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Costs and cost-effectiveness of integrated horizontal community health worker programmes in low- and middle-income countries (2015–2024): a scoping literature review

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ABSTRACT

Background Community health workers (CHWs) play a vital role in delivering primary health care in low- and middle-income countries (LMICs), addressing multiple diseases through horizontal programmes. Despite their effectiveness, there is a US$4.4 billion annual funding gap for professional CHW programmes. Some countries have adopted these programmes, while others require stronger economic evidence to justify investments. This study updates a 2015 review, critically examining the costs and cost-effectiveness of horizontal CHW programmes in LMICs.

Methods A scoping review was conducted using 10 databases and grey literature, covering studies published between August 2015 and July 2024. Search terms related to 'Community Health Workers' and 'Economic Evaluations' were used. Studies were screened via Covidence software based on inclusion and exclusion criteria. Data on study methodology, cost and outcomes were extracted, tabulated in Microsoft Excel and analysed.

Results A total of 18 studies, covering 42 scenarios, were included. Most studies focused on partial economic evaluations, with cost analyses being the most common method. CHW compensation varied widely, with a median monthly salary of US$265 (range US$3033 ($148 (Ethiopia)–$3181 (Malawi)); IQR US$346 (US$203–US$549)). The most commonly reported cost metric was the annual cost per capita, with a median of $6.02 (range: $0.29–$67.95). Sensitivity analyses were conducted in 29% of the scenarios, with six scenarios concluding CHW programmes were cost-effective. However, most did not conclude on cost-effectiveness or affordability, highlighting gaps in the evidence base. Service provision was the most frequently reported outcome, while cost per outcome and affordability were under-reported.

Conclusions This review highlights gaps in the economic evaluation of horizontal CHW programmes, particularly in cost-effectiveness and affordability. More large-scale evaluations are needed to inform national health policies and support sustained investment in CHW programmes to strengthen health systems and address workforce shortages.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ While community health worker (CHW) programmes have been recognised for their effectiveness in addressing diverse health issues and reaching underserved populations, evidence on their costs and cost-effectiveness is poorly understood.

⇒ The most recent scoping review on this topic, conducted nearly a decade ago (2015), identified significant heterogeneity in the methods and reporting of economic evaluations of CHW programmes plus a lack of data on costs and cost-effectiveness, highlighting the need for updated and systematic research.

⇒ The majority of studies included in this previous review focused on findings from disease-specific CHW programmes, meaning that there was a lack of evidence focusing on integrated horizontal CHW programmes, which is addressed in this review.

INTRODUCTION

Community health workers (CHWs) are essential in improving health outcomes in low- and middle-income countries (LMICs) and high-income countries alike.[1] CHWs can

WHAT THIS STUDY ADDS

⇒ We identified 42 scenarios from 18 studies reporting economic evidence for horizontal CHW programmes between 2015 and 2024, with the majority of scenarios reported from sub-Saharan Africa (n=36).

⇒ Compensation for CHWs varied significantly, with only a minority of scenarios (42.9%) reporting CHWs earning a monthly salary (median US$265 (range US$148–US$3181)). The majority of CHWs were either unpaid volunteers, received stipends, were assigned hypothetical wages (e.g., a simulated minimum wage to model a particular payment scenario), or their form of compensation was not reported.

⇒ Most programmes lacked comprehensive cost-effectiveness reporting, with significant gaps in reporting comparable outcomes like cost per disability-adjusted life year averted, and did not follow standardised reporting practices.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Of the three studies that assessed the cost-effectiveness of horizontal CHW programmes, all concluded that they were cost-effective. The two studies that addressed affordability of CHW programmes suggested it was highest in countries closest to the Abuja declaration target for health spending.

