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Public health surveillance through community health workers: a scoping review of evidence from 25 low-income and middle-income countries

Jacob Albin Korem Alhassan ,[1,2] Odette Wills[1]

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[1]Ad Astra Foundation, Tamale, Ghana
[2]Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

Correspondence to
Dr Jacob Albin Korem Alhassan; jaa178@mail.usask.ca

ABSTRACT

Background The last 3 years have witnessed global health challenges, ranging from the pandemics of COVID-19 and mpox (monkeypox) to the Ebola epidemic in Uganda. Public health surveillance is critical for preventing these outbreaks, yet surveillance systems in resource-constrained contexts struggle to provide timely disease reporting. Although community health workers (CHWs) support health systems in low-income and middle-income countries (LMICs), very little has been written about their role in supporting public health surveillance. This review identified the roles, impacts and challenges CHWs face in public health surveillance in 25 LMICs.

Methods We conducted a scoping review guided by Arksey and O'Malley's framework. We exported 1,156 peer-reviewed records from Embase, Global Health and PubMed databases. After multiple screenings, 29 articles were included in the final review.

Results CHWs significantly contribute to public health surveillance in LMICs including through contact tracing and patient visitation to control major infectious diseases such as HIV/AIDS, malaria, tuberculosis, Ebola, neglected tropical diseases and COVID-19. Their public health surveillance roles typically fall into four main categories including community engagement; data gathering; screening, testing and treating; and health education and promotion. The use of CHWs in public health surveillance in LMICs has been impactful and often involves incorporation of various technologies leading to improved epidemic control and disease reporting. Nonetheless, use of CHWs can come with four main challenges including lack of education and training, lack of financial and other resources, logistical and infrastructural challenges as well as community engagement challenges.

Conclusion CHWs are important stakeholders in surveillance because they are closer to communities than other healthcare workers. Further integration and training of CHWs in public health surveillance would improve public health surveillance because CHWs can provide health data on 'hard-to-reach' populations. CHWs' work in public health surveillance would also be greatly enhanced by infrastructural investments.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study offers a broad-ranging synthesis of the role of community health workers (CHWs) in public health surveillance and covers a wide range of countries across three continents.
⇒ The study relied on three major global health databases and this facilitated access to a wide range of records increasing the likelihood of identifying relevant studies.
⇒ The time period of this review (the last two decades) allowed for understanding CHW roles in public health surveillance both in pre-COVID-19 contexts as well as CHW roles in the COVID-19 context.
⇒ The use of grey literature sources might have broadened the understanding of the role of CHWs in public health surveillance particularly in contexts where descriptions of CHW roles do not get published in peer-reviewed papers.

INTRODUCTION

Community health workers (CHWs) are a critical component in the health system architecture of low-income and middle-income countries (LMICs). They are primarily based outside health facilities and often have some formal but limited training provided by the health systems or health programmes they support.[1] Following the Alma Ata Declaration of 1978 that promised 'health for all' through bottom-up approaches, CHWs have been a pivotal part of healthcare delivery in LMICs through their efforts in health education and the delivery of primary healthcare services.[2 3] In most cases, CHWs do not receive any formal professional certificate or degree and perform their duties on a voluntary basis.[1] However, some CHWs may receive a salary or other incentives.[4] It is increasingly recognised that CHW programmes can improve health to achieve public health goals in LMICs.[1 4]

Historically, there has been a rise and fall in attempts at implementing CHW programmes in LMICs. In the mid-1970s, CHWs were a key element of the strategy to achieve WHO's 'Health for All by the year 2000' agenda.

