth (reporting) prototype and use only USSD. The usability testing also revealed that literacy and numeracy levels were
not comparable. Most CHVs could count well and found ways to communicate counted numbers even if they had low literacy.

4. Supply Chain Design and Requirements Building

The supply chain design workshop yielded a standard system design mapping process from national level to community level, plus alternate processes for when CHVs were migrating. Figure 4 outlines the flow of commodities and data as mapped during the supply chain design workshop. As the supply chain processes to the health facility level are well-established in Kenya, the workshop focused primarily on the last step in the supply chain. The commodity list for the CHVs in these counties was still being discussed at the time of writing but included some basic supplies for treating worms, diarrhea, and malaria, as well as contraceptives.

Two options were identified for a migrating CHV: they could receive double the quantity of commodities for the migration period or they could collect supplies from an alternative health facility during migration. CHVs could choose depending on what was more convenient: carrying more supplies or accessing another facility. Approval for the alternative arrangement rested with the CHV supervisor. The requirements for the application were developed to allow the supervisor to adjust the settings in the application to account for the change.

DISCUSSION

HCD approaches facilitated the design of an innovative supply chain and digital solution to address challenges faced by CHVs in hard-to-reach areas and nomadic communities with complex socio-cultural factors and to support the county government in improving access to health care and the overall health and well-being of these communities. Common methods used for supply chain design might not have achieved the insights and empathy gained from the HCD process and the structured, cocreative process used for translating findings into feasible, acceptable solutions. Traditionally, supply chain assessments primarily look to health care providers as their source of information. Insights generated from interacting with a variety of stakeholders, not just health care providers, highlighted contextual barriers that affect nomadic CHVs and the recurring challenges that influence the supply chain system generally.
between CHVs and their community, supervisor, and health facility.

HCD provided insight into the needs of the people who would benefit from the innovation and helped create novel approaches to meet these needs and deliver solutions that would work in this socioeconomic context. The research techniques used provided deep insights into this complex community. For example, interviews were conducted in a place chosen by the interviewee. This ensured that each interviewee was in familiar surroundings and felt comfortable, which facilitated more genuine, meaningful interactions and responses. Interview guides ensured coverage of important lines of inquiry, while also enabling flexibility to dive into and follow the users’ stories. “Day in the life” mapping tools allowed participants to visually impart information that would have been hard for interviewees to articulate or for the design team to document as observations.

The HCD technique of cocreation supported stakeholders in a constructive, creative, and inclusive process that encouraged contributions and ideas from different perspectives. Insights from the exploratory research were critical to ensure that stakeholders truly understood the end users. These insights also informed the overarching principles for the design. The 4 design principles (addressing sustainability, connectivity challenges, illiteracy, and ensuring intuitive usability) led the design team to identify the 2 distinct models for data flow to accommodate differing levels of skills, motivations, and contextual elements within the health system in northern Kenya. Model 1, which includes the supervisor’s app, built on the behavior observed during the fieldwork, where supervisors would complete or validate data on paper-based reporting for CHVs with low literacy. Model 2 was designed for CHVs who have the capacity to enter the data directly into a digital solution. The design team agreed that ultimately all CHVs would graduate to Model 2 once they had capacity for self-reporting as outlined in Figure 3.

The iterative usability testing for the 4 prototype tools facilitated continuous learning and adjustment of the design. Table 5 outlines the outcomes of the usability testing and how it changed the overall design. Usability testing is a widely used user-centered technique that evaluates a product’s design and function and the degree to
<table>
<thead>
<tr>
<th>Supply Chain Solution</th>
<th>Positive Results</th>
<th>Negative Results</th>
<th>Changes Made in Final Iteration</th>
</tr>
</thead>
</table>
| Paper-based stock record             | 1. Most pictures worked well in assisting the CHV to identify the commodity and the symptoms it treats  
2. The circles used in counting the commodities helped those who could not write numbers  
3. When supply chain terms were explained in Swahili, it increased understanding of the action that CHVs needed to do in reporting  
4. If there was a color picture of the actual commodity, this helped CHVs to identify it | 1. Some CHVs had challenges identifying some icons (e.g., family planning method and the avoiding pregnancy icon)  
2. CHVs found it difficult to find where to enter their names  
3. CHVs were familiar with reporting data horizontally (rows) rather than vertically (columns)  
4. Users generally ignored the “units” column and counted based on what they were used to  
5. Some users found the shading of circles difficult, making it difficult to total and some recorded by using tally lines through each circle  
6. CHVs with low literacy could not identify different columns with supply chain terms  
7. Some CHVs entered their age as opposed to the year which the report is being submitted | 1. Changed icons that were confusing to users  
2. Moved CHV names and their details to the left of the document  
3. Changed Month, to Month of Report and Year of Report to clearly define purpose of cell  
4. Included clear visual distinction between commodities such as a gray bar between commodities and the alternate shading of horizontal rows  
5. Used horizontal rows instead of columns for each commodity  
6. Included colloquial or familiar terms for some commodities (e.g., dewormers for albendazole)  
7. Added Swahili translations in brackets under existing supply chain terminology |
| Redesigned cStock smartphone application | 1. The audio was the most appreciated feature by the CHVs as it helped identify the commodities  
2. The icons allowed for CHVs to identify commodities based on look rather than text  
3. The CHVs were also able to identify icons that they had previously seen in the paper recording tool  
4. The back and next arrows were understood by some of the CHVs  
5. They were able to scroll down the months when selecting the period for reporting | 1. CHVs found some of the icons confusing because they were not representative of reality  
2. Some CHVs clicked the icons and not the buttons when selecting which reports to send  
3. Most CHVs had difficulty identifying the fields to enter their data  
4. Some users understood the arrows to mean “next,” but other users did not | 1. Changed the receiving and dispensing icons based on user feedback  
2. Added audio for most icons  
3. Changed the icon for audio from a speaker to a person speaking  
4. Changed commodity icons to reflect the commodities’ actual look  
5. Changed icons to match the revised paper tool  
6. Included navigation arrows, as well as buttons with “next and back” to allow multiple paths to navigate the app |
| CHV supervisor smartphone application | 1. Supervisors appreciated the prototype  
2. The user experience was easy, and they were able to generally follow it with ease  
3. The tech was easy to use, even at various levels of technology literacy | 1. Some supervisors were not able to relate how the dashboard related to the paper-based resupply worksheet  
2. The validation section of the app was confusing due to unclear wording  
3. Most CHVs found the section added for additional CHVs (CHVs that migrate into your area) confusing | 1. Made it clearer that resupply values were the total amounts received from the facility  
2. Changed column heading for the checkboxes in the validation page  
3. Relabeled additional CHV section in dashboard to articulate that those are CHVs who have migrated to the area |
which it meets users’ expectations and needs. The use of high-fidelity, clickable prototypes enabled early, frequent usability testing before time and money were spent on software development. For example, usability testing revealed that CHVs were able to learn how to use a simpler digital solution that used more visual cues and required less steps. The testing also demonstrated that CHVs with low literacy were numerate, which informed the design team that the solutions could include tallying of data. For the paper-based forms, the design team made adjustments during testing to ensure that CHVs understood the illustrations and could navigate the tools. Thus, this iterative, user-based process resulted in truly innovative tools that were more user-friendly, more appropriate, and more likely to be used by CHVs.

Further research is required to fully understand the benefits of HCD in the design of supply chain and digital health solutions for this population. Its benefits might include fewer post-implementation iterations of tools, better uptake and acceptance of solutions, and improved sustainability. As the tools and systems are rolled out to these communities in the ASAL counties of Kenya over the next year, HCD will continue to be used during the process of implementation. The design team will continue to observe and listen to the users, and will adapt solutions and processes to address their needs—and will then observe the longer-term benefits and potential cost savings of using the HCD process prior to implementation.

**Limitations**

HCD has some limitations. Compared to other program design approaches, HCD and systems analysis can take a greater time investment up front (in this case it took 7 months). The approach requires significant time before implementation to conduct the research (2 to 3 months), thoroughly understand the end users (and establish trust with them), and develop and repeatedly test the design and high-fidelity prototypes of the solutions (2 to 3 months). This HCD process was longer than an average process, as it did focus on a particularly complex environment, and 4 different solutions were designed, tested, and iterated. This long lead time can result in some frustration for users and partners who are enthusiastic about finding solutions to their challenges. However, the alternative of quickly developing a product and then testing usability may result in the solution requiring major changes since it was designed for the user but not with the user. HCD, which centers on designing digital solutions in complex environments, may potentially result in less time spent overall since uptake is faster and more intuitive and fewer iterations to the tools are required after implementation; however this needs to be evaluated.