⇒ The methodological inconsistencies and variability in reporting across studies underscore the need for a reference case in evaluating the economic impact of horizontal CHW programmes, which would enhance comparability and reliability of findings and allow authors to report on cost-effectiveness and affordability.

provide critical healthcare services, often in underserved and remote areas, bridge gaps in healthcare delivery, support health responses during crises,[2] ensure that basic health needs are met and improve health outcomes, with a significant equity dividend.[3 4] While CHWs have been around for nearly a century, their emergence as a professional occupational group (proCHWs) who are salaried, skilled, supervised and supplied in line with the WHO Guidelines[5] is gaining momentum. The growing popularity of proCHW programmes in LMICs can be attributed to their effectiveness in addressing diverse health issues (including maternal and child health issues, infectious diseases and non-communicable diseases among others),[6–9] and their ability to reach populations that traditional healthcare systems may not adequately serve.[10] Yet, despite this, there is estimated to be a US$4.4 billion dollar funding gap for proCHW programmes.[11]

Integrated horizontal and vertical programmes represent two different approaches to healthcare delivery by CHWs.[12] Horizontal programmes aim to provide a broad range of services addressing multiple health issues through an integrated system. They focus on strengthening the overall health system by promoting comprehensive care and addressing various health determinants and diseases simultaneously.[13] In contrast, vertical programmes are designed to tackle specific health issues or individual diseases (eg, malaria, tuberculosis, cancer, etc) through targeted interventions. These programmes often operate independently of the broader health system and focus on achieving particular health outcomes related to a single condition or a set of related conditions.[14]

While the literature suggests that integrated horizontal programmes may offer greater potential for long-term sustainability[12] and cost savings compared with vertical programmes[13], a systematic and comprehensive evaluation of this specific evidence remains lacking. The most recent study to broadly review the costs and consequences of CHW programmes was a scoping review by Vaughan *et al*, conducted nearly a decade ago.[15] This review identified 36 studies focused on economic evaluations of various CHW programmes and found that CHWs may be a cost-effective approach in some settings. However, it included only four studies on integrated horizontal approaches [16–19] and highlighted significant heterogeneity and methodological challenges in economic evaluations, making it difficult to draw definitive conclusions about the cost-effectiveness of these programmes. Since then, no updated review has focused on integrated horizontal CHW programmes.

This present study aims to address this gap in the literature by providing an updated overview of the evidence on the costs and cost-effectiveness of integrated horizontal CHW programmes, that is, programmes targeting more than one disease area, in LMICs from 2015 to 2024. Additionally, it assesses the methodologies used in these evaluations and examines how costs and cost-effectiveness are reported and whether conclusions are drawn around affordability of such programmes. By fulfilling these objectives, this research intends to enhance the understanding of the economic value of integrated horizontal CHW programmes and support evidence-based decision-making for community health system strengthening in LMICs.

METHODS

Nature of review

A scoping review was conducted to identify and map the available evidence on economic evaluations of both vertical and integrated horizontal CHW programmes in LMICs published between 2015 and 2024. Due to the large number of studies identified and to ensure comparability in reporting, this paper focuses exclusively on integrated horizontal programmes, namely programmes that are targeting multiple different disease areas. Analyses of studies adopting a vertical approach will be presented in future papers.

A scoping review was chosen, given the broad and varied nature of the field (Vaughan *et al*), with the goal of identifying updated evidence, mapping research methodologies and highlighting knowledge gaps (Munn *et al*). This study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.[20] The PRISMA-ScR checklist is available in the online supplemental material S1. The protocol was uploaded to Open Science Framework on 27 July 2023.[21]

Search strategy and study selection criteria

An initial search was conducted covering 1 January first 2015 to 11 July 2023 in the following databases: Ovid Medical Literature Analysis and Retrieval System Online (MEDLINE) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily (1946 to 6 July 2023); Ovid Embase Classic+Embase (1947 to 7 July 2023); Ovid American Psychological Association (APA) PsycInfo (1806 to July week 1 2023); Ovid Global Health (1910 to week 26); Ovid Allied and Complementary Medicine (AMED) (1985 to June 2023); Cochrane Central Register of Controlled Trials; Cumulative Index to Nursing and Allied Health Literature; Web of Science Core Collection; Scopus and Latin American and Caribbean Health Sciences Literature. To ensure this review was up to date, a second repeat search was conducted to capture relevant literature up to and including 16 July 2024.