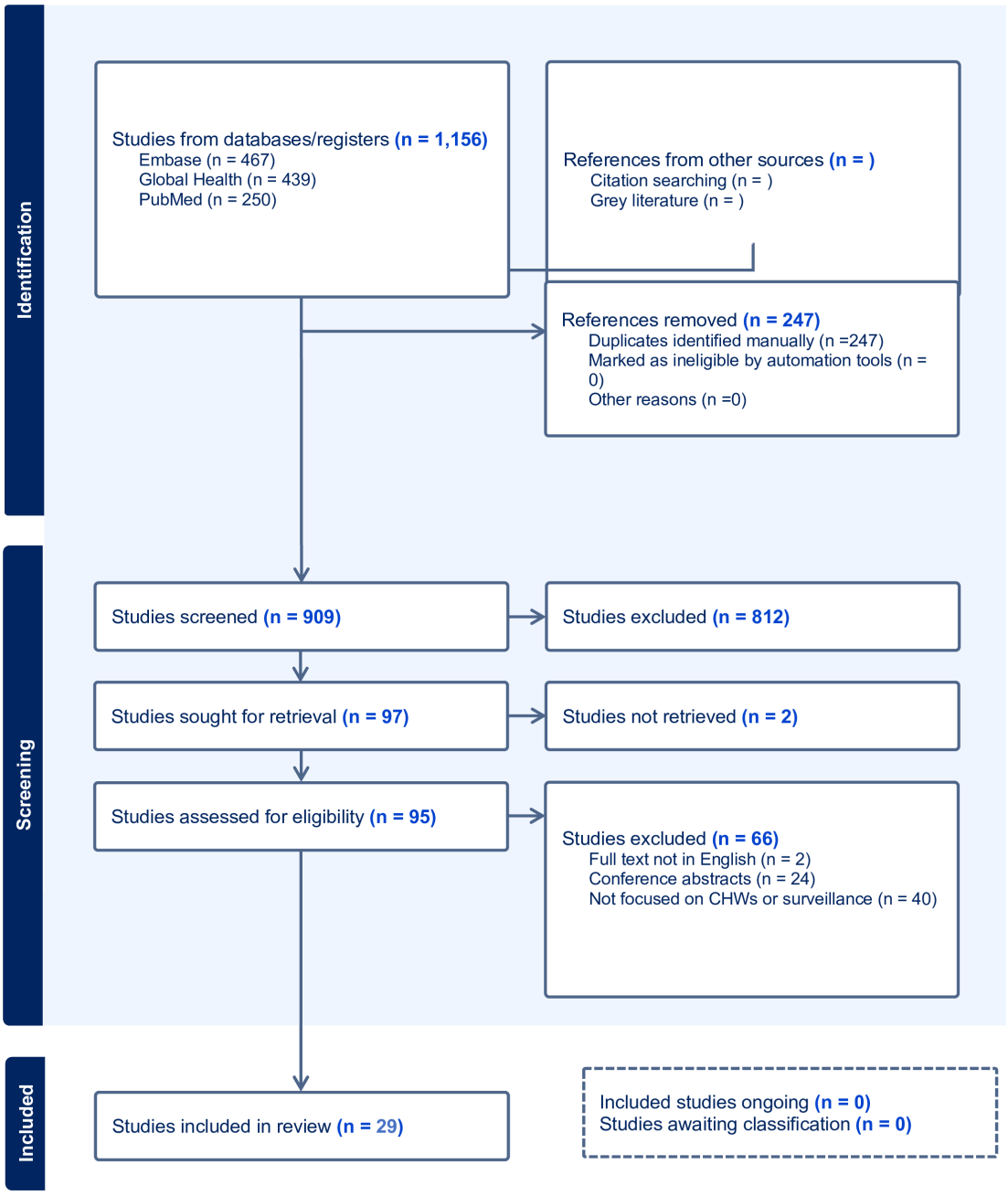

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Extension for Scoping Reviews diagram of included studies. CHWs, community health workers.

Because of this ambition and institutional orientation, many CHW programmes were established in the late 1970s in LMICs.[5] Not too long after that, however (in the late 1980s), there was a reorientation towards selective primary healthcare given the rise of neoliberal economic policies and this significantly undermined the critical role of CHWs.[2] Structural adjustment programmes, governance failures in countries where large CHW programmes were operational and ideological changes all contributed to the waning of CHW programme implementation.[5] The 2000s saw a reorientation and interest in CHWs once again with increased interest in implementing CHW programmes although most recent attempts continue to be plagued by very similar challenges as those faced in the 1970s, including poor implementation and resource challenges.[3] In recent years, several critical questions have arisen on the ongoing role of CHWs and the possibilities for improving public health through their work such as whether they should only work in communities or within facilities, who should select them and to whom they are accountable.[6–8]

Although CHWs have played a wide range of public health roles, not much attention has been given to their role in public health surveillance. The last 3 years have revealed the dangers of poor public health surveillance systems, ranging from the global pandemics of COVID-19 and mpox (monkeypox) to the recent Ebola epidemic in Uganda. Public health surveillance is a critical component