HCD when implemented in its purest form can take a long time and is resource-intensive. However, there are different ways to integrate HCD in a project that could shorten the time for the design process. In this instance, it was combined with training project staff in the methodology; alternatively, an experienced external design team could have been hired and the process would be faster but more expensive. It should be noted that HCD requires specialized expertise to lead the process, and individuals working in governments of low- and middle-income countries may not have these skills. At this time, HCD is a specialized methodology that requires external assistance. HCD is most suitable to solve complex problems, such as the one described in this article, where previous health interventions have failed.

In this project, we combined HCD with system analysis and supply chain design methodologies that supported the design team to also consider a

### TABLE 5. Continued

<table>
<thead>
<tr>
<th>Supply Chain Solution</th>
<th>Positive Results</th>
<th>Negative Results</th>
<th>Changes Made in Final Iteration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid USSD and SMS reporting system (Paper prototype)</td>
<td>1. A large number of the CHVs interviewed had a feature phone as their main phone</td>
<td>1. This prototype was the most difficult for all CHVs, both literate and low literate 2. CHVs were not able to switch from USSD to SMS. They entered data on the dial pad and not the SMS</td>
<td>1. Needed to be redesigned to only USSD and significant tests were done to ascertain its usability in these communities</td>
</tr>
</tbody>
</table>

Abbreviations: CHV, community health volunteer; SMS, short message service; USSD, unstructured supplementary service data.
wider system strengthening perspective.\textsuperscript{19} We saw this as necessary in our highly complex social and cultural context. However, this approach has the potential disadvantage that it results in a highly context-specific solution that may not be applicable in other contexts. For this project, the redesigned cStock application and USSD is being implemented in Samburu County; this will provide valuable insights into whether the redesigned cStock is well adopted in more traditional community health units or if it is highly context-specific to the ASAL counties. HCD can also be narrow in focus, converging on certain complex problems and specific user challenges and not focusing on the larger system challenges. Another limitation of HCD is that it does not entail rigorous research nor does it provide quantitative data for measuring the impact or outcomes of the program. As with other social and behavioral methodologies, HCD may need to be complemented by traditional evaluation methodologies to generate evidence of program effectiveness.

**CONCLUSION**

CHVs in marginalized, nomadic communities live and work in a complex environments. Health services and tools need to be designed to address the unique needs of these communities if health systems are to improve universal access to health care and reduce health inequities. By incorporating the voice of CHVs and their communities, HCD approaches facilitated the design of innovative digital health solutions to support a data-driven supply chain that reflected the needs and expectations articulated by the CHVs and thus is more likely to be used and owned by CHVs. Further evaluation is required at the end of project to assess and reflect on the value of HCD in designing effective digital solutions that have high rates of uptake in complex settings. To ensure that the larger goal of improving access to health commodities and contributing to improved health outcomes of the population is reached, an evaluation should also consider standard performance metrics to assess the supply chain and availability of essential medicines.\textsuperscript{20}

**Acknowledgments:** We acknowledge the Government of Kenya for their partnership and commitment throughout the work described in this article. In particular, we thank the Head of the Community Health Department and their team, the Head of the Reproductive Health Program and their team, and the County Governments of Samburu, Turkana, and Wajir, as well as the health care workers in these counties. We are also grateful to our partners at Save the Children in Wajir and Amref Health Africa in Samburu and Turkana for their collaboration and input. The authors also thank the reviewers and administrative staff within InSupply Health and JSI who supported the production of this article, as well as the implementation teams and partners on the ground in Kenya who supported the work described in this article. We would like to thank colleagues at the Bill & Melinda Gates Foundation for their thought leadership and support of this project.

**Funding:** This work was funded by the Bill & Melinda Gates Foundation.

**Competing interests:** None declared.

**REFERENCES**

Peer Reviewed

Received: July 29, 2020; Accepted: November 12, 2020


© Andersson et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00378
FIELD ACTION REPORT

Early Lessons From Launching an Innovative Community Health Household Model Across 3 Country Contexts

Daniel Palazuelos,a,b,c Lassana M. Jabateh,d Miry Choi,d Ariwame Jimenez,e Matthew Hing,a,f Mariano Matias Iberico,g,h Basimenye Nhlema,h Emily Wroea,b,c

Key Findings

Assigning community health workers to households, as opposed to individuals, is a feasible and functional method for structuring how community health can contribute to implementing universal health coverage.

Key Implications

Program managers should consider how to adapt international best practices for their unique contexts. The Partners In Health experience with implementing a new approach across 3 new program sites in 3 countries suggests that this is best done by both providing clarity on program architecture and also funding mechanisms for frontline program leadership to visit and learn from each other in situ.

Policy makers should consider how community health programs can be structured as extensions of functioning health systems into households for all diseases and all age groups, as this provides a platform for working effectively toward universal health coverage.

Resumen en español al final del artículo.

ABSTRACT

Community health workers (CHWs) are integrated into health systems through a variety of designs. Partners In Health (PIH), a nongovernmental organization with more than 30 years of experience in over 10 countries, initially followed a vertical approach by assigning CHWs to individual patients with specific conditions, such as HIV, multidrug resistant-TB, diabetes, and other noncommunicable diseases, to provide one-on-one psychosocial and treatment support. Starting in 2015, PIH-Malawi redesigned their CHW assignments to focus on entire households, thereby offering the opportunity to address a wider variety of conditions in any age group, all with a focus on working toward effective universal health coverage. Inspired by this example, PIH-Liberia and then PIH-Mexico engaged in a robust cross-site dialogue on how to adapt these plans for their unique nongovernmental organization-led CHW programs. We describe the structure of this “household model,” how these structures were changed to adapt to different country contexts, and early impressions on the effects of these adaptations. Overall, the household model is proving to be a feasible and functional method for organizing CHW programs so that they can contribute toward achieving universal health coverage, but there is no “one-size-fits-all” approach. Other countries planning on adopting this model should plan to analyze and adapt as needed.

BACKGROUND

Although community health workers (CHWs) are an essential part of the health workforce, how to best incorporate them into health care systems continues to generate considerable debate and innovation. The scope of work given to CHWs often reflects larger assumptions and ambitions; in the era of selective primary health care and vertical funding for only select diseases, CHWs were usually positioned to focus on individual patients, on only a small number of priority conditions, or primarily on prevention efforts. In the recent push for universal health coverage (UHC), CHWs are increasingly called to focus their energies on entire households and individuals with multiple diseases.
The Household Model at Partners In Health

Partners In Health (PIH), a nongovernmental organization with more than 30 years of experience working in over 10 countries, has responded to the UHC call by incorporating a CHW approach, called the “household model” (HHM), in 3 countries where larger health care system strengthening partnerships already exist. PIH always works within the public sector, and any clinical spaces or materials provided are done in partnership with the national ministries of health (MOHs), with full ownership maintained by the public sector. The HHM approach has been a PIH initiative to demonstrate to MOH colleagues the benefits of providing CHW coverage to every household in a service area to detect, refer, and follow up on a range of priority health issues through regular home visits (Figure). This integrated approach supports the broader needs of entire households and is presented as a feasible and scalable mechanism for further expanding UHC by linking the household to the health system. Although structuring CHW workflow via home visits has historically been a core experience of both successful nongovernmental organization programs (such as the census-based impact-oriented model in Bolivia) and exemplar national programs (such as in Costa Rica), PIH set out to adapt and modernize the tools and techniques from such experiences for 3 new contexts. The authors of this article engaged in a robust cross-site dialogue to spark further innovation and improve quality in their respective programs. The most important insights have been captured here via an online collaborative authoring process in which the first author (DP) provided the article’s structure, and then authors from each program added text, comments to other authors’ additions, and edits. The first and final authors then sculpted a final product that responded to peer reviewers’ comments.