Additionally, the following sources were searched to identify any relevant grey literature: Google Scholar, Bielefeld Academic Search Engine; DART-Europe E-theses Portal; E-Theses Online Service, Open Access Theses and Dissertations and The Open Archives Initiative Protocol for Metadata Harvesting (OAIster) database, plus websites of key organisations involved with CHWs (eg, CHW Central, Community Health Impact Coalition and Healthcare Information for All (HIFA.org)). For the purpose of this study, grey literature included (but was not necessarily limited to) theses or dissertations, preprints or unpublished research, and internal reports.

The search strategy included all appropriate controlled vocabulary and keywords for 'CHWs', 'economic evaluations' and 'LMICs', which are defined below. Reference lists of included studies were reviewed to identify any additional studies missed by database searches. Full search strategies are available in the online supplemental material S2.

Community health workers

There are several different terms that can be used to refer to CHWs, which vary depending on the context. For the purpose of this review, previous literature [3 22 23] was used to define CHWs as healthcare workers who:

1. Are primarily based in the community providing primary healthcare services;
2. Are part of the health system (ie, government or Non-Governmental Organization (NGO) supported CHWs), performing tasks related to healthcare delivery and/or health education, promotion or care coordination and
3. Have received organised training and/or certification but do not have a tertiary-level degree such as a nursing or midwifery degree.

Definitions of economic evaluation

To investigate the costs and cost-effectiveness of integrated horizontal CHW programmes, both full and partial economic evaluations were included. Full economic evaluations, as defined by Drummond *et al*, compare the costs and outcomes of health interventions against alternatives, such as the current standard of care or a no-intervention scenario.[24] These evaluations encompass various types, including cost-effectiveness analysis (CEA), cost-utility analysis, cost-benefit analysis, cost-minimization analysis, cost-consequence analysis, social return on investment, multi-criteria decision analysis, budget impact analysis and programme budgeting and marginal analysis.

Partial economic evaluations, on the other hand, consider costs and/or consequences without necessarily comparing alternatives or linking costs to benefits. They can include outcome descriptions, cost descriptions, cost-outcome descriptions, effectiveness evaluations or cost analyses. While full economic evaluations are preferred for guideline and policy development due to their comprehensive nature,[25] partial economic evaluations are valuable for initial programme development and in contexts where full evaluations are too costly, particularly in LMICs.[26]

Low- and middle-income countries

The World Bank classification of economies was used to define LMIC countries as either 'low', 'lower-middle' or 'upper-middle' income[27] based on the costing date for each respective study.

Inclusion and exclusion criteria

The following criteria were used to include studies in this review:

- Studies were included if they primarily evaluated CHW programmes, excluding those focused exclusively on other healthcare professionals such as doctors, nurses or midwives.
- Only studies that evaluated integrated horizontal CHW programmes were included. For this review, integrated horizontal CHW programmes were defined as those addressing multiple community health needs across different disease areas through broad-based, integrated approaches. These programmes involve CHWs delivering a range of services and interventions, rather than focusing solely on single-issue or disease-specific interventions. The range of services and interventions offered varied from 'general health promotion activities'[28] to comprehensive packages of care encompassing over 16 areas of care, including disease prevention and control (eg, HIV, Tuberculosis (TB), malaria, diarrhoeal disease and pneumonia); family health services; hygiene and environmental sanitation (eg, water, disposal of stools and latrine use); health education and communication and first aid.[26] This definition focuses on the scope of health needs addressed rather than the programme's

operational characteristics, such as whether it is new or existing or its funding model.
- Studies had to provide details of an economic evaluation, including both full and partial evaluations.
- Only studies published between August 2015 and July 2024 were included, as the previous review on this topic covered literature up to July 2015.
- The studies needed to evaluate interventions or programmes conducted in LMICs.

Studies were excluded if they:
- Were letters to the editor, commentaries, protocols, opinion pieces, policy briefings or conference abstracts. Although systematic reviews were excluded, their reference lists were searched for potentially eligible studies using a snowball sampling approach.
- Assessed the economic impact of digital add-ons to CHW programmes (eg, mobile phone interventions), as our focus was on the economic evaluation of the CHW intervention itself, not the digital add-on.