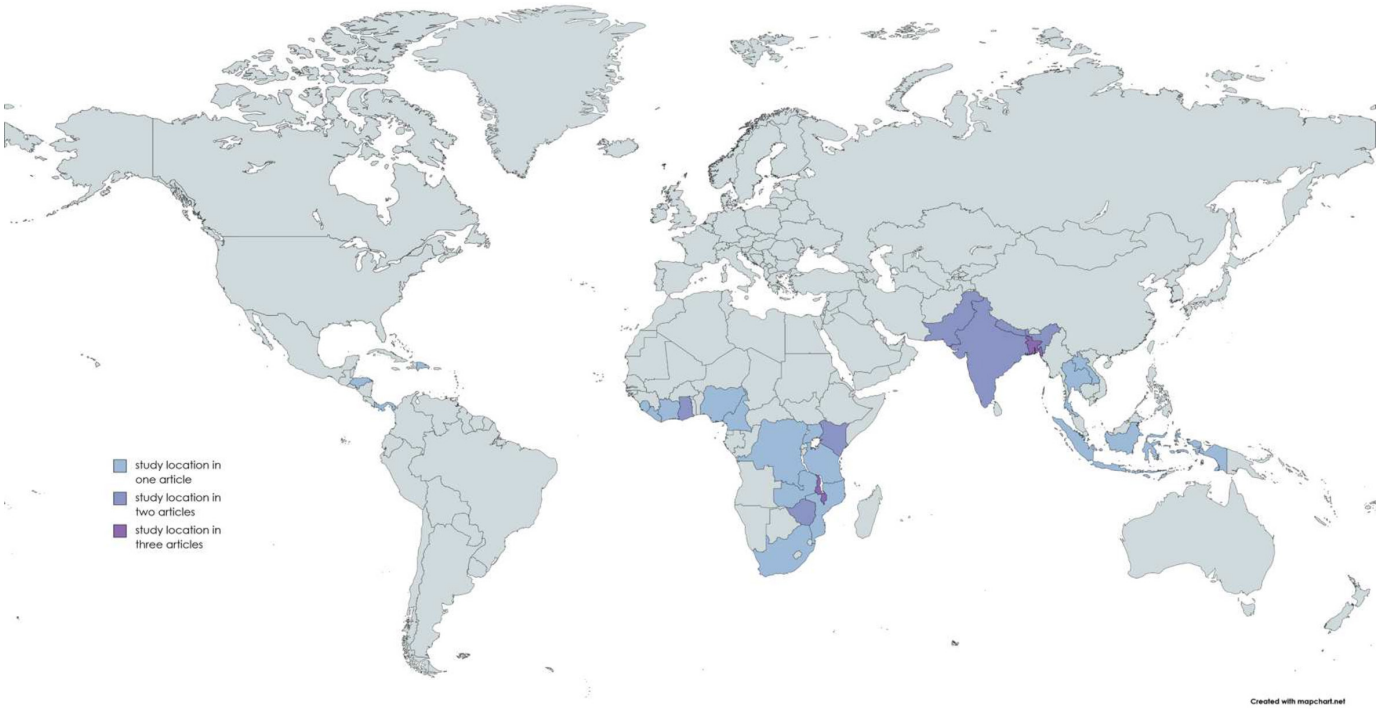

Figure 2 Geographical distribution of included studies.

of any efforts to prevent these epi/pandemics. Yet, surveillance systems may fail to accurately document the disease burden in LMIC contexts because of resource constraints including infrastructural challenges and inadequate human resources for health.[9] Given the critical role played by CHWs in health systems strengthening and response to health challenges, their role in public health surveillance could be pivotal in preventing and containing epidemics. The objective of this scoping review was to explore the roles of CHWs in public health surveillance systems in LMICs as well as the impacts they have had in supporting surveillance. Additionally, we explored the challenges faced when using CHWs for public health surveillance work and described the kinds of technologies that are being adapted and used as part of CHW programmes to improve surveillance in LMICs.

METHODS

This review was guided by the five-stage methodological framework proposed by Arksey and O'Malley.[10] This approach was chosen because it provides a useful methodology for systematically determining the state of evidence on a given topic, identifying gaps in research and providing guidance for future research in the area. The approach includes the following steps: (1) identify the research question; (2) identify studies that are relevant to the research question; (3) review and select a subset of studies for inclusion in the final review; (4) chart data and information of the selected studies; and (5) summarise and present the results.[10]

This review set out to examine CHWs' roles in disease surveillance in LMICs. Specifically, the review focused on the role played by CHWs in disease surveillance as well as their impacts and the challenges they face. It however did not include routine monitoring and evaluation work done by non-governmental organisations (NGOs) while engaging with CHWs. This review also included a secondary research question exploring the extent to which innovative information and communication technologies (ICTs) were incorporated into the work of CHWs as part of their surveillance work.

With the guidance of an expert academic librarian, three major databases (Embase, Global Health and PubMed) were searched in October 2022. The following search was used to extract studies from the databases: (community health worker OR community health extension worker OR village health team* OR primary healthcare worker*) AND (surveillance OR public health surveillance OR disease monitoring OR community disease reporting). Detailed searches can be found in online supplemental file 1.

The inclusion criteria for the review included: (1) publication in the English language; (2) full text, peer-reviewed journal articles; (3) the study described specific roles of CHWs in surveillance and the impacts of using CHWs; (4) the study described key challenges faced when using CHWs whether these challenges were faced by CHWs, health systems or researchers. To identify a wide range of studies, no restrictions were used for the publication date or the designs of the studies, but studies retrieved from the databases and included in the final selection were those published over the last 20 years. CHWs are a diverse group with variations in education and pre-service training. We included all types of CHWs

ranging from those with some or limited formal education to those who could not read or write.

The search findings from the databases were exported into Rayyan software followed by a systematic de-duplication and title/abstract screening which was conducted by two reviewers. The reference lists of relevant articles were also searched to identify further studies which were reviewed to be added to the records. The relevance and appropriateness of articles selected for the final review were agreed upon by both reviewers. No registered protocol was published for this study and it received no financial support from any funding agencies. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Extension for Scoping Reviews (PRISMA-ScR) diagram (figure 1) describing the literature search process and included studies is presented below. Online supplemental file 2 shows the PRISMA-ScR checklist and figure 2 shows the geographical distribution of included studies.

Patient and public involvement

None.

Findings

The systematic search of relevant databases resulted in a total of 1,156 records: Embase (467), Global Health (439) and PubMed (250). A total of 247 duplicates were removed and 909 screened. After titles and abstracts were screened, 812 irrelevant records were excluded. The full texts of 95 articles were reviewed to assess if they met the inclusion criteria. A total of 66 articles/records were excluded at this stage because there was no full text in English (2), they were conference abstracts (24) or not explicitly focused on both CHWs and surveillance (40). A total of 29 peer-reviewed articles met the inclusion criteria and were included in the final review. The studies adopted quantitative, qualitative and mixed methodologies with some studies specifically describing interventions to train CHWs.[11 12] Studies were from 25 LMICs across the world including Africa,[11–26] Asia,[27–36] Latin America[37 38] and the Caribbean.[39] Although most studies focused on specific infectious diseases including HIV/AIDS,[20] malaria,[15 18 37–39] tuberculosis (TB),[16 19] Ebola,[12] neglected tropical diseases (NTDs)[13 24 26] and COVID-19,[34] others focused on maternal and child health,[14 25 29–32 35] general health/overall mortality[17 21 23 33] and specific outcomes such a suicide.[28] Once data charting was completed, we synthesised results by identifying the most commonly described roles, challenges and impacts and categorised these based on similarity. For example, among included studies, we grouped together roles related to data, engaging with communities, health education and those connected to testing and treatment. We then synthesised these studies focused on how similarly they described roles across these domains to provide a summary of the most common roles. We used a similar approach to identify challenges and impacts of CHWs in public health surveillance.