- **COUNTRY SPECIFICS**

  **Malawi**

  Malawi is one of the poorest nations on the planet, and health spending per capita is only US$35 (as of 2018). PIH began working in the remote district of Neno, Malawi, in 2007 to support the MOH in responding to the growing burden of HIV and TB. Locally known as Abwenzi Pa Za Umoyo, in partnership with the government, PIH built 2 government

---

**FIGURE.** Diagram of the Partners In Health Household Model

Abbreviation: CHW, community health worker.

a Cartoon images courtesy of Mango Tree, Jesse Hamm, Petra Rohr-Rouendaal, and Rebecca Ruhlmann.
hospitals and revitalized several facilities, connecting them to a wide network of CHWs who provided direct support to HIV and TB patients. Combined with efforts in staffing and supply chain, Neno district achieved the highest rate in the country for retention in care for people living with HIV, improved uptake of maternal services, greatly expanded care for noncommunicable diseases (NCDs), and provided services for diseases that are generally undertreated in rural systems, such as Kaposi’s Sarcoma. In 2016, Abwenzi Pa Za Umoyo started transitioning their CHW program to the HHM, in which CHWs were expected to visit each of their assigned households monthly with the goal of becoming the “foot soldiers” for health surveillance assistants (HSAs), the national CHW cadre in Malawi. HSAs largely focus on curative care in health posts, and the HHM supports them by focusing more on active case finding and referral, education, and treatment support for chronic diseases in the home. Data from routine HHM visits are aggregated for monitoring and supervision purposes and reported to the HSAs and the MOH. To determine whether the HHM is effective and to understand any unintended consequences, the team is currently analyzing a stepped-wedge randomized trial of the program.

Liberia

Liberia is also one of the poorest nations on the planet, and health spending per capita is only SUS45 (as of 2018). PIH began working in Liberia in response to the Ebola epidemic of 2014–2016. Committed to supporting the government to rebuild the health system, PIH maintained operations after the epidemic subsided. Similar to Malawi, the PIH team in Liberia revitalized a government rural hospital and connected it to a growing network of CHWs who focused on supporting individual patients with HIV, TB, or leprosy. These CHWs were seen as critical for helping to achieve some of the best clinical results in the country for these diseases. After the Ebola epidemic, the Liberian MOH launched a community health program that focused primarily on supporting CHWs in remote communities more than 5 kilometers from the nearest health facility. These CHWs—called community health assistants (CHAs)—provide a polyvalent package of primary health care services and epidemic surveillance in 15 counties, serving approximately 29% of the total Liberian population. The Liberian MOH is currently finalizing a strategic plan to launch another cadre—called community health promoters (CHPs)—for communities located within 5 kilometers of a health facility. Since September 2019, PIH has been a key collaborator in helping to form and refine the strategy for the CHP cadre by partnering with the government to launch a CHP experiment that utilizes the HHM approach to organize how the CHPs engage with beneficiaries within 5 kilometers of 1 PIH-revitalized rural hospital in Maryland county, Liberia. The program’s goal is to leverage CHW referrals to increase health facility utilization, improve retention in care, and build trust between the community and the health system. Embedded in the roll-out of the PIH program
is a pre- and post-demographic and health survey to provide evidence on the program’s impact.

**Mexico**

Mexico is an upper middle-income country, but there remain pockets of the country, such as in the southern state of Chiapas, that struggle with extreme poverty and very limited access to quality health care. PIH supported community health efforts in Chiapas, Mexico, for nearly 2 decades before officially launching PIH-Mexico (locally known as Compañeros En Salud, or CES) in 2011. Working with the local health authorities in rural communities in the Sierra Madre mountains, CES revitalized nearly a dozen rural clinics and connected them to 4 cadres of CHWs (locally known as Acompañantes) that were initially focused on providing treatment support for: (1) NCDs, (2) maternal and newborn health, (3) mental health, and (4) child development and nutrition (including early childhood stimulation). Although a stepped-wedge analysis showed that the NCD-focused CHW program had helped achieve some of the best rates of clinical control for NCDs in the region, the team saw the potential for the NCD and maternal/newborn health cadres to be collapsed into a single cadre through the HHM. In 2019, after regular consultation with the teams in Malawi and Liberia, the Mexico team piloted a new CHW program that moved away from a physician-directed vertical care model, toward a model where CHWs had more autonomy to use algorithms for screening, follow-up, and referral to the health center.

**THE HHM CROSS-SITE LEARNING INITIATIVE**

Teams in Malawi designed the PIH approach on how to assign CHWs to households, including relevant programmatic architecture. They then worked with community health leadership in Liberia and Mexico, both remotely and on-site, to adapt these plans for their contexts. We offer a review and comparison of internal programmatic decisions and iterative adjustments as the programs were adapted to different local realities. Programmatic inputs and parameters decided upon per country are shown in the Table.

**Benefits of Adopting the HHM**

**Greater Coverage of Multiple Health Conditions, Integration with Health Facilities, Acceptance, and Social Connectedness**

In Malawi, expanding from HIV/TB to several other conditions, initial data demonstrate improved uptake of antenatal care, improved communication across health facilities and CHWs, and greater social connectedness. In Mexico, adding clinical tasks to the scope of work (e.g., blood pressure/diabetes screening) led some community members to express seeing greater credibility in the CHWs’ work. In Liberia, vulnerable communities within 5 kilometers of a health facility face significant barriers to care beyond geographic barriers; the CHWs’ greater presence in households through regular visits is providing a format by which to build greater familiarity with, and trust in, the health care team.
Greater Opportunities to Focus on “Upstream” Determinants of Health

In Liberia, the arrival of the CHP program presented an opportunity to reengage with previously dormant community health committees in the region where PIH works. These committees were elected by the community to collaborate directly with the CHPs on identifying the community’s needs and coordinating health messaging. Embedding CHPs within community social structures increased their legitimacy and opened new opportunities to address public health issues. One CHP, for example, worked with their community health committee to organize a local cleanup of trash.

Greater CHW Autonomy

With more disease priorities to focus on, and a wider range of ages, the CHWs have had to seek greater autonomy to address the myriad challenges that arise. In Malawi, for example, the CHWs came to know the complexities of their households such that they could decide which to visit more or less frequently. In Liberia, some CHPs and their supervisors independently planned health outreaches to other communities not yet integrated into the HHM. In Mexico, the CHWs were transitioned from nurse- and doctor-led supervision to a more autonomous unit that coordinates with the local clinic but has freedom to make decisions that affect their workflow.
## TABLE. Characteristics of Each Partners In Health Household Model Across 3 Country Contexts

<table>
<thead>
<tr>
<th></th>
<th>Malawi: Community Health Workers</th>
<th>Liberia: Community Health Promoters</th>
<th>Mexico: Household Model Acompañantes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start date</strong></td>
<td>2017</td>
<td>2019</td>
<td>2019</td>
</tr>
<tr>
<td><strong>Number Currently Working</strong></td>
<td>1045 CHWs, 183 SCHWs, and 14 site supervisors</td>
<td>46 CHPs, 5 CHP-S, and 1 CHN</td>
<td>70 CHWs (currently being piloted in only 1-2 of 10 target communities)</td>
</tr>
<tr>
<td><strong>Catchment Area Served</strong></td>
<td>14 rural catchment areas (138,291 people)</td>
<td>7 peri-urban communities (10,369 people)</td>
<td>10 rural communities (11,645 people)</td>
</tr>
<tr>
<td><strong>CHW: Household Ratio</strong></td>
<td>1:20–40</td>
<td>1:40–60</td>
<td>1:30–40</td>
</tr>
<tr>
<td><strong>Frequency of Household Visits</strong></td>
<td>Monthly (daily for patients on TB treatment and those on first year of antiretroviral therapy)</td>
<td>Monthly (more often if there are specific patients getting intensive treatment support)</td>
<td>Monthly (monthly, biweekly, or weekly, depending on level of chronic disease control)</td>
</tr>
<tr>
<td><strong>Assigned Tasks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Monthly Home Visits</strong></td>
<td>• Provide health education</td>
<td>• Monitor and screen household members for symptoms related to 8 priority health areas (TB, HIV, STIs, NCDs, family planning, maternal and neonatal health, child health and pediatric malnutrition)</td>
<td>• Provide health education</td>
</tr>
<tr>
<td></td>
<td>• Monitor and screen household members for symptoms related to 8 priority health areas (TB, HIV, STIs, NCDs, family planning, maternal and neonatal health, child health and pediatric malnutrition)</td>
<td>• Monitor and screen household members for symptoms related to 8 priority health areas (community event-based surveillance, reproductive, maternal, and neonatal health, child health, HIV, TB, leprosy and other neglected tropical diseases, mental health, and NCDs)</td>
<td>• Monitor and screen household members for symptoms related to priority health areas (hypertension, diabetes, family planning, maternal and neonatal health, and child health)</td>
</tr>
<tr>
<td></td>
<td>• Provide basic treatment at doorstep for diarrhea and acute malnutrition in children</td>
<td>• Provide basic treatment at doorstep for diarrhea and acute malnutrition in children</td>
<td>• Provide basic treatment at doorstep for diarrhea and acute malnutrition in children</td>
</tr>
<tr>
<td></td>
<td>• Identify vulnerable families eligible for social support</td>
<td>• Identify vulnerable families eligible for social support</td>
<td>• Identify vulnerable families eligible for social support</td>
</tr>
<tr>
<td><strong>Linkage to Care</strong></td>
<td>• Refer or physically escort patient to health provider as needed</td>
<td>• Refer or physically escort patient to health facility as needed</td>
<td>• Refer or physically escort patient to health facility as needed</td>
</tr>
<tr>
<td></td>
<td>• Follow up on missed appointments</td>
<td>• Follow up on missed appointments</td>
<td>• Follow up on missed appointments</td>
</tr>
<tr>
<td><strong>Additional Visits for Chronic Conditions</strong></td>
<td>• Follow-up visit within 48 hours of referral or after escort to health facility</td>
<td>• Follow-up visit within 48 hours of referral or after escort to health facility</td>
<td>• Follow-up visit within 48 hours of referral or escort to health facility, 5 days after identification of moderate acute diarrhea, or every 2 weeks for moderate acute malnutrition</td>
</tr>
<tr>
<td></td>
<td>• Visit as needed for ongoing treatment adherence and psychosocial support</td>
<td>• Visit based on color risk code assigned by facility (daily, 8, 4, or 2 visits per month) for treatment adherence and psychosocial support</td>
<td>• Visit as needed, in coordination with physician, for ongoing support</td>
</tr>
</tbody>
</table>

