



Comparing the roles of community health workers for malaria control and elimination in Cambodia and Tanzania

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ABSTRACT

The reduction of deaths from malaria in sub-Saharan Africa (SSA) is stalling, whereas many countries in Southeast Asia are approaching malaria elimination. We reviewed the role of community health worker (CHW) programmes in malaria control and elimination between regions, with a more detailed description of the programmes in Tanzania and Cambodia. Compared with Tanzania, Cambodia has a much more developed CHW network, which has been pivotal in the near elimination of malaria. In Tanzania, the malaria burden has remained similar over the last decade and treatment continues to rely on healthcare facilities, which provide more limited access to early diagnosis and treatment. Overall, the proportion of malaria cases treated by CHWs is substantially lower in SSA than in Southeast Asia. Even though networks of CHWs are resource intensive and malaria epidemiology differs substantially between countries, there is a strong case for expanding CHW networks in rural SSA to improve early access to effective malaria treatment and reduce the malaria burden.

INTRODUCTION

Over the last decade, there has been a sharp decline in falciparum malaria attributable morbidity and mortality in most of Southeast Asia (SEA), whereas progress to reduce the malaria burden and related mortality has stalled in many African countries.¹ Over the same period, there has been a much greater emphasis on developing community health worker (CHW) networks for early diagnosis, treatment and surveillance of malaria in SEA compared with sub-Saharan Africa (SSA). CHWs are paraprofessionals with variable levels of training, education and skills related to health services and are often selected from the same community.² A CHW network represents a functional landscape of community health systems that effectively bridge between community members and the health centres for malaria control and elimination.

We explore if the difference in successful malaria control between the continents can

SUMMARY BOX

- ⇒ Community health workers (CHWs) offer community health services including for malaria.
- ⇒ CHWs' contributions to malaria control and elimination in Southeast Asia (SEA) have been more significant compared to sub-Saharan Africa.
- ⇒ In Cambodia, CHWs play critical roles for community management of malaria, whereas this role is much more limited for CHWs in Tanzania.
- ⇒ To achieve national malaria control goals, Tanzania can use existing CHWs in the community by devolving roles and responsibilities related to community diagnosis and treatment of uncomplicated malaria, and referral of complicated cases from community to the health centres.
- ⇒ National malaria control programme in Tanzania, together with the partners, stakeholders and funders, urgently requires collaborative initiatives to promote the community management of malaria through CHWs.

be explained by the higher availability of malaria services at the community level in SEA than SSA. While previous systematic literature reviews have outlined the overall roles and contribution of CHWs for malaria control and elimination activities in SEA and SSA, there are no comparative analyses between the regions.^{3–5} Comparative analyses between the regions and countries can offer insights into the similarities and differences in epidemiological, social and health system characteristics, and thus reveal transferable and actionable lessons to inform the existing service delivery strategies.⁶ We compared CHW programmes between SEA and SSA through a systematic review of the published literature (online supplemental appendix figure 1) supplemented by discussions with key informants in Cambodia and mainland Tanzania (online supplemental appendix 1: Thematic outcomes from systematic review). Since our systematic literature review did not



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yield adequate content for a comparative analysis, we have expanded the findings from the review with lessons learnt from malaria-related research in Cambodia and Tanzania.

Specifically, in this analysis, the CHW programmes of Cambodia and Tanzania were selected as case examples for comparison based on our engagement with the social, cultural and epidemiological context in these countries. The main objective of this article was to compare CHWs' roles and contributions in malaria programmes in Cambodia and Tanzania to deduct relevant and qualified insights for Tanzanian CHWs' programme for malaria.