CHWs play a wide range of roles as part of their surveillance work and these can be categorised into four main types of not entirely mutually exclusive functions including: (1) community engagement; (2) data gathering; (3) screening, testing and treating patients; and (4) health education and promotion. We also identified three key types of challenges faced by CHWs and health systems using CHWs for surveillance including: (1) lack of education and training; (2) lack of financial and other resources; and (3) logistical and infrastructural challenges. The use of CHWs was very impactful and several studies that compared the effectiveness of CHWs' surveillance with other forms of surveillance concluded that CHWs were more or just as effective as traditional surveillance.[13 15 17 22 24 31] In the sections that follow, we describe the roles, challenges and impacts of CHWs in their work to support surveillance. Online supplemental table 1 includes a summary of included studies and online supplemental table 2 provides a detailed appendix of included studies.

CHW roles

CHWs play four main kinds of roles in their surveillance work with community members and patients. While some of these roles are directly related to traditional surveillance such as data collection and screening, others such as community engagement, health promotion and education are secondary roles incorporated into surveillance roles by CHWs either at the behest of supervisors or through CHWs' innovations. Generally, the roles assigned to and played by CHWs depend on a combination of their education and pre-service training and available resources for building their technical capacities to support surveillance.

Community engagement

One of the main roles of CHWs in surveillance work in LMICs is community engagement. Several studies have revealed that because CHWs are usually from the community, they are some of the most effective agents for community engagement. CHWs often have a deep understanding of cultural practices and why community members may refuse to adhere to treatment or refuse to report cases of diseases. In a comparative analysis of treatment adherence aimed at preventing mother-to-child transmission of HIV/AIDS, Cataldo *et al*[20] noted that CHWs were often effective at identifying and convincing mothers to adhere to treatment because of their deep community knowledge. Similarly, a Cameroonian study on the use of CHWs for surveillance of outbreak-prone diseases concluded that CHWs are effective agents of community engagement for displaced communities because they are often trusted by communities more than, for example, traditional healthcare workers.[22] CHWs perform their community engagement role through household visits and drawing on their own lived experience when interacting with other community members.[13 19 22 29 34 39]

Data gathering

By far the most common role played by CHWs in the included studies was data gathering as part of

disease surveillance. In most cases, this involved going door to door to interview community members and patients, taking photos, completing vital registrations or conducting verbal autopsies. These data points are then transferred to appropriate facilities via mobile technologies or physical papers and folders. In Zimbabwe, Kambarami *et al*[25] highlighted that as part of pregnancy surveillance, CHWs collected data on women's menstrual health, while in Pakistan, Khalid *et al*[32] described CHWs as playing a critical role in collecting data on pregnancies, births, and maternal and child deaths during household visits. In rural Nepal, Bhatta *et al*[33] also highlight the role of CHWs in improving surveillance by collecting data on fatal injuries and other demographic data. In some cases, the data collected are not restricted to mortality and morbidity data but may also include samples in the case of surveillance for patients with TB in South Africa.[16] Additionally, in the case of surveillance of NTDs, Timothy *et al*,[13] based on a survey of CHWs in Liberia, describe the data gathering role of CHWs to include the taking of photographs of skin-related NTDs. In places where vital registration systems have been historically ill-equipped/insufficient, CHWs have played an important role in obtaining vital registration data to be forwarded to health facilities.[21] Beyond the collection of data directly related to mortality and morbidity, CHWs also support surveillance by collecting data on treatment as in the case of CHW surveillance data gathered from Kenya, Nigeria and the Democratic Republic of the Congo.[14]

Screening, testing and treating

As part of their surveillance work, CHWs also play a critical role in supporting screening, testing and treatment, particularly for infectious diseases in LMICs. In Panama,[37] Zambia,[18] the Dominican Republic[39] and Honduras and Laos,[38] an identified role of CHWs as part of surveillance work has been the administration of rapid diagnostic testing for malaria, particularly among marginalised populations and those in so-called 'hard-to-reach places'. In other contexts, such screenings have been done for other conditions, such as TB in South Africa,[16 19] skin-related NTDs in Liberia[13] and even pregnancy testing in Zimbabwe.[25] In most cases, where CHWs play a role in identifying and testing for conditions, they also often play a role in providing treatment for patients and community members. Bhavnani *et al*[37] note that Panamanian CHWs, after identifying malaria cases, provide treatment for community members. This treatment could be in the form of giving available medications or accompanying patients in their treatment journey to ensure that patients access the medicines they need.[20] In Indonesia, this accompaniment comes in the form of travelling with women to attend antenatal care clinics,[29] while in Liberia, this role involves supporting community members in managing skin-related NTDs.[13] Afai *et al* have also noted that CHWs in Mozambique have incorporated the distribution of antimalarials into their surveillance work.[15]

Health education and promotion

Beyond the provision of treatment, CHWs also provide health education and promotion support as part of their surveillance work. In places such as Ghana, CHWs have supported public health surveillance through critical preventative measures such as the distribution of mosquito-treated nets.[21] In Sierra Leone, Mckenna *et al*[12] highlight the role of CHWs in health promotion noting that CHWs do not only provide information about how Ebola is spread during household visits but also provide counselling to community members about vaccinations. CHWs also help to organise health promotion campaigns and incorporate the sharing of key health information as part of their surveillance work.[16] Through these activities, CHWs move beyond collecting data and simply screening for disease to supporting existing preventative medicine and primary healthcare services as part of their surveillance role.