*Continued*
<table>
<thead>
<tr>
<th>TABLE. Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Malawi: Community Health Workers</strong></td>
</tr>
<tr>
<td><strong>Outside the Household</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>CHW Selection</strong></td>
</tr>
</tbody>
</table>
Reduced Stigma for Patients and CHWs

In all 3 countries, a major concern of the patient-centered model was that home visits were a public announcement that someone had a particular disease (e.g., TB or HIV). As such, a number of patients had declined treatment support. In the HHM, a home visit could be for any family member for a wide variety of conditions, so anonymity was inherently easier to maintain. Similarly, because many of the CHWs in the previous model in Malawi and Liberia were themselves living with HIV, a common perception was that all CHWs working with PIH had HIV; this type of bias has not been seen with the HHM.

Challenges With Adopting the Household Model

Imperfect Coordination With Health Facilities Has Consequences

Patient satisfaction with the HHM is often determined by how they are received once referred to the clinic. In Liberia, the CHPs faced difficulties in

### TABLE. Continued

<table>
<thead>
<tr>
<th>Training Schedule</th>
<th>Malawi: Community Health Workers</th>
<th>Liberia: Community Health Promoters</th>
<th>Mexico: Household Model Acompañantes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 days foundational training and quarterly 1-day refresher trainings</td>
<td>2 months foundational training, regular refresher trainings</td>
<td>2 weeks of foundational training (theoretical + practical training and mentorship) with monthly continuing education</td>
</tr>
<tr>
<td>Supervision and Mentoring</td>
<td>1 SCHW assigned to 10 to 15 CHWs&lt;br&gt;• 4 CHW visits per month&lt;br&gt;• All CHWs visited per quarter using standardized form for feedback&lt;br&gt;• 3 households per CHW visited for spot checks</td>
<td>1 CHP-S assigned to up to 10 CHPs&lt;br&gt;• Visit all CHPs monthly&lt;br&gt;• Spend 1 day per week at the health facility to help patients referred by CHPs navigate health facility and access health services&lt;br&gt;• Facilitate monthly meetings of CHPs to collect data and discuss challenges</td>
<td>1 CHW supervisor assigned to 10 CHWs&lt;br&gt;• Hold monthly group meetings to discuss challenges, reinforce key competencies, restock CHW supplies, and schedule 1:1 mentoring meetings&lt;br&gt;• 1:1 mentoring with supervisor once every 3 months using CHW performance indicators and a standardized open-ended form that encourages supportive supervision&lt;br&gt;• Observation-based supervision with CHW during household visits using a standardized form and immediate feedback&lt;br&gt;• Household spot checks using standardized form&lt;br&gt;• Expected to informally gather feedback from health facility physicians and observe group dynamics</td>
</tr>
<tr>
<td>Supervision Tools:</td>
<td>1 site supervisor assigned to 4–19 SCHWs (depending on number of villages in catchment area)&lt;br&gt;• 4 SCHW visits per month&lt;br&gt;• All SCHWs visited per quarter using standardized form for feedback&lt;br&gt;• 3 households per SCHW visited for spot checks</td>
<td>1 CHN assigned up to 10 CHP-S&lt;br&gt;• Visit all CHP-Ss monthly&lt;br&gt;• Supervise community-based sputum collection for TB suspects, and community HIV testing&lt;br&gt;• Restock monthly supplies (reporting tools, family planning commodities, stationary, etc)&lt;br&gt;• Spend up to 40% of the time at the facility for clinical screening, addressing relationships between CHPs and health facility staff, supporting patients in accessing services and with care coordination&lt;br&gt;• Facilitate training and refresher trainings&lt;br&gt;• Represent the CHP program’s successes and challenges at weekly health facility review meetings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 SCHW assigned to up to 15 CHWs&lt;br&gt;• 4 CHW visits per month&lt;br&gt;• All CHWs visited per quarter using standardized form for feedback&lt;br&gt;• 3 households per SCHW visited for spot checks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision Tools:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CHN, community health nurse; CHP, community health promoter; CHP-S, community health promoter supervisor; CHW, community health worker; HSA, health surveillance assistant; SCHW, senior community health worker; NCD, noncommunicable disease.
integrating with the clinical staff at the outpatient department: clinicians would not share patients’ diagnoses or treatment regimens with CHPs because of misperceptions that they weren’t health providers, and clinicians expressed anger that the CHPs increased the workload with new referrals (but without new investments in the facility). Therefore, CHPs faced both dismissal at the health facilities and in turn frustration from community members who blamed them for negative interactions in the clinic. In Mexico, although CES works actively to improve primary care, similar frustrations were encountered.

**Encountering Unanticipated Salary Challenges**

Moving from a single-disease model to the HHM required increased work expectations, and therefore required an increase in CHW salaries and supervision. In Mexico, however, labor laws were seen by program leadership as a barrier that prevented hiring CHWs full time; paying CHWs a full-time salary as a formal employee added an additional 30% fringe and would have given CHWs the right to be paid a severance fee if the program were to downsize. The PIH-Mexico team was in agreement with the sentiment that CHWs should be afforded such benefits, but current budgeting did not allow for this level of investment. In Liberia, the national community health policy adopted in 2015 that established the CHA cadre also standardized CHA salaries, and as such, PIH had to decrease the CHP cadre salary to align with government regulations. This led to concerns by many CHWs that the salary was not proportional to the increase in work and responsibilities.

**Transition Pains**

In Mexico, CHWs voiced concerns that moving from a single-patient single-disease model to a broader focus with more patients and more conditions diluted and distracted their ability to connect therapeutically. In addition, the new model demanded full-time work year-round, but this was not always possible during the short but intensive coffee harvest period that provided the family with the majority of their yearly income. In Malawi, implementation challenges included long distances to travel between houses, poor transportation options, lack of transportation funds, and demotivation when finding a house empty upon arriving. To address this, households were redistributed to be closer to CHWs’ homes. Similarly, in Liberia CHPs received a monthly transportation stipend to assist in physically escorting patients to the health facility, but due to the large demand they could escort only a few before the funds ran out.

**Managing New Volumes of Data**

In Malawi and Liberia, paper data collection systems were aggregated at multiple levels for monitoring and evaluation. This system provided leadership with high level trends but did not allow for real-time analyses to guide decision making (i.e., to adequately support and supervise the CHWs and to measure whether vulnerable populations were reached). As such, Abwenzi Pa Za Umoyo in collaboration with Medic Mobile is piloting the use of mobile health solutions (a smartphone-based mobile application called YendaNafe that enables CHWs to maintain digital records of their work, synchronizing these records in real time with a centralized system). Mexico hopes to learn from this experience to also implement a completely paper-free digital health solution that will include digital elements of supervision.