CHWS FOR MALARIA CONTROL

There is a general consensus on the importance of CHWs to support primary healthcare services, including malaria, in low-income and middle-income countries as witnessed by the Alma Ata Declaration from 1978 and the more recent Astana Declaration signed in 2018.⁷ CHWs usually consist of community residents that work on a voluntary basis or receive small incentives. CHWs are often the first point of contact to address health issues in the community. The service package provided, the diseases covered and eligibility to manage malaria by CHW differ between countries.⁸ As frontline health workers in a community, CHWs may have to manage health issues that are beyond their level of competence due to a shortage of more qualified health professionals. For instance, CHWs may find themselves obliged to offer maternal and child health services even when they may not have received adequate training to manage these health issues.⁹

In many countries, CHWs can provide basic malaria services, including diagnosis with a malaria rapid diagnostic tests (RDTs), treatment with artemisinin-based combination therapy (ACT), collection of basic epidemiological data, referral for severely ill patients and the promotion of services.^{8 10} In addition, CHWs can contribute to additional malaria control and elimination activities, such as the distribution of insecticide-treated bednets.^{11 12} Early diagnosis and treatment of malaria at the point of first contact is critical for reducing disease morbidity and transmission. The presence of well-resourced and trained CHWs can prevent progression from uncomplicated malaria to severe malaria and death.¹³ The large added value of CHWs in reducing malaria cases has been well documented in a variety of settings.^{4 11 14}

COMPARISON BETWEEN CAMBODIA AND TANZANIA

We built the comparison of CHWs' programmes in Cambodia versus Tanzania based on our research engagement and discussions with relevant content experts, CHWs and their supervisors in both countries. We reflect on our engagement with CHWs related to malaria on how their roles and contributions could be optimised for malaria control and elimination.^{15–18} Table 1 provides an

overview comparing the CHW network in Cambodia with Tanzania (table 1).

In Cambodia, the national malaria control programme is managed by The National Centre for Parasitology, Entomology and Malaria Control (CNM),¹⁹ founded in 1984 by the Ministry of Health. In 1990, CNM transitioned to provide community-based malaria services. Supported by the Global Fund to Fight Acquired Immune Deficiency Disease Syndrome (AIDS), Tuberculosis and Malaria (GFATM), the village malaria worker (VMW) network was expanded in 2004 to cover all communities with high malaria transmission, trained and supervised by CNM and non-governmental organisation (NGO) partners. After 2013, under the Regional Artemisinin-resistance Initiative, the network was further expanded to 3500 VMWs and supplemented by mobile malaria workers (MMWs) to cover communities in more remote villages, forests and forest fringes.^{11 16 20} This expansion has been the main driver of the sharp decline in malaria cases over the last decade in Cambodia with a target for malaria elimination by 2025.^{21 22} VMWs and MMWs maintain a stock of RDTs and quality assured ACTs to diagnose and treat uncomplicated falciparum and vivax malaria, while more complicated cases are referred to the closest healthcare centre. In addition, VMWs and MMWs are essential for collecting malaria surveillance data. They receive case-based incentives and allowances for additional activities such as point of care diagnosis of forest workers and attendance of monthly meetings at the healthcare centres.²³ In addition to a financial incentive, a role as VMWs or MMWs provides added social value in the community. The system of malaria-dedicated CHWs for malaria elimination has been successfully implemented in other countries of the Greater Mekong Subregion (GMS).²⁴

In contrast to the low malaria transmission setting of Cambodia (with an annual prevalence of 4021 malaria cases with *Plasmodium vivax* as the dominant species in 2022),²⁵ Tanzania is among the countries with the highest malaria transmission globally, mainly caused by *Plasmodium falciparum* which is responsible for 96% of malaria infections.²⁶ Tanzania is among the top 10 countries with the highest malaria cases and deaths, accounting for 4.1% of the global cases and deaths in 2021.²⁵ The national goal is to reduce the average malaria prevalence in children under 5 years of age from 7% to less than 3.5% in 2025, but the number of malaria cases and deaths have not substantially declined since 2012.^{1 26} Since the targets set in the Tanzania Malaria National Strategic Plan (MNSP) 2021–2025²⁷ were unlikely to be achieved, a Supplementary Malaria Mid-term Strategic Plan (SMMSPP) 2018–2020 was developed to re-set the strategy. Tanzania is also included in the WHO High Burden High Impact (HBHI) countries, where additional malaria interventions are being promoted.¹ The malaria programme performance review identified the lower test rate in rural areas as well as in the lowest wealth quintile of the population as causes for persistent malaria transmission.