Challenges faced by CHWs

We identified three key challenges involved in the use of CHWs. These challenges are either those faced by CHWs in the discharge of their duties or those faced by health systems and researchers in their attempts to use CHWs for surveillance work. Broadly, the challenges associated with the use of CHWs as well as those faced by CHWs in their surveillance work can be divided into three main categories that are not entirely mutually exclusive including: (1) lack of or insufficient education and training; (2) lack of financial resources; and (3) logistical and infrastructural challenges. For roles that required more technical skills, like screening and testing, education/training-related challenges were often identified. Challenges related to confidentiality and difficulties in community engagement also emerged more commonly on health issues/outcomes considered more sensitive such as HIV/AIDS and suicide.

Lack of education and training

One of the key challenges with the use of CHWs for surveillance work is the fact that CHWs may lack the requisite education and training to carry out *all* duties effectively. This lack of education may manifest in limited technological and language abilities. In Sierra Leone, Mckenna *et al*[12] have noted that many CHWs found it difficult to use a mobile application developed to be used for Ebola surveillance because the messaging on the application was in a specific language not spoken by all CHWs. Regeru *et al*[23] have also noted how in Kenya and Malawi, CHWs conducting surveillance struggled because of insufficient knowledge and training in data management. This leads in some places to errors in surveillance such as duplication and reporting on people outside of the designated catchment area for surveillance as Stanton *et al* found for lymphatic filariasis surveillance in Ghana and Malawi.[24] In many cases, CHWs may not know how to read and write and this can pose difficulties in their attempts to play their data gathering role. CHWs trying to support surveillance in Nepal had difficulties completing

notification of death forms because of a lack of education and training.[33] In some cases, this challenge arises because of institutional contexts where CHWs may be operating without sufficient supervision and training,[16] and this can lead to several negative outcomes including breaches of confidentiality by CHWs.[20]

Lack of financial and other resources

One of the major challenges faced by CHWs in the discharge of their duties is the absence of financial resources. In most healthcare systems where CHWs support surveillance work, they do so without financial compensation. While this reality can be a source of pride and a sense of 'spirit of service',[39] lack of financial incentives can render CHW surveillance work difficult particularly in situations where CHWs who are often smallholder farmers feel that that they have to choose between surveillance work and their livelihoods.[21] Lack of financial resources also renders CHW work difficult because in some cases, they are forced to use their personal financial and other resources to be able to carry out surveillance work.[20] Some of the personal resources CHWs have often had to rely on to be able to work include the use of their own mobile phones, airtime, means of transportation and time.[20] Working under such financial and other resource constraints undermines the effectiveness of CHWs and can directly disrupt and interfere with the quality of the surveillance work carried out by CHWs.[14 19 25 32]

Logistical and Infrastructural challenges

Beyond financial resource challenges faced by CHWs as they try to conduct surveillance work, they also face challenges related to the socioeconomic and institutional contexts within which they operate. While some of these challenges are common realities in LMICs, they hamper CHWs' ability to function and in many cases, disrupt surveillance work. A number of studies on CHW roles in surveillance have highlighted transportation challenges CHWs often face either due to poor road networks or unavailability of appropriate means of travel to be able to transmit surveillance data.[11 19 21] While in some cases, transportation challenges may be mitigated through the use of text messaging platforms, some CHWs may still struggle to conduct their work because of poor cellphone coverage,[11 26] lack of electricity or intermittent power outages[11 12 26] or in some cases, because of ongoing insecurity and the possibility of attacks by insurgent groups.[22] While the issue of insecurity faced by CHWs in Cameroon as described by Metuge *et al*[22] was by armed insurgent groups in a context of conflict, CHWs may also face similar challenges as they try to conduct surveillance in areas with higher levels of poverty and crime.[16]

Community engagement challenges

In a few cases, CHWs may also face challenges in their attempts at community engagement often because of ongoing misunderstandings. For example, there are reported examples where community members may think that CHWs are paid for their work leading community members to refuse to cooperate with CHWs.[21] In other cases, CHWs may find themselves in uncomfortable positions because while their closeness to the community allows them to share their lived experience and better connect with community members, they may also be perceived as 'informants' in their surveillance work.[28] In some cases as well, CHWs may find themselves in high-risk situations where community members refuse to cooperate with them or resist their attempts at data gathering or sample collection.[19] Across the multiple cultural contexts of included studies, challenges related to community engagement often emerged in rural contexts compared with urban contexts thus requiring CHW cultural competence to navigate.