No restrictions were placed on the time frame of the analysis or language. Although the search was conducted in English, full texts were reviewed in any language. Studies were not excluded based on quality due to the high diversity in study types and the interest in exploring the breadth of available evidence. Full eligibility criteria are detailed in the Population, Intervention, Comparison, Outcome (PICO) framework in the online supplemental material S3.

Study screening process

Following a search of the databases and grey literature by a qualified information search specialist, citations were exported to the Covidence platform.[29] Duplicate results were removed using an automated 'de-duplicate' feature within Covidence.

A team of 18 researchers took part in the initial study screening process, given the high number of studies identified for screening. First, a group meeting was held to familiarise the team with the inclusion and exclusion criteria, also enabling the team to clarify any points of ambiguity. Next, a subset of 40 studies was used as a training set to ensure strong inter-reviewer agreement (>80%) could be reached prior to conducting the live screening. Reviewers then conducted screening of titles and abstracts. Each title and abstract was reviewed by two reviewers independently. Any conflicting screening decisions were resolved by a third reviewer who read the study in full and evaluated it against the inclusion and exclusion criteria.

The full texts of the remaining relevant articles were then analysed by two reviewers for final inclusion/exclusion. If a full text was excluded at this stage, a reason was documented. Any conflicts at this stage were flagged within Covidence and resolved by a third reviewer.

Following the large number of studies identified after this final screening process, a decision was made by the research team to focus on interventions that focused on integrated horizontal CHW programmes for the sake of reporting comparability.

Data extraction

Data were extracted using a custom Google Sheets document. The extraction form was tested for user-friendliness and completeness with the entire research team using three test articles during a joint video conference call. Modifications were made based on the feedback. The spreadsheet captured data on the article meta-data, information about the study site and CHWs involved in the study, methodological data and reporting, as well as outcomes and cost data.

Broadly, outcomes were categorised into five categories—(1) service provision (eg, number of antenatal visits, number of medications distributed and number of household visits); (2) population coverage (eg, households covered); (3) mortality and morbidity outcomes (eg, reduction in maternal mortality and lives saved); (4) cost savings and cost recovery outcomes (eg, amount of money saved) and (5) societal outcomes (eg, economic growth).

In terms of cost data, the documentation included whether costs were reported in the following categories: (1) cost per CHW; (2) cost per consultation; (3) cost per service; (4) cost per capita or (5) cost per beneficiary. We also documented whether cost per outcome was reported in the study (ie, cost per disability-adjusted life year (DALY) or cost per life year gained). All costs were converted to and reported in 2024 USD to facilitate comparison. For costs reported in US$, we first converted costs to local currency units (LCUs) of the same year using that year's exchange rate (World Bank, 'US$ per LCU, period average').[30] With the costs reported in US$ now in LCUs and for costs originally reported in LCUs by the resource, we inflated costs to 2024 LCUs using LCU inflation rates reported by the International Monetary Fund ('inflation, average consumer prices').[31] With all costs in 2024 LCUs, we converted costs to 2024 US$ using the 'LCU per US$, period average' official exchange rate for 2024.[30]

We also report on whether the study authors drew conclusions on the cost-effectiveness (referring to the comparison of costs and health outcomes) and affordability of the horizontal CHW programme. To determine cost-effectiveness, we looked for evaluations that use criteria based on (1) thresholds (willingness to pay or gross domestic product (GDP)/capita) or (2) a comparison with an alternative service—such as an evaluation of how the CHW intervention compares to other existing healthcare services in terms of cost-effectiveness and overall impact. We report on affordability measures mentioned by study authors, namely budget impact.

As part of the quality assurance process, an external independent researcher with a background in health economics rechecked the data extraction form for accuracy. Relevant data were then coded for analysis and analysed using Microsoft Excel.