Table 1 CHW programmes in Cambodia and Tanzania

Characteristics	Cambodia ^{70 71}	Tanzania ²⁹	WHO recommendation ⁷⁰
Healthcare workers per population	Doctors/10000=1.4 Nurses and midwives/10000=9.5 CHWs/1000 population=0.1	Doctors/10000=0.3 Nurses and midwives/10000=4.4 CHWs/10000=0.1	Doctors/10000≥9 Nurses/10000≥19 CHWs/10000≥25
Current health expenditure (% of GDP) ³⁰	7.51%	3.75%	World average=10.89%
Total number of CHWs	2800–3500 VMWs and MMWs ¹⁶ ²³ (CHWs specifically trained and deployed for malaria)	12 000–17 000 ^{29 72}	
Population	17 million	64 million	
Population density	76 per km ²	96 per km ²	
Area	181 035 km ²	945 087 km ²	
Healthcare facilities	Cambodia's public healthcare system consists of a network of 34 national and provincial-municipal level hospitals, 92 operational district referral hospitals, 1222 healthcare centres and 128 healthcare posts ⁷³	8549 healthcare facilities. ⁷⁴ A total of 336 hospitals. Among regions, Dar es Salaam has the largest concentration of hospitals, 53 institutions. The Mwanza and Kilimanjaro regions followed, each with 21 and 20 hospitals, respectively. ⁷⁵	
Universal healthcare coverage by social insurance	30% ⁷⁶	15%–32% ^{77 78}	
Roles and responsibilities	Focused on malaria. Cover entire responsibilities related to malaria. ^{11 23} CHWs for malaria are referred to as VMWs and MMWs and are provided with diagnostics and antimalarials. VMWs and MMWs diagnose malaria using RDTs and provide antimalarials if they are non-severe, refer severe and complicated cases of malaria to healthcare centre, report monthly cases and participate in malaria prevention activities. VMWs/MMWs receive case-based incentives. Village support health group are parallel CHWs for all other health conditions.	Focus on maternal and child health (diarrhoea, pneumonia and malaria), health promotion (nutrition, sanitation and hygiene). ²⁹ Other may be recruited for vertical programmes such as HIV home-based care, onchocerciasis and lymphatic filariasis elimination programme and trachoma disease. There are no malaria-specific CHWs. The CHWs are largely responsible for offering advice to all diseases. CHWs mainly offer health education, identify the diseases, refer them to the dispensaries (primary healthcare services) and provide follow-ups. NMCP in support with GFATM and PMI has planned to initiate a community case management (by CHWs) in some priority regions and is being planned to be implemented in selected regions.	

CHW, community health worker; GDP, Gross Domestic Product; GFATM, Global Fund to Fight Acquired Immune Deficiency Disease Syndrome (AIDS), Tuberculosis and Malaria; MMWs, mobile malaria workers; NMCP, National Malaria Control Programme; PMI, President's Malaria Initiative; RDT, rapid diagnostic test.

Tanzania has a long history of providing community health at the village level through the Ujaama policies established in the 1960s, following the independence from the earlier British administration. Because of a reduction in public funding, many of the community-based healthcare facilities transferred to faith-based NGOs in the 1990s. Malaria control improved in the new

millennium supported by the Roll Back Malaria initiative. Malaria parasite prevalence dropped from 18% in 2008 to 7% in 2017.²⁸ However, several reviews identified gaps in community-based malaria management, in particular an absence of trained CHWs in more remote regions.^{26 27} Tanzania suffers from one of the lowest healthcare worker to population ratios in the world.^{29 30}