Impacts of CHWs on surveillance

The use of CHWs in surveillance has been highly effective in improving public health surveillance, especially in low-resource contexts. For example, Anwar *et al* have revealed that in Pakistan, use of CHWs was highly impactful and led to an increase in the observed perinatal and maternal mortality rates since CHWs effectively identified cases not identified through existing surveillance systems.[31] A similar finding was reported by Stanton *et al* for lymphatic filariasis rates in Ghana and Malawi.[24] In cases where CHWs have the capacity to test and treat, they have effectively not only provided information to aid surveillance but successfully ended outbreaks as in the case of malaria outbreaks in Santo Domingo.[39] For data that are often extremely hard to find in LMIC contexts such as suicide data[28] and data on injuries,[33] the use of CHWs has played a role in providing such critical information for health systems while ensuring that those in rural and remote communities are included in such surveillance.[29 31] CHWs' community engagement skills also help to facilitate cooperation from community members leading to effective surveillance and the sustainability of public health surveillance efforts.

Incorporation of technologies into CHWs' surveillance work

As part of our secondary research question, we explored how various ICTs have been incorporated into CHW surveillance work. Among the included studies, 12 specifically highlighted the fact that they had incorporated technologies in CHW surveillance, and these ranged from the use of Excel sheets[38] and text messaging[11 26 27] to clinical algorithms.[35] Although the use of these technologies, particularly text messaging applications have significantly improved surveillance, particularly in resource-constrained contexts, existing infrastructural challenges including challenges with electricity[11 12] and cellphone coverage[11 26] often undermine the effectiveness of these technologies. Nonetheless, the incorporation of ICTs into CHWs work has positive effects on surveillance work with real potential for building the capacities of the CHWs and communities who benefit from such interventions.

DISCUSSION

We set out to describe the role CHWs play in public health surveillance across LMICs. CHWs have been a critical part of primary care and community health initiatives since the Alma Ata Declaration of 1978. Our review has revealed that the roles played by CHWs to support public health surveillance in LMICs are varied and can be very impactful to health systems. While this evidence encourages the need to support and expand CHW programmes, it is necessary to assign CHW roles and tasks based on their capacities and be mindful of safety implications for some tasks that may be assigned to CHWs.[40] For example, the possibility of violating patient privacy[34] despite well-intentioned attempts at health promotion necessitates proper training and resourcing to mitigate. In many LMICs, the absence of strong vital registration systems also means that CHWs are absolutely necessary for providing much needed data for health systems.[41] In this sense, health system stakeholders should consider CHWs as vital players for improving disease surveillance and reporting. Drawing on innovative approaches for capturing data that might otherwise go unreported such as verbal autopsy,[42] the routine integration of CHWs in surveillance systems has the potential to provide data beyond the traditional maternal and child health outcomes to include data on outcomes such as suicide.[28]

The challenges faced in using CHWs need to be confronted by health systems given the value and importance of the roles played by CHWs. Indeed, financial, logistical and infrastructural challenges faced by CHWs require governments and donors to further invest resources to enhance capacity building of CHWs to support public health surveillance in LMICs. Nonetheless, a simple investment of resources alone will not remove all barriers faced by CHWs as some of the challenges they face relate to soft skills and the intricacies of building trust during community engagement. As noted previously, for example, there are several instances where CHWs may be perceived as informants while trying to do surveillance work, and this undermines their safety and ability to work effectively.[28] While in some cases, CHWs may decide to share or inform programme coordinators or health system stakeholders about these challenges, structural inequities and power imbalances often mean that CHWs may remain silent.[43] This means that while CHWs' intimate community knowledge can be relied upon for community engagement to support disease surveillance, programme managers, researchers and health system stakeholders seeking to rely on CHWs for surveillance work need to collaboratively engage communities with the help of CHWs to build trust and promote transparency.

Technological innovations can be powerful tools to support the work of CHWs and lessen the burden they face as they try to support surveillance work. Generally, the use of mobile technologies promotes quick transfer of data and mitigates against some of the barriers CHWs may face such as lack of transportation. Nonetheless, deep-seated infrastructural challenges including poor (or lack of) mobile phone networks and persistent power outages can undermine CHWs' ability to use these powerful technologies for improving surveillance.

Strengths and limitations of this study

This study offers a broad-ranging and up-to-date synthesis of the role of CHWs in public health surveillance and covers a wide range of countries across three continents. This allowed for an understanding of how varied contexts influence the role of CHWs in conducting and supporting public health surveillance in LMICs. Second, the study relied on three major global health databases, and this facilitated access to a wide range of records increasing the likelihood of identifying relevant studies. The identified studies covered a broad range of topics and highlighted varied roles across contexts. A limitation of this study is that it would not have captured roles of CHWs in public health surveillance that are not reported in the peer-reviewed literature. The use of grey literature sources might have broadened the understanding of the roles of CHWs in public health surveillance particularly in contexts where descriptions of CHW roles do not get published in peer-reviewed academic journals.

CONCLUSION

Given the ever-present threat of epidemics particularly as the world enters the closing phase of the COVID-19 pandemic as a public health emergency of international concern,[44] it is necessary to draw on the ingenuity of CHWs to support public health surveillance in LMIC contexts. CHWs have played several key roles in public health surveillance and should be empowered and prioritised by governments of LMICs as a health system strengthening strategy[45] as well as a potential epi/pandemic response strategy. The emergence and re-emergence of major infectious disease threats vis-à-vis crumbling public health infrastructure in LMIC contexts underscore the need to invest in CHWs to support public health surveillance.[46] CHWs have proven through their several roles and impacts in public health surveillance in LMICs that they can be counted on to improve public health surveillance in these contexts.