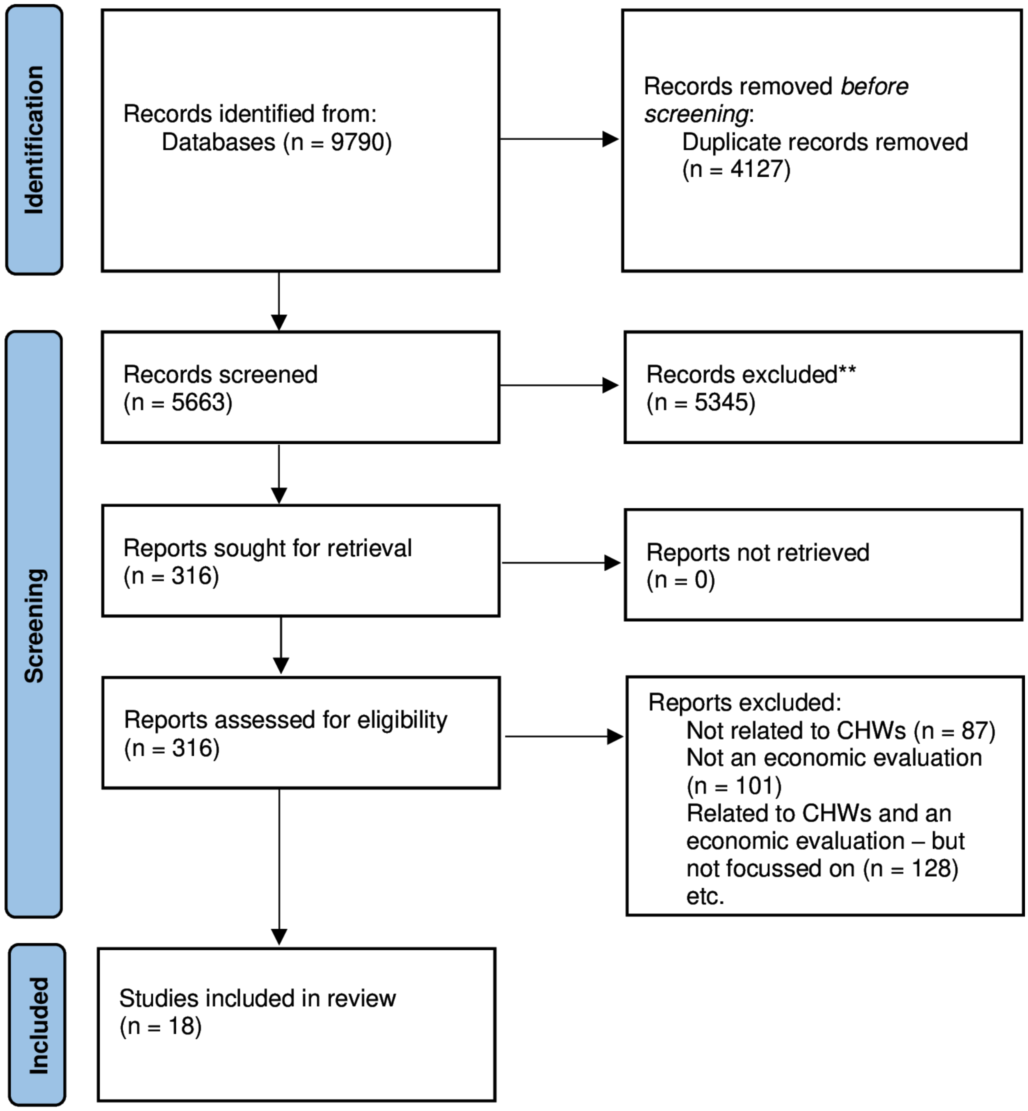

Figure 1 PRISMA flow diagram. CHWs, community health workers; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Patient and public involvement

Patients and the public were not consulted as part of this scoping review, however CHWs were involved as part of the coauthorship team to provide greater contextual insights—especially regarding the discussion section of this study.

RESULTS

Search results

The initial search yielded 9790 articles, which were reduced to 5663 after the removal of duplicates. 5345 studies were excluded following abstract screening, and an additional 170 were excluded after full-text review. This process resulted in 146 studies meeting the inclusion criteria. A subanalysis revealed that 18 of these studies focused on integrated horizontal evaluations of CHW programmes. Further details can be found in the PRISMA flow chart (see figure 1).