**LESSONS LEARNED**

The HHM is inspired by the principle of “accompaniment,” which is both a philosophical stance and a rubric for programmatic design. Incorporating community health is guided by 3 principles: (1) CHWs must be professionalized; (2) CHWs must be positioned as bridges to care, not islands; and (3) CHW program budgets must make room for community work and not health work alone. Although all 3 country programs were philosophically aligned and in regular communication, local adaptations to the HHM were necessary to respond to local realities and pressures. During this process, common lessons arose. Some align with other analyses, such as was described in the CHW Performance Measurement Framework, and others are unique to this experience.

**Recruit Effectively, With an Eye for Growth**

It is important to fully map out what the job entails so the right people can be recruited (i.e., the right attributes, skill sets, geographic distribution, and time expectations). Similarly, if the intervention is to substantially grow in scope, the CHWs recruited need to have the ability to grow with the program through retraining and flexibility with restructuring. This approach is consistent with the CHW development domain of the Performance Measurement Framework. When selecting candidates, the use of written tests and interviews with clear scoring criteria should be balanced with concerns that literacy
criteria might exclude representation from traditionally disenfranchised groups.

**Work to Better Integrate CHWs Into the Health System**

CHWs in the HHM are meant to serve as a bridge between facilities and households. Therefore, community members naturally perceive them as an extension of the health facility and sometimes transfer resentment or frustration with the health facility to CHWs. The transition to the HHM has to develop specific and actionable procedures to intentionally engage health facility leadership before, during, and after its implementation.17

**Discuss Salary Expectations Early**

CHWs should be remunerated fairly through financial compensation.18 How much they are paid depends on a variety of contextual factors including local labor laws, other salary benchmarks in the area, and what CHWs perceive as the value of their work. Starting these conversations early and explicitly (i.e., during recruitment), can save considerable debate and discord later. Non-financial incentives may include anything that improves the employment experience (e.g., good training, career growth opportunities, positive interactions with supervisors, etc.) but should be considered and handled separately from salary negotiations.

**Expand CHW Autonomy While Building Functioning Support Systems**

To achieve UHC, CHWs will have to be entrusted to operate more autonomously within thoughtfully structured roles in the health system. In line with the CHW Performance Measurement Framework’s15 goals of job satisfaction, empowerment, and credibility, CHWs should be set up to succeed, including having clear job aids and decision-support algorithms, referral and counter-referral systems, and supportive supervision that empowers them instead of focuses on correcting errors.

**Accept That Trade-offs Are Inevitable**

CHW programs hoping to contribute to UHC will inevitably have to make decisions about what is included in the scope of practice and what is not. A common, yet erroneous, tactic seen elsewhere is to simply add more tasks without empowering CHWs to actually take on those tasks, such as by shifting time from other responsibilities or by increasing their salaries so that they can work more hours. If health systems aim to provide coverage for more health conditions, then investments will need to increase to meet new opportunities adequately.

**Cross-national Learning Is Best Done On-site**

For organizations hoping to improve multinational sharing and learning, we found that a number of factors facilitated this process. The most useful activity was getting country leadership to visit partner countries. This is in opposition to online conference calls and/or flights to conferences and meetings in the global north. Such on-site “learning trips” build functional relationships, facilitate material sharing, and allow for a deeper understanding of how the programs actually work in their full complexity. What also helped was consistent messaging around how the programs could learn from each other, which reinforced a growing narrative around why the programs were aligned (what has been described by community organizers as “the story of self, us, and now”).19 – sites were encouraged to see themselves as connected and then awarded with learning trips when they expressed wanting to connect deeper. This process decentralized the power to teach from a central “expert” in the global north to the network of talented and engaged practitioners on-site.

**CONCLUSION**

PIH found that it was possible to adapt the core principles of the HHM across different contexts by utilizing an iterative approach and operational judgment honed from past efforts. The PIH experience with implementing the HHM offers important lessons for other CHW program leaders looking at polyvalent CHW programs embedded within health systems to support progress toward UHC.

**Funding:** The Samuel Family Foundation provided funding for implementing the HHM in Malawi and partly in Liberia, and the AbbVie Foundation provided funding for piloting the HHM in Mexico. The Sall Family Foundation provided funding to support the cross-site dialogue that made multisite implementation possible. The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development.

**Competing interests:** Dr. Palazuelos reports personal fees from the Community Health Academy, outside the submitted work; no other conflicts to declare.

**REFERENCES**


En Español

Lecciones Iniciales del Lanzamiento de un Modelo Innovador de Salud Comunitaria a Través de Visitas a Hogares en Tres Contextos Nacionales

Mensajes clave: El asignar hogares en vez de individuos a trabajadores comunitarios de salud es un método viable y funcional de estructurar la salud comunitaria para contribuir a la cobertura universal de salud.

El Resumen

Los sistemas de salud integran a trabajadores comunitarios de salud (TCS) de manera variada. Partners in Health (PIH), una organización no gubernamental con más de 30 años de experiencia en más de 10 países, inicialmente aplicó un enfoque vertical, asignando TSC a individuos con enfermedades específicas, como VIH, MDR-TB, diabetes y otras enfermedades no transmisibles para brindar apoyo psicosocial y de tratamiento individualizado. A partir de 2015, PIH-Malawi rediseñó sus asignaciones de TCS para enfocarse en todos los habitantes del hogar, cubriendo una variedad más amplia de condiciones en todas las edades, con el propósito de avanzar una cobertura de salud universal y efectiva.

Inspirados por esta experiencia, PIH-Liberia y luego PIH-México iniciaron un firme diálogo internacional con el fin de adaptar el modelo para sus necesidades particulares. Describimos la estructura de este “Modelo Hogar”, los cambios realizados para adaptar el modelo a sus contextos particulares y los hallazgos iniciales producto de estas adaptaciones. En general, el modelo hogar está demostrando ser un método viable y funcional para organizar a los TCS, de manera que avance la meta de cobertura universal de salud. La experiencia indica también que no existe un modelo de “talla única” y que otros países que consideren adoptar este modelo deberán analizarlo y adaptarlo a su realidad.

Peer Reviewed

Received: July 31, 2020; Accepted: December 3, 2020; First published online: xxx


© Palazuelos et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00405

Global Health: Science and Practice 2021 | Volume 9 | Supplement 1
Learnings From a Pilot Study to Strengthen Primary Health Care Services: The Community-Clinic-Centered Health Service Model in Barishal District, Bangladesh

Md. Eklas Uddin,^a^ Joby George,^b^ Shamim Jahan,^a^ Zubair Shams,^a^ Nazmul Haque,^a^ Henry B. Perry^c^

**Key Findings**

- The process of creating a model to increase community health worker (CHW) harmonization and collaboration, increase community engagement, and improve quality of health services required multistakeholder platforms to develop policy, provide technical guidance, and implement interventions at the local level.
- Early qualitative findings of the pilot model found that there was a growing awareness of the need for the inclusion of the community as a key actor and a shared responsibility among CHWs, communities, and the local government in the process of community health system strengthening.
- Interventions implemented through the model increased resource mobilization for community clinic service delivery and the uptake of the primary health services at community level.

**Key Implications**

- For policy makers, strengthening the delivery of community-centered primary health care services requires a comprehensive approach to engage both the community, CHWs, and local government.

---

**ABSTRACT**

**Background:** Community clinics (CCs) staffed by community health workers (CHWs) represent an effort of the Government of Bangladesh to strengthen the grassroots provision of primary health care services and to accelerate progress in achieving universal health coverage. The Improving Community Health Workers (ICHWs) Project of Save the Children piloted a CC-centered health service (CCHS) model that strengthened community and local government engagement, harmonized the work of different CHW cadres who were working in the same catchment area of each CC, and improved the accountability of CHWs and the CC to the local community.

**Methods:** We describe the process for developing and implementing the CCHS model in 6 unions in Barishal District where the model was piloted and provide some early qualitative and quantitative findings pertaining to the model’s effectiveness. Data were collected from CCs in the 6 pilot unions and 6 other unions that served as a control. Qualitative data were collected from the intervention area during the pre-pilot (October 2017–September 2018) and pilot phase (October 2018–September 2019). Document review, key informant interviews, and focus group discussions were also conducted. Maternal and child health service utilization data were extracted from the government health information system in both the intervention and control areas.