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Contributors JAKA conceptualised and oversaw data collection and analysis. JAKA conducted initial searches and together with OW screened relevant records. JAKA drafted and revised the manuscript. OW critically reviewed and revised the manuscript. Both JAKA and OW reviewed and approved the final manuscript before submission. JAKA accepts full responsibility for the work and conduct of the study, had access to the data, and controlled the decision to publish. JAKA attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. Transparency: JAKA (the guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

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Patient consent for publication Not applicable.

Ethics approval Ethics approval is not required as this was a review of already published studies.

Provenance and peer review Not commissioned; externally peer reviewed.

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ORCID iD

Jacob Albin Korem Alhassan http://orcid.org/0000-0002-5370-0612

REFERENCES

1 O'Brien MJ, Squires AP, Bixby RA, *et al*. Role development of community health workers: an examination of selection and training processes in the intervention literature. *Am J Prev Med* 2009;37:S262–9.
2 Basilico M, Weigel J, Motgi A, *et al*. Health for all: competing theories and Geopolitics. In: Farmer P, Kim JY, Kleinman A, eds. *Reimagining global health: An introduction*. Berkeley: University of California Press, 2019: 74–110.
3 Wintrup J. Health by the people, again? the lost lessons of Alma-ATA in a community health worker programme in Zambia. *Soc Sci Med* 2023;319:115257.
4 Kok MC, Kane SS, Tulloch O, *et al*. How does context influence performance of community health workers in Low- and middle-income countries? evidence from the literature. *Health Res Policy Sys* 2015;13.
5 van Ginneken N, Lewin S, Berridge V. The emergence of community health worker programmes in the late apartheid era in South Africa: an historical analysis. *Soc Sci Med* 2010;71:1110–8.
6 Mwai GW, Mburu G, Torpey K, *et al*. Role and outcomes of community health workers in HIV care in sub-Saharan Africa: A systematic review. *J Int AIDS Soc* 2013;16:18586.
7 Schneider H, Blaauw D, Gilson L, *et al*. Health systems and access to antiretroviral drugs for HIV in Southern Africa: service delivery and human resources challenges. *Reprod Health Matters* 2006;14:12–23.
8 Schneider H, Lehmann U. Lay health workers and HIV programmes: implications for health systems. *AIDS Care* 2010;22:60–7.
9 Jayatilleke K. Challenges in implementing surveillance tools of high-income countries (Hics) in low middle income countries (Lmics) *Curr Treat Options Infect Dis* 2020;12:191–201.
10 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology* 2005;8:19–32.
11 Clara A, N,SM, Joseph B, *et al*. Community-based surveillance in Côte D'Ivoire. *Heal Secur* 2020;18:S23–33.
12 Mc Kenna P, Babughirana G, Amponsah M, *et al*. Mobile training and support (MOTS) service—using technology to increase Ebola preparedness of remotely-located community health workers (Chws) in Sierra Leone. *Mhealth* 2019;5:35.
13 Timothy JWS, Rogers E, Halliday KE, *et al*. Quantifying population burden and effectiveness of decentralized surveillance strategies for skin-presenting neglected tropical diseases, Liberia. *Emerg Infect Dis* 2022;28:1755–64.
14 Puri D, Nisar YB, Tshefu A, *et al*. Prevalence of clinical signs of possible serious bacterial infection and mortality associated with them from population-based surveillance of young infants from birth to 2 months of age. *PLoS One* 2021;16:e0247457.
15 Afai G, Banze AR, Candrinho B, *et al*. Challenges for malaria surveillance during the COVID-19 emergency response in Nampula, Mozambique, January-may 2020. *Pan Afr Med J* 2021;38:254.
16 Ajudua FI, Mash RJ. Implementing active surveillance for TB—the views of managers in a resource limited setting, South Africa. *PLoS One* 2020;15:e0239430.
17 Schuttner L, Sindano N, Theis M, *et al*. A mobile phone-based, community health worker program for referral, follow-up, and service outreach in rural Zambia: outcomes and overview. *Telemedicine and E-Health* 2014;20:721–8.
18 Larsen DA, Chisha Z, Winters B, *et al*. Malaria surveillance in low-transmission areas of Zambia using reactive case detection. *Malar J* 2015;14:465.
19 Ajudua FI, Mash RJ. Implementing active surveillance for tuberculosis: the experiences of Healthcare workers at four sites in two provinces in South Africa. *S Afr Fam Pract* 2022;64:1–11.
20 Cataldo F, Seeley J, Nkhata MJ, *et al*. She knows that she will not come back: tracing patients and new thresholds of collective surveillance in PMTCT option B. *BMC Health Serv Res* 2018;18:76.
21 Dil Y, Strachan D, Cairncross S, *et al*. Motivations and challenges of community-based surveillance volunteers in the northern region of Ghana. *J Community Health* 2012;37:1192–8.
22 Metuge A, Omam L-A, Jarman E, *et al*. Humanitarian led community-based surveillance: case study in Ekondo-titi, Cameroon. *Confl Health* 2021;15:17.
23 Regeru RN, Chikaphupha K, Bruce Kumar M, *et al*. Do you trust those data?' - A mixed-methods study assessing the quality of data reported by community health workers in Kenya and Malawi. *Health Policy Plan* 2020;35:334–45.
24 Stanton MC, Mkwanda SZ, Debrah AY, *et al*. Developing a community-led SMS reporting tool for the rapid assessment of Lymphatic Filariasis morbidity burden: case studies from Malawi and Ghana. *BMC Infect Dis* 2015;15:214.
25 Kambarami RA, Mbuya NN, Pelletier D, *et al*. Performance differ by task in a multi-Tasked setting. *Glob Heal Sci Pract* 2016;4:238–50.
26 Kalinga A, Munga M, Ngenya A, *et al*. The viability of Utilising phone-based text messages in data capture and reporting morbidities due to Lymphatic Filariasis by community health workers: a qualitative study in Kilwa district, Tanzania. *BMC Health Serv Res* 2022;22:924.
27 Meyers DJ, Ozonoff A, Baruwal A, *et al*. Combining Healthcare-based and Participatory approaches to surveillance: trends in Diarrheal and respiratory conditions collected by a mobile phone system by community health workers in rural Nepal. *PLoS One* 2016;11:e0152738.
28 Vijayakumar L, Pathare S, Jain N, *et al*. Implementation of a comprehensive surveillance system for recording suicides and attempted suicides in rural India. *BMJ Open* 2020;10:e038636.
29 Pangestu ND, Joebagio H, Rahardjo SS, *et al*. The role of community health workers in maternal and child health surveillance to optimize maternal and child health in Pasuruan district, East Java. *J HEALTH POLICY MANAGE* 2017;02:128–36.
30 Islam MS, Baqui AH, Zaidi AK, *et al*. Infection surveillance protocol for a Multicountry population-based study in South Asia to determine the incidence, etiology and risk factors for infections among young infants of 0 to 59 days old. *Pediatr Infect Dis J* 2016;35:S9–15.
31 Anwar J, Torvaldsen S, Sheikh M, *et al*. Under-estimation of maternal and perinatal mortality revealed by an enhanced surveillance system: Enumerating all births and deaths in Pakistan. *BMC Public Health* 2018;18:428.
32 Khalid A, Adamjee R, Sattar S, *et al*. Maternal and child surveillance in peri-urban communities: perceptions of women and community health workers from Pakistan. *PLOS Glob Public Health* 2022;2:e0000295.
33 Bhatta S, Mytton J, Joshi E, *et al*. Development and evaluation of a community surveillance method for estimating deaths due to injuries in rural Nepal. *Int J Environ Res Public Health* 2021;18:8912.
34 Kaweenuttayanon N, Pattanarattanamolee R, Sorncha N, *et al*. Community surveillance of COVID-19 by village health volunteers, Thailand. *Bull World Health Organ* 2021;99:393–7.
35 Darmstadt GL, El Arifeen S, Choi Y, *et al*. Household surveillance of severe neonatal illness by community health workers in Mirzapur, Bangladesh: coverage and compliance with referral. *Health Policy Plan* 2010;25:112–24.