CHWs are distributed unevenly over rural areas.^{31 32} In addition, CHW services are not dedicated to malaria only, but also provide for a range of other diseases and services, including general health advice, preventive medicine and referral support.^{29 33} In Tanzania, unlike in Cambodia, CHWs are not allowed to diagnose and treat malaria cases despite the fact that several studies have clearly shown CHW-led early diagnosis and treatment of malaria is feasible, accepted by the community, and led to a reduction in malaria attributable morbidity and mortality.^{34 35} Currently, the role of CHWs in Tanzania is mostly restricted to referring patients with malaria to the healthcare centres. This strategy does not account for the frequent challenges in reaching healthcare centres from more remote locations. These access barriers can result in treatment delays and increase the risk of more severe disease and an increase in malaria transmission.^{4 34 35} Informal shops and pharmacies provide anti-malarial drugs but are not quality controlled and may provide substandard doses without diagnostic testing.³⁶ The importance of CHWs for early diagnosis and treatment has now been recognised and a programme was designed for community case management in five high malaria burden regions (Katavi, Kagera, Geita, Kigoma and Ruvuma), where malaria services will be provided by trained healthcare staff called Community Owned Resource Persons (CORPs). As of 2023, only Katavi has begun community case management because only 38% of CORPs have been identified to roll out the programme.^{26 27} This programme will be implemented in a limited number of villages.³⁷

Compared with Cambodia and the larger GMS, available funding for CHW/VMW programmes tends to be much lower in SSA than in the GMS where regional grants provide the main funding for malaria community health programmes.³⁸ Increased funding for CHW networks in SSA from international donors will be important, but requires CHW networks able to absorb such funding.

COMPARISON OF CHW NETWORKS IN SOUTHEAST ASIA AND SUB-SAHARAN AFRICA

The main aim of comparing the regional differences in CHW networks between Southeast Asia and Africa was to explore how the broader epidemiological and health system context have bearings on the functioning of CHW networks in the community. The comparison is constrained by extensive differences in social, cultural and political parameters, as well as the limited number of studies on the subject (online supplemental appendix 1). However, a systematic literature review supporting this article does provide some insights in the differences in roles and contributions to malaria control of CHW networks between regions and countries.

The proportion of malaria cases diagnosed and treated by CHWs is substantially higher in SEA than in SSA. The WHO reports that community management of malaria by CHWs in SEA comprised more than 50% of malaria

cases compared with just 1% in SSA.^{1 39} Furthermore, the proportion of malaria cases managed by CHWs was reported to have decreased from 2% in the period from 2005 to 2011 to 1% in the period from 2015 to 2021.¹ Overall, it was estimated that in the African setting, only 7% of patients with malaria receive effective treatment in the public system, with poor coverage reported in particular from Somalia, South Sudan, Chad, Ethiopia, Central African Republic and Sudan.⁴⁰ However, variability in the reported proportion of malaria cases managed by the formal health system is large, from less than 1% in Chad and South Sudan to 60% in Uganda.⁴⁰ In addition, having access to formal or informal healthcare services alone does not guarantee appropriate malaria treatment. For example, in Nigeria, 84% of patients with malaria accessed a care provider, but less than a third of these were offered appropriate treatment.⁴⁰

In the absence of CHWs, patients with fever will often rely on the informal health sector, including traditional healers and drug stores. Alternatively, patients have to travel to the nearest health post for malaria diagnosis and treatment, which results in delays in treatment and increased costs. Factors contributing to a poor provision of healthcare services in SSA include inadequate budgetary allocations, limited management infrastructures and shortages of qualified medical personnel.⁴¹

For SSA as a whole, the estimated healthcare workforce ratio is 1.55 per 1000 people, which is well below the WHO-defined threshold of 4.45 healthcare workers per 1000 population needed for the delivery of essential healthcare services and universal healthcare coverage^{42 43} and translating to a shortage of 1.3 million CHWs in SSA.⁴⁴ In comparison, in SEA the healthcare workforce ratio is estimated 2.7 per 1000 population,^{45 46} with an increasing number over the last decade.⁴⁷

A WAY FORWARD

Despite the differences in epidemiological, social and health system characteristics, there are lessons learned from Cambodia and SEA that can be used to strengthen the roles of CHWs for malaria control and elimination in Tanzania. Aligning with the building blocks for health system strengthening outlined by WHO,⁴⁸ we discuss specific insights on using CHWs system for malaria in Tanzania. Important components for a quality network of CHWs for malaria control include good governance, organisational structure, adequate funding, and training and supervision of community healthcare workers (figure 1).