**Results:** Community group meetings ensured engagement with local government authorities and supported resource mobilization. There was greater coordination of work among CHWs and increased motivation of CHWs to better serve their clients. The analysis showed that the increase in maternal health consultations was substantially greater in the intervention area than in the control area, as was the number of referrals for higher-level care.

**Conclusion:** The CCHS model as applied in this pilot project is effective in engaging local key stakeholders, increasing CHW capacity, and improving client satisfaction. The model demonstrated that a community health system can be strengthened by a comprehensive approach that engages communities and local government officials and that harmonizes the work of CHWs.

---

**BACKGROUND**

During the past 4 decades, Bangladesh has made a number of reforms in its health system and strengthened its extensive health service infrastructure in both the public and private sectors. As a result, Bangladesh has achieved impressive gains in population health, achieving the Millennium Development Goal 4.

---

^a^ Save the Children, Dhaka, Bangladesh.
^b^ Independent consultant, Hargeisa, Somalia.
^c^ Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA.

Correspondence to Md. Eklas Uddin (eklas.uddin@savethechildren.org).
Despite the proliferation of community clinics nationwide to improve access to essential primary health services, these services remained underutilized.

target of reducing under-5 child mortality by two-thirds between 1990 and 2015 and improvement in other key indicators such as maternal mortality, immunization coverage, and control of malaria, TB, and diarrhea diseases. Even so, all these indicators indicate that considerable challenges remain for reaching the health-related Sustainable Development Goal (SDGs).

Although the government’s health system covers all citizens in theory, in practice, many sick people receive either no care or inadequate care. Private sector services are too expensive for many, and out-of-pocket expenditures for health care are high. The provision of services for the growing burden of noncommunicable diseases is only just beginning. Sixty-three percent of births still occur at home, often aided by unskilled birth attendants. Among noninstitutional deliveries, only 7% of newborns receive all 5 recommended essential newborn care practices. The coverages of antenatal care (ANC) and postnatal care services are still 82% and 52%, respectively. The quality of care in both public and private services is poor, with low levels of knowledge among service providers and poor application of skills in practice.

In 1998, the Government of Bangladesh established community clinics (CCs) nationwide to improve access to essential primary health services to all, particularly for those in the most remote and hard-to-reach areas. By 2018, 13,779 CCs had been established with each serving 6,000–8,000 people in rural areas. Despite the proliferation of CCs nationwide to improve access to essential primary health services, these services remained underutilized. The underutilization of CC services has been attributed to lack of awareness on the value of services; perceived poor quality of care; lack of coordination between CHWs of the 2 government directorates (health services and family planning), as well as between public sector and nongovernmental organization (NGO) CHWs who work at the CC and in its catchment areas; poor community engagement; lack of local government support for community health programs; and lack of accountability of service providers to the local community, among others.

Additional information about Bangladesh’s community health system is provided in Supplement 1.

## IMPROVING COMMUNITY HEALTH WORKERS PROJECT

To increase the utilization of health services at CCs and to strengthen the community health system, the Improving Community Health Workers (ICHWs) Project (hereafter referred to as the Project) was launched in 2016. The Project is part of a 6-country global initiative funded by the U.S. Agency for International Development and the United Nations Children’s Fund (UNICEF) that addresses recognized policy and implementation barriers to effective performance of CHWs. The overall goal of the global project is to help countries achieve full coverage, at the local level, of high-impact health and nutrition interventions. In Bangladesh, the Project was led by Save the Children International. The Project established a strategic partnership with UNICEF, BRAC (Bangladesh’s largest NGO), and Partners in Health and Development, a local NGO that implemented the Project at the district level. The Project sought to create a model to encourage CHW collaboration, foster community engagement, and improve quality of health services.

Save the Children convened 3 multistakeholder platforms to operationalize the Project at the national and district levels.

1. **It established a National Steering Committee**, comprised of representatives from the government, development partners, and agencies to provide policy and strategic guidance, Project oversight, identification and endorsement of best practices, and incorporation of learnings into operational plans. Upon the committee’s recommendation, the Ministry of Health and Family Welfare (MOHFW) approved a standardized definition for the role of CHWs along with a standardized job description to be applied to all CHW cadres. As a culmination of its policy-level work, the Project helped the MOHFW develop the Bangladesh National Strategy for Community Health Workers (2019–2030), providing clear guidance on CHWs’ unique job functions and how they are to collaborate with and complement each other to enhance community health care services.

2. **The Project established a National Stakeholder Forum** to provide technical guidance and inputs into the CHW strategy and policy processes.

3. **It established a District Coordination Committee** composed of government personnel from local health and family welfare departments, NGO representatives, and other stakeholders including the local government to oversee and implement learning agenda activities at the local level.

In Barishal District, the Project established a District Learning Lab (DLL), covering a total of 187 CCs in 54 unions of 6 subdistricts, in
conjunction with the District Coordinating Committee to strengthen Bangladesh’s community health system. The DLL conducted a pilot test of a comprehensive service delivery and community organizing model—the CC-centered health service (CCHS) model. Through the DLL, stakeholders could influence the learning agenda, test and refine interventions, document findings, and collect evidence to guide national policy and program innovations.

There was a growing awareness of the need for the inclusion of the community as a key actor in the process of health systems strengthening. A pre-pilot analysis by Save the Children in 2018 on the CCHS model area recommended that the community groups (CGs) and community-support groups (CSGs) needed to be more functional and supportive of the CCs to foster stronger community engagement and accountability of service providers at each CC.

This article describes the Project’s development of the CCHS model and its efforts toward health system strengthening through community and local government engagement.

**THE COMMUNITY-CLINIC-CENTERED HEALTH SERVICE MODEL**

In supporting the DLL agenda, the Project designed a coordination and harmonization mechanism among CHWs, in conjunction with interventions for strengthening local government support, community engagement, and accountability. The Project piloted these interventions through the CCHS model from October 2018 to September 2019. The model aimed to provide a more coherent and organized approach to CHW programs leading to increased coverage, improved care-seeking, and increased referrals to higher levels of care. The CCHS model was tested in 25 CCs under 6 unions of 6 subdistricts of the DLL in Barishal District, Bangladesh.

Endorsed by the National Steering Committee and with the technical support from Save the Children, the CCHS model was implemented by a local partner NGO in collaboration with the District Coordination Committee.

Some of the key components for which the Project provided technical support are briefly described here (Figure 1).

**CHW Harmonization and Collaboration**

The Project facilitated the development of harmonized job descriptions for the CHWs and tested them in the intervention area. The job descriptions contained the main general functions and tasks of all CHW cadres as well as the specific tasks in which each CHW cadre could coordinate with the other CHWs in the respective cadres, whether they were government or NGO CHWs. The harmonization process aimed to enable different cadres of CHWs to organize their work in a complementary fashion and facilitate alignment of their tasks. The Project organized a team training for CHWs during which 3 CHW cadres learned together. This helped them to support and coordinate with each other. The Project also facilitated microplanning meetings for each CC involving all CHWs, their supervisors, and community members to strengthen harmonization and cooperation.

**Community Engagement**

One of the vital components of the CCHS model is community engagement. In the piloted CCs, the Project strengthened community engagement initiatives using different tools and techniques. According to the government community engagement protocol, the CG is pivotal in the management of the CC. The CG is a committee that includes 3 CHWs and has 17 members, most of whom are selected from the village. The head of the CG is an elected local government official.

**BOX 1. Ministry of Health and Family Welfare Community Engagement Strategy**

The current Bangladesh National Health Policy and strategies recognize active community engagement as a fundamental component of its health service system. Community health workers are at the interface between households, the community, and the health system and play a crucial role. The Ministry of Health and Family Welfare integrated the community engagement approach through the Operational Plan of Community-Based Health Care, which has, so far, formed about 13,800 community groups, each of which comprises members to support the management and operations of a community clinic. In addition, each community clinic has 3 community support groups. The community clinic policy promotes smooth, effective, and quality health services at the community level and defines mechanisms for engagement between each community clinic and the community it serves through the community groups and the community support groups.
In the catchment area of each CC, there are also 3 CSGs located in remote villages. Each CSG comprises 15–17 community members and 1–2 members who are also CG members. They support CG activities and promote CC message in their respective villages.