36 Farzin A, Saha SK, Baqui AH, *et al*. Population-based incidence and etiology of community-acquired neonatal viral infections in Bangladesh: A community-based and hospital-based surveillance study. *Pediatr Infect Dis J* 2015;34:706–11.
37 Bhavnani D, García Espinosa B, Baird M, *et al*. Malaria surveillance and case management in remote and indigenous communities of Panama: results from a community-based health worker pilot. *Malar J* 2022;21:297.
38 Napier HG, Baird M, Wong E, *et al*. Evaluating vertical malaria community health worker programs as malaria declines: learning from program evaluations in Honduras and Lao Pdr. *Glob Health Sci Pract* 2021;9:S98–110.
39 Valdez D, Keys H, Ureña K, *et al*. Malaria outbreak response in urban Santo Domingo, Dominican Republic: lessons learned for community engagement. *Rev Panam Salud Publica* 2020;44:e92.
40 Glenton C, Javadi D, Perry HB. Community health workers at the dawn of a new era: 5. roles and tasks. *Health Res Policy Sys* 2021;19:1–17.
41 Birn A-E, Pillay Y, Holtz TH. In: *Textbook of Global Health*. Oxford: Oxford University Press, 2017. Available: https://academic.oup.com/book/25517
42 D'Ambruoso L, Boerma T, Byass P, *et al*. The case for verbal autopsy in health systems strengthening. *The Lancet Global Health* 2017;5:e20–1.
43 Musoke D, Nyashanu M, Bugembe H, *et al*. Contested notions of challenges affecting community health workers in Low- and middle-income countries informed by the silences framework. *Hum Resour Health* 2022;20:4.
44 World Health Organization. Statement on the fifteenth meeting of the IHR (2005) Emergency Committee on the COVID-19 pandemic, 2023. Available: https://www.who.int/news/item/05-05-2023-statement-on-the-fifteenth-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-coronavirus-disease-(covid-19)-pandemic [Accessed 23 May 2023].
45 Jerome G, Ivers LC. Community health workers in health systems strengthening: A qualitative evaluation from rural Haiti. *AIDS* 2010;24:S67–72.
46 Garrett L. Betrayal of Trust: The Collapse of Global Public Health. Oxford: Oxford University Press, 2004.