Governance and organisational structure

Governance in health system is a cross-cutting theme that oversees the strategic policy frameworks, effective oversight, regulation, implementation and accountability and is essential in ensuring the functionality of the health services delivery.⁴⁸ Nonetheless, governance often can taper and falter its effectiveness towards the tail end of

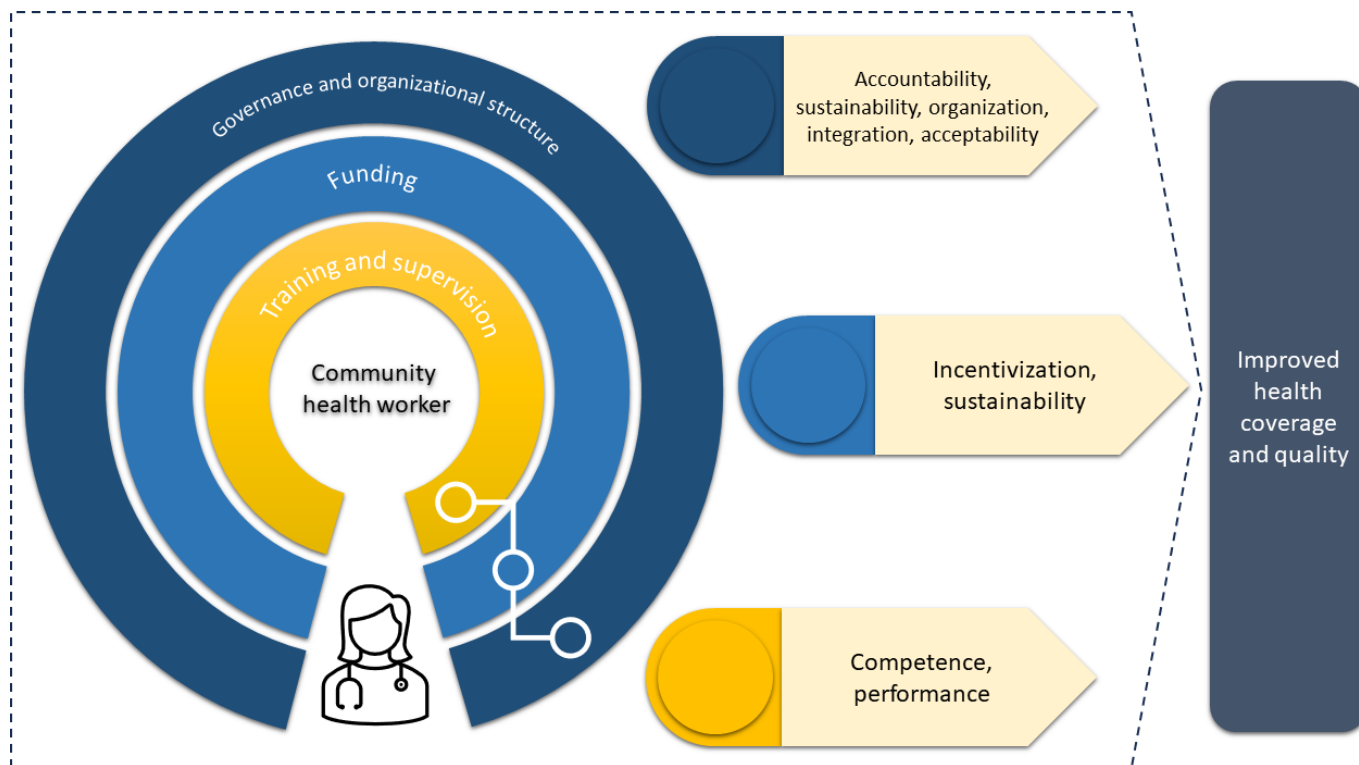


Figure 1 Essential health system components that affect community health workers' efficiency for improved healthcare services. Adapted from WHO's building blocks of health system.⁴⁶

the health system structure where CHWs deliver health services. CHWs need to function in a clear organisational structure to ensure they are a legitimate and integral part of the healthcare system.⁴⁹ Ministries of Health and national malaria control programmes are best positioned to provide this structure and can be assisted by national and international non-governmental organisations. Aspects of good governance within the supportive health system include clear policy guidance and regulation, effective coordination and well-defined accountability.⁵⁰ Roles and contributions of CHWs can be enhanced by integrating CHWs as formal components of the healthcare system, which also fosters their societal status and formalises their responsibilities.⁵¹