The members of the CGs and CSGs are supposed to be representative of the entire CC catchment area. Pre-pilot analysis in the CCHS model intervention area revealed that almost all the CG-CSG members were residing very close to the CC, and hardly any people were living in the outer portions of the CC catchment areas. In most cases, the number of members in each group was considerably less than called for, and most members were self-selected. As a consequence, the Project applied a social mapping tool to ensure representative membership of the entire community clinic catchment area.

Local Government Support

The union parishad (UP) is the lowest government administrative unit in rural Bangladesh. Each UP is made up of 9 wards, with usually 1 village designated as a ward. Each UP is supposed to form a health, education, and family planning standing committee to oversee community health functions. Figure 3 shows the organizational hierarchy and relationships between local government (UP) and the community health service delivery system. In addition, each UP is expected to allocate 10%–15% of its annual budget for health issues. The elected UP member of the ward where a CC is situated is expected to serve as the chairperson of the CG. Evidence suggests that active participation of UP members as chairs of CGs facilitates good performance of CGs, and a well-functioning CG makes CC health workers more accountable. So, the Project organized orientations for UPs and facilitated knowledge sharing, best practices, and advocacy that aimed to ensure the UP’s support for community health programs.

Accountability Mechanisms

The community scorecard is a powerful tool to monitor services, empower citizens, and improve the accountability of service providers. The scoring exercises provide citizens the opportunity to analyze health services based on their personal perceptions. The Project introduced the community scorecard tool in the intervention area to obtain citizen perceptions about CC services, hold the service providers accountable, and ultimately improve quality of CC services. The Project implemented the community scorecard in 13 CCs. The Project’s technical team customized and facilitated the community scorecard process.

Monitoring, Supervision, and Data Analysis

The Project also facilitated the government’s existing procedures for monitoring and supervision, data analysis, and implementation of findings.
Supplement 2 provides further details about the implementation process of and learning from CCHS model components.

## METHODS

### Study Sites

The CCHS model was implemented in the intervention area in Barishal District, located in southern Bangladesh. The district was selected because of its high disease burden and low income. According to a Bangladesh Demographic and Health Survey (2014), in Barishal District, 69% of deliveries occur at home; and the crude birth rate is 22.2 per 1,000 populations per year. Save the Children has had a longstanding engagement in this region with health, education, and humanitarian support programs. In addition, the MOHFW authorities maintain good coordination between local and national levels.

---

### Figure 2. Social Map Showing Typical Distribution of Community Group and Community Support Group Members Before and After Reformation of Group Membership

- **Before:** 40% area covered by CG-CSGs
- **After:** 100% area covered by CG-CSGs

The dots are all relatively close to the CC

The dots are more equitably distributed throughout the CC’s catchment area

Each dot refers to the residence location of a group member.

---

### Figure 3. Organizational Hierarchy and Relationship Between Local Government and Rural Community Health Service Delivery System, Bangladesh

Abbreviation: CSG, community support group.
with NGOs and cooperate with any new program interventions that enhance the community health system.

The CCHS Model and its assessment were carried out in 6 UPs (1 UP from each upazila) in the Project area. Another 6 UPs outside of the Project area were selected from adjacent upazilas as a control area (Table 1). The control areas were located geographically adjacent to the intervention areas and shared similar socioeconomic characteristics.

The UPs in the intervention area were selected by the District Coordination Committee and the Upazila Health and Family Planning Officer on the basis of the following considerations: previous service performance, availability of human resources (CHWs present as well as their supervisors), presence of NGO community health workers, availability of infrastructure and communication (UPs in areas where communication is easy as well as UPs in hard-to-reach areas), and Government of Bangladesh consensus.

Data Collection Methods
The study collected both qualitative and quantitative data from both the intervention and control areas.

Primary Data Collection
Key informant interviews and focus group discussions were conducted using a structured questionnaire. Interviews were done in each UP in both the intervention and control areas. The respondents were selected purposely, and all the interviews were conducted in person (Table 2).

### TABLE 1. Study Intervention and Control Areas of the Community-Clinic-Centered Health Service Model Pilot Intervention, Bangladesh

<table>
<thead>
<tr>
<th>Intervention Area</th>
<th>Upazila</th>
<th>Union Parishad</th>
<th>District</th>
<th>Control Area</th>
<th>Upazila</th>
<th>Union Parishad</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barishal</td>
<td>Babuganj</td>
<td>Rahamatpur</td>
<td>Barishal</td>
<td>Agailjhara</td>
<td>Goila</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bakerganj</td>
<td>Rangashree</td>
<td></td>
<td>Rajihar</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gaurnadi</td>
<td>Mahilara</td>
<td></td>
<td>Muladi</td>
<td>Charkalekhan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Banaripara</td>
<td>Soliabagpur</td>
<td></td>
<td></td>
<td>Kazirchar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wazirpur</td>
<td>Bamrail</td>
<td>Patuakhali</td>
<td>Sadar</td>
<td>Laukathi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sadar</td>
<td>Raypasha korapur</td>
<td></td>
<td></td>
<td>Borobighai</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 2. Qualitative Data Collection of the Community-Clinic-Centered Health Service Model Pilot Intervention, Bangladesh

<table>
<thead>
<tr>
<th>Type of Respondent</th>
<th>Respondents</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community health</td>
<td>Assistant Health Inspector</td>
<td>12 key informant interviews</td>
</tr>
<tr>
<td>worker supervisors</td>
<td>Expanded Program on Immunization</td>
<td>12 key informant interviews</td>
</tr>
<tr>
<td></td>
<td>Supervisor: nongovernmental organization</td>
<td>12 key informant interviews</td>
</tr>
<tr>
<td>Health service</td>
<td>Upazila Health and Family Planning Officer</td>
<td>9 key informant interviews</td>
</tr>
<tr>
<td>managers</td>
<td>Upazila Family Planning Officer</td>
<td>9 key informant interviews</td>
</tr>
<tr>
<td>Local government</td>
<td>Union parishad chairman/ Union Parishad Education, Health &amp; Family Planning</td>
<td>12 key informant interviews</td>
</tr>
<tr>
<td>representative</td>
<td>Standing Committee member</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>66 persons interviewed</td>
<td></td>
</tr>
<tr>
<td>Community representative</td>
<td>Community group and community support group member</td>
<td>12 focus group discussions</td>
</tr>
</tbody>
</table>
Secondary Data Collection
We conducted an extensive record review and data extraction from the government health information system since the activities of CCs are included in this. Project-level reports including baseline and endline assessment and policy briefs were also reviewed. For our purposes here, we use the term prepilot phase as the period of collection of baseline data (October 2017–September 2018) while the pilot phase refers to the period of Project intervention, October 2018–September 2019.

Data Analysis
Themes observed in the qualitative data were identified manually and then converted into codes and subcodes by aligning them with key components of the CCHS model. For quantitative data, we calculated descriptive statistics and 2-sample t-tests with equal variances using Microsoft Excel.

Ethical Considerations
The study proposal was reviewed by the Save the Children Ethics Review Committee and determined to be exempt from further human subjects review. During all interviews, the interviewers obtained verbal consent and assured respondents that there would be no adverse physical or psychological effects from their participation. The interviewers also informed the respondents that they could leave the interview anytime and that they did not necessarily have to answer all questions. The study team followed the Save the Children policy about receiving prior permission for taking and using visual still or moving images. All the responses were de-identified before analysis.

RESULTS
Qualitative Assessment Findings
From the interviews, it was found that the key stakeholders became more involved in the CG/CSG meetings (Box 2). Details are as follows.

Respondents mentioned that joint planning meetings held between the government and NGO workers made it possible to share reports, reduce under- and overreporting of services, and reduce duplication in the reporting of services. CHW supervisors mentioned that CHWs conducted and attended joint planning and report sharing meetings regularly as part of the community microplanning meetings that aimed to ensure that the entire population in the UP was reached. The microplanning meetings provided a useful mechanism to bring the health and family planning CHWs together with the community to accurately capture community information and ensure that consistent data were being reported.