Eight of the 18 studies reported multiple scenarios with unique cost and/or cost-effectiveness data (eg, different geographic settings or CHW payment structures). For instance, Wafula *et al* detailed three distinct scenarios within a single study—rural, peri-urban and nomadic—each with different inputs and outcomes. Consequently, these scenarios have been analysed and reported separately, resulting in a total of 42 individual scenarios included in this review (see online supplemental material S4).

Geographic distribution

The majority of scenarios were reported from sub-Saharan Africa (n=36), with the remaining scenarios located in South Asia (n=6). South Africa accounted for the most scenarios (n=11). Of the 42 scenarios, 24 were from low-income countries, four were from lower-middle-income countries, 11 were from upper-middle-income countries and three were a mix. Online supplemental table 1 (details of CHW roles and scenarios in included studies) provides an overview of each study's intervention, evaluated scenarios, CHW roles and comparators, while online supplemental table 2 (summary details of horizontal interventions) provides a summary on the economic evaluation aspects, including the type of analysis, CHW compensation models, cost per capita and cost-effectiveness conclusions.

CHW cadres and compensation

Across the 42 scenarios, 11 different terms were used for CHWs, with 'CHWs' being the most popular (n=23). The role descriptions for individual CHW cadres (where available) can be found in the online supplemental material.

28 scenarios reported the total number of CHWs involved in the programmes, which ranged from 9 to 38 507 (median, 1439.5; IQR, 10 686.75). Only one scenario provided a gender breakdown of CHWs, specifically documenting that 48% of CHWs involved in the programme were female.

Compensation for CHWs was documented in 35 scenarios (83.3%), with a significant variation in the type of compensation. Salaried CHWs were reported in 18 scenarios (43%). The median monthly salary for salaried CHWs was US\$265 (range US\$3033 (US\$148 (Ethiopia)–US\$3181 (Malawi)); IQR US\$346 (US\$203–US\$549)).

In the remaining scenarios, CHWs were assigned a hypothetical wage (such as a minimum wage, to simulate potential economic outcomes and assess the impact of different compensation models on costs and benefits, n=15), were unpaid volunteers (n=4) or received a stipend, which is a fixed, often modest, monetary amount provided on a variable basis (such as an incentive or payment for attending a training, n=2). For the remaining three cases, the compensation details were not documented.

CHW compensation by country and country income level can be found in the data extraction matrices in the online supplemental material.

Nature and type of economic evaluations

The type of economic evaluation varied across the scenarios. The majority employed partial economic evaluations, primarily focusing on cost analyses (n=31). Full economic evaluations, such as cost-effectiveness analyses, were less common (n=5). Of the full economic analyses, these were a cost-benefit analysis (n=2), a cost-effectiveness analysis (n=2) and a cost-effectiveness and benefit-cost ratio study (n=1).

Study perspective

The perspective from which the economic evaluations were conducted varied among the studies. In 18 scenarios (42.9%), the perspective was explicitly stated, with a provider perspective—which focused on the direct costs incurred by the healthcare providers or CHW programmes—being the most common (n=13). Three scenarios took a societal perspective, which considers a broader range of costs and benefits, including those borne by patients, families and the wider economy (eg, time, transport and lost productivity). Two scenarios used a health system perspective, which encompasses costs and outcomes across the entire health system, including both provider-level expenditures and any upstream or downstream system-wide impacts (eg, referrals, hospital admissions or supply chain costs).

In 24 scenarios, a perspective was not explicitly stated; after health economists in our team reviewed these studies, we inferred that the majority of these studies took a provider perspective (n=14), followed by a health system (n=9) and societal perspective (n=1).

Methodological reporting

In the reviewed scenarios, the reporting of different types of costs varied significantly. Recurrent costs were the most commonly reported, included in 90.5% of scenarios (n=38), followed by training costs (76.2% of scenarios, n=32), indirect costs or overheads (57.1% of scenarios, n=24) and capital costs (54.8% of scenarios, n=23). The majority of studies reported a time horizon of 1 year (n=34). Additionally, all studies lacked a Consolidated Health Economic Evaluation Reporting Standards (CHEERS), indicating a gap in standardised economic evaluation reporting practices.[32]

Outcome reporting

From the 42 scenarios, outcomes related to service provision were the most frequently reported outcome (n=26). This was followed by outcomes related to population coverage (n=12), cost savings and cost recovery (n=5), mortality and morbidity outcomes (n=3) and societal outcomes (n=1) (online supplemental material—data extraction spreadsheet).