In Cambodia, VMWs and MMWs are recognised community structures of malaria healthcare services and are regarded as essential components to achieve the goals of malaria elimination.^{11 16} Supervision, technical and professional support are provided in monthly meetings at the healthcare centre, from where they also receive supplies of medicines and diagnostics.¹⁶ In Tanzania, the scope of CHWs training is limited and generally does not include malaria diagnostic testing and treatment. This may compromise the quality of services. A useful tool can be the WHO guideline on health policy and system support to optimise CHW programmes. In addition to the importance of a clear delineation of roles, remuneration, training and supervision, the guideline stresses the importance of CHW programmes evaluation and adaptation if needed.⁵²

In Cambodia, VMWs have been adjusted to the changing epidemiological context of malaria, with a sharp drop in malaria cases and a relatively increased importance of vivax malaria.⁵³ This adaptive model aligns with the concept of a 'learning health system'.⁵⁴ This system is adaptive, flexible and open to accommodate new evidence, in contrast to conventional policy formulation and implementation based on a vertical governance system.⁵⁴ A learning health system requires engagement with all relevant stakeholders, including policymakers, healthcare service providers and the community, to seek for their opinion and feedback, and to implement adaptations if indicated.⁵⁰ Community engagement plays a central role in enhancing the acceptability of services and interventions provided by CHWs.⁵⁵

In Tanzania, dispensaries are the lowest level health structures available at villages and are capable to provide pre-referral management of severe diseases with parental antimalarials. Once referred to health centres, they can be admitted in the inpatient departments of health centres or hospitals equipped to provide further management of complications.²⁷ When CHWs in the community are only devolved to make presumptive diagnosis and refer them to dispensaries, community management of malaria remains underserved. In addition to lack of definite diagnosis at the community level, distance to the nearest dispensaries, severity of the cases, time and resources required to travel to the dispensaries and quality of care can affect the outcome.⁵⁶ Embracing this particular gap, and following the national health

policy, community-based health services are recognised to be an integral part of the primary healthcare system, the government has re-introduced the use of voluntary community-based health workers and this demonstrates the commitment to extend the community outreach through CHWs.^{26 27 37} Implementing the policy stringently to roll out the CHWs for malaria diagnosis, treatment and referral emerges as a critical and imminent next step for malaria control programme in Tanzania.

Sustainable funding

The two main aims of optimal financing in health system include (1) raising sufficient funds to deliver health services, for example, through domestic revenue collection and external funds, and (2) providing financial risk protection to the population through fund pooling mechanisms such as health insurance schemes.⁴⁸ Both of these aims are complementary and can predicate the equitable health services delivery. Optimal health financing requires availability of sustainable funding mechanism that can support the incentives to the health service providers, and affordability to the recipients. To ensure community health services are available and accessible, the foremost step is to incentivise CHWs adequately.⁴⁸ Although social standing and recognition are important for CHWs' motivation and performance, financial incentives and adequate remuneration are needed to sustain quality CHW networks. The current examples of all successful CHW programmes have a system of remuneration in place. Even if incentives are modest, they are important to preserve the motivation of CHWs and limit their need to seek for alternative sources of income.⁵⁷ In some countries, such as Bangladesh, CHWs sell selected diagnostic tests and medicines integrated in their service.⁵⁸ Although such models are criticised as they could commercialise the health services and widen the health inequity gap, this model could also be useful to ensure sustainability, as shown by the Bangladesh Rehabilitation Assistance Committee (BRAC).⁵⁹ Liaising with private sector providers with provision of incentives to test for malaria, quality antimalarial drugs and integrating reports on malaria case numbers has also been successful in several malaria endemic countries.