The Project found that some CGs and CSGs in pilot areas were not formed according to MOHFW guidelines—a key reason why those committees were not functioning well. In the intervention area, all 25 CGs and 75 CSGs were formed following the proper guidelines (i.e., representing the

---

**BOX 2. Summary of Comments From Key Informant Interviews and Focus Group Discussions Regarding the Effectiveness of the Project Intervention**

- Improvement in quality of the daily work of community health workers
- More coordination
- Greater sense of sharing and cooperation among providers
- Reduced data duplication
- Easier to identify and correct mistakes
- Increased accountability to each other and to the community
- Improved coordination between government and nongovernmental organization health workers
- Gaps in service coverage reduced
- Increased information sharing
- Health services improved
- Community health workers better able to reach their targets
- Greater transparency of work
- Greater efficiency of work, providing time to devote to improving the quality of services
whole population). The Project provided technical assistance to CCs in helping to update and reform 25 CGs and 75 CSGs by selecting members from all catchment areas of 25 CCs within the intervention area using a community mapping tool. CG meetings were attended by most of the CHWs, and all CSG meetings were attended by one of the CHWs.

CHWs mentioned that their activities were overseen by the local government representatives. The local government played an important role in promoting CC and CHW services in the community and provided additional support needed for the improvement of the CC’s infrastructure.

The CHW supervisors and the health and family planning managers monitored all the CHWs’ activities and provided them with feedback. They also helped the CHWs provide health services for mothers and children. During supervision, they checked the record books and helped in developing strategies for re-engaging clients who were in need of additional services. The health and family planning managers also conducted a joint supervisory visit to each CC every month and complete a supervisory checklist. In the next visit, the identified issues were followed up with the respective staff, leading to a significant improvement in the quality of services.

The community scorecards contributed to improved quality, efficiency, and accountability of services and provided useful information on medicine shortages, service provider behaviors, and other client complaints. There was a general agreement among all the interviewees that the community scorecards had been effective in enabling clients to ask for and receive more effective and respectful care. The community scorecards also strengthened the accountability of CHWs to the community and motivated CHWs to achieve a higher level of excellence in their work.

Quantitative Assessment Findings
Between the pre-pilot and pilot phases, the number of women in UPs in the intervention areas using services (Figure 4) increased more compared to the number of women in UPs in the control areas. In the intervention areas, visits for ANC, postnatal care, and nutrition counseling, as well as iron/folate tablets distributed, increased more compared to the control areas. However, there was no difference between the intervention and control areas in child health services provided. Supplement 3 provides more detailed information on services provided and statistical significance for all of the quantitative data shown. Three of the five difference-in-differences (for antenatal care, nutritional counseling, and iron/folate distribution) were statistically significant at the 0.01 level.

Between the pre-pilot and pilot phases, coverage of ANC visits increased in the UPs in intervention areas (Figure 5) more compared to those in control areas, with the greatest increase in ANC visits being for the first ANC visit (ANC1). There was improvement in utilization for ANC2 and ANC3 visits as well, but the difference-in-differences progressively declined from ANC1 to...
ANC4. There was minimal change in the coverage of 4 ANC visits in the intervention and control areas.

Between the pre-pilot and pilot phases, referrals of mothers and children for higher levels of care increased 42% in UPs in the intervention area compared to increasing 1% in the control area (Figure 6).

**DISCUSSION**

We have described a pilot intervention model for improving the functioning of the local-level community health system in 6 UPs of the Barishal District, Bangladesh. Through a process of strengthening the formation and functioning of CGs and CSGs and the installation of microplanning meetings that enabled CHWs to better coordinate their work, increases in the utilization of maternal health services were observed. Increases in the first ANC visit were particularly pronounced. In addition, there were marked increases in the number of women referred from CCs in the intervention area compared to the control area. The increase in referrals reflects CHWs’ improved capacity to make decisions about women needing higher levels of care. However, the same
cannot be said of utilization of child health services. It may be due to facility readiness gaps for providing childcare services like consistent availability of expanded program of immunization, relevant medicines for fever or vomiting. Also, CCs might not be as child-friendly because of lack of space or poster/cartoon for child communication.

The Project facilitated monthly community microplanning meetings in the intervention area and introduced key stakeholders to how these meetings could increase the efficiency and effectiveness of their work. The participation of CHWs, their supervisors, UP representatives, and community members helped to make these meetings effective. Gradually, CHWs became more comfortable sharing data and addressing common challenges during these meetings. Similarly, research from Sierra Leone by O’Connor et al. showed that CHWs’ sharing of their data with local health system and community government representatives can lead to improvements in health system functioning.14

This study suggests that the interventions employed for strengthening the role of the CGs and CSGs and for improving the harmonization and coordination of CHWs in the catchment areas of the CCs were effective in improving the utilization of services for pregnant women. Similar results were also observed in other countries. Namazzi et al. showed that CHWs in Ghana generated an increased utilization of maternal and neonatal health services through their active participation in the community and their capacity to refer high-risk cases to nearby facilities.15 Similar to the CGs and CSGs platform, Awasthi et al. suggested that community engagement and social awareness could help in promoting the utilization of maternal health services.16

The current study supports the conclusion that the CCHS model enables both UPs as well as CGs and CSGs to be more involved in CC oversight and accountability monitoring. The model also leads to improved coordination and effectiveness of the CHWs working in the CC catchment area. These, in turn, contribute to an increase in utilization of services at the CCs. A comprehensive approach was required to achieve these results. However, the functionality of local government committees varies.

The study demonstrates that engaging the community can help to resolve longstanding issues in community health programs. The social mapping process helped make CGs and CSGs more representative and more effective. The community scorecard tool ensured tripartite coordination among CHWs, the community, and the local government, and enhanced accountability of services to the community. In the Democratic Republic of the Congo, community scorecards bridged the divisions between frontline health care providers and community members by providing opportunities for exchange and collaboration at the community level.17 Community scorecards can increase the availability of information about maternal and neonatal health services.18 Effective facilitation of the community scorecard process requires skilled application, but the use of community scorecards needs to be expanded.

The Bangladesh National Strategy for Community Health Workers (2019–2030),10 developed in part on the basis of the experiences gained by implementation of the Project, needs to be implemented and scaled up. Ongoing monitoring and evaluation are needed. Our study suggests that local stakeholders and CHWs will need to work together for this strategy to be successful.

**Limitations**

Our study has some limitations. The quantitative outcomes assessed here are limited to utilization of services at the CC. We did not carry out any assessments regarding whether the Project had any impact on quality of care or on population coverage of services. In addition, the qualitative data assessment included data only during the first 6 months of the intervention (pilot) phase (October 2018–March 2019) because the COVID-19 pandemic had affected the intervention area at that time, prohibiting the collection of additional qualitative data.

**CONCLUSION**

In Bangladesh, there is a need to address the fragmentation of different CHW programs and to harmonize their work at the micro level. There is also a great need to engage communities in the oversight of the community health system. Innovative community-based strategies such as the ones described here and implemented on a pilot basis can be useful for guiding the rollout of interventions and health improvements at scale. Government and civil society organizations are well placed to reduce fragmentation and duplication of CHW services and to establish a more effectively functioning local health team through community partnerships.

The next decade will be critical to cement Bangladesh’s community-based health care system as the foundation of its primary health care system and achieve the SDGs and UHC by 2030. Building on previous learnings and achievements, the community health system now has the opportunity to become stronger. It is now widely recognized that CHWs have been major providers of the essential service package and have the potential for increasing their uptake even further. Therefore, to maximize their reach and effectiveness, the Government of Bangladesh will need to continue...
to invest in CHW support using methods such as those that have been piloted in this Project.

Acknowledgments: The authors wish to thank the National Steering Committee on Community Health for endorsing the pilot testing of the community-clinic-centered health service (CHS) model and the District Coordination Committee members who provided all out support to the Project staff implementing the model in Barisal District. Special thanks go to Community Based Health Care, Directorate General of Health Services, the Ministry of Health and Family Welfare for their oversight on the model area community clinics and their leading role in developing the Bangladesh National Strategy for CHWs 2019–2030 that acknowledges several CHS model components. The authors also appreciate the field staff of Partners in Health and Development for collecting data during the pre-pilot and pilot phase. We thank the Director, Health Nutrition HIV/AIDS of Save the Children who inspired and guided the Improving Community Health Workers Project team to undertake innovative works.

Funding: This study was made possible through the funding support provided by the U.S. Agency for International Development to the Improving Community Health Workers Project of Save the Children that implemented the community-clinic-centered health service model.

Competing interests: None declared.

REFERENCES


Peer Reviewed

Received: September 10, 2020; Accepted: January 5, 2021


© Uddin et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit http://creativecommons.org/licenses/by/4.0/. When linking to this article, please use the following permanent link: https://doi.org/10.9745/GHSP-D-20-00466