Almost all available reports and studies highlight the problem of underfunding of CHWs programmes for malaria,⁶⁰ although it is difficult to obtain detailed information on funding for CHWs in malaria endemic countries from publicly available information.^{8 61} CHW network funding will have to come from the national public health budget and from international donors. If CHWs are only providing malaria services, their funding will have to compete with other diseases. Expanding the malaria service package with selected other relevant primary healthcare services can increase cost-effectiveness and ensure sustained uptake of services by the community, including malaria services.⁶²

The major international donors for malaria services include the GFATM and the President's Malaria Initiative

(PMI). The GFATM provides globally 63% of all international financing for malaria programmes and has invested USD16.4 billion in malaria control programmes since its establishment in 2002. These funding mechanisms recognise the importance of strengthening the community-based management of malaria, particularly in high-transmission areas where healthcare services are sparse. However, a lack of sufficient numbers of trained healthcare workers hampers the roll out of CHW networks.³⁷ While specific CHWs for malaria such as those in Cambodia can be ideal for a malaria endemic context, availability of funding and motivations for reforming community health system can be a major barrier, and thus cost-sharing through integration of roles can be an alternative. Integrating malaria programmes with other diseases can facilitate the share of resources and clearly requires weighing the benefits appropriate for the local social, and epidemiological context.⁶³ For instance, United Nations Children's Fund (UNICEF)/WHO formulated strategy of 'integrated management of childhood illnesses' (IMCIs) covers important additional diseases including acute respiratory infections, acute diarrhoeal diseases, measles and malnutrition.⁶⁴

Services provided by CHWs are often not covered by health insurance schemes, obliging out of pocket expenses for patients.⁶⁵ In many malaria-endemic countries, the financial capacity of communities in remote rural areas is so minimal, that even subsidised insurance schemes are not affordable for the majority of residents. Two main types of health insurance funds exist in Tanzania, the National Health Insurance Fund (NHIF) covering a range of both public and private healthcare and a Community Health Fund (CHF) with coverage of payments to public healthcare providers at district level only. Although CHF is aimed to serve low socioeconomic communities, their uptake by the rural population is limited to around only 25%, because of substantial residual costs for the subscribers, a limited range of services, lack of healthcare centre staff, frequent drug stock outs, perceived poor quality of services and lack of knowledge about the benefits of the insurance.⁶⁶ A system of centrally funded malaria services provided by a network of CHWs in poor rural areas seems therefore the preferred way forward.

Training and supervision of CHWs

CHWs are the community units of broader health workforce critical for health system to function that operates based on their availability, accessibility, acceptability and quality. Nonetheless, their quality services are dependent on training, supervision and monitoring.⁶⁷ Effective training and supervision will provide technical knowledge, skills and socially oriented capacities (eg, counselling and interpersonal communication) supplemented by ongoing in-service and in-field mentoring and support.^{67 68} Many studies have established the importance of training, decision support and supervision of CHW networks, whether run by the public health sector

or NGOs.^{8 67} With adequate training and supervision, it has been shown that malaria services provided by CHW networks are at least as effective as services provided by basic professional healthcare providers.⁶⁷ Several studies have shown that training of CHWs resulted in improved access to malaria diagnosis and treatment, a significant shortening of the duration of illness, and a reduction in the number of severe malaria cases.⁴ Recent operational studies from Cambodia have shown that VMWs were able to integrate relatively sophisticated medical equipment and diagnostics into their routine work for malaria control and elimination.^{15–18}

Aligning with the sharp drop in malaria cases in Cambodia, NMCP has devolved VMWs with expanded roles and responsibilities for community-based diagnosis, treatment and referral for other diseases and this further demonstrates the instrumental role of training and supervision.⁶⁹ Tanzania can adapt the existing community-based human health resources to include early diagnosis, treatment and referral of malaria through extended training and supervision. Aligning with the vision of the national malaria strategic plan of Tanzania 2021–2025, health system in Tanzania can revamp the roles and responsibilities of existing CHWs starting with the villages in the malaria endemic regions such as Mtwara.²⁷ Key shifts identified in the PMI's 2023 report also outline their joint commitment with Global Fund to provide training, supervision and compensation for the government of Tanzania's newly established CORPs programme.²⁶ The delayed implementation of the programme implies the need to generate evidence, multisectoral collaboration and community engagement on the roles of CHWs for malaria control and elimination.

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