Cost reporting

The most commonly reported cost metric used in the included studies was annual cost per capita (n=18), which averaged US\$6.02 (median), calculated from a wide range of estimates (US\$0.29–US\$67.95). The second most frequently reported metric was cost per service (n=9, median US\$1.54, range US\$0.40–\$13.89), followed by cost per CHW per year (n=8, median US\$3793, range US\$197–US\$9,186).

Full details of cost reporting by country and country income status can be found in the data extraction matrices in the supplementary material (Supplementary Material—Data Extraction Spreadsheet).

Out of the 42 scenarios, only three (7.14%) reported cost per LYG. Two of these were from a low-income country (US\$150 and US\$377 in Ethiopia) and one was from an upper-middle income country (US\$179—South Africa).[33–35] The remaining 39 scenarios (92.86%) did not provide specific cost figures for LYG.

Cost per DALY was not reported in any of the 42 scenarios.

Sensitivity analyses

Sensitivity analyses were conducted in a minority of scenarios (n=12, 29%). One-way sensitivity analysis, either alone or in combination with probabilistic sensitivity analysis, was the most common, appearing in a total of eight scenarios, with variable parameters.

Conclusions on cost-effectiveness

Six scenarios concluded that CHWs were cost-effective.[16 33–36] Of these, three used threshold GDP/capita as the decision-making criteria.[33–35] For example, in the study by Assebe *et al* from Ethiopia, the conclusion was that the Health Extension Program (HEP) interventions were very cost-effective, offering good value for money by achieving health outcomes at costs within acceptable thresholds relative to Ethiopia's GDP per capita. Overall, the HEP is cost-effective by investing US$77.40 for every LYG. Similarly, South Africa's Community-Oriented Primary Care (COPC) model achieved a cost per LYG of R2668, significantly lower than the country's GDP per capita threshold, alongside a benefit-to-cost ratio of 3.4. The other three scenarios that drew this conclusion did not use a decision-making criterion; rather, they simply stated in their conclusions that the programme was 'cost-effective' without using any criterion.[16 36]

The remaining 36 scenarios did not draw any conclusions as to whether the horizontal CHW programmes represented good value for money.

Findings on affordability

Only two studies commented on the affordability of the CHW programmes described. First, the study by Nepal *et al* concluded that "with increased health care spending, including if Nepal spends the recommended 7.0% of 2030 GDP on health care required to meet its SDG targets, the allocation required for a cadre as described in the pilot may be quite feasible".[37] Taylor *et al* consider three potential 'remuneration models' for CHWs (volunteers, national minimum wage and US$80/month) and four potential national healthcare budgets (actual budget, target budget: Abuja declaration 15% of central government expenditure, actual budget + external resources for health, target budget + 2% GDP) to calculate 2 scenarios. They found affordability is lowest when CHW programmes are funded solely by central government healthcare expenditure, with CHWs earning the local equivalent of $80 per month (median relative cost of 27.3% of the total healthcare budget). They found CHW programmes to be more affordable when funded by the Abuja declaration target spending plus an additional 2% of GDP and if CHWs are volunteers (median relative cost of 6.7% of the total healthcare budget).[38]

DISCUSSION

This scoping review provides updated evidence about the costs of integrated horizontal CHW programmes in LMICs from 18 studies published between 2015 and 2024. Compared to the 2015 review, the size of the evidence base has increased, but remains insufficient. Across the 18 studies, 42 distinct scenarios described primarily the costs of CHWs in Sub-Saharan Africa (n=36). Most of these studies represent sub-national CHW programmes and were not reflective of those at scale (eg, national programmes).

The present review adds consolidated and comparable findings on CHW remuneration: studies most frequently reported on salaried CHWs (n=18 scenarios), with monthly salaries of $148 (Ethiopia) to $3181 (Malawi). Nearly as many scenarios (n=15) considered hypothetical compensation scenarios, such as remunerating CHWs using the national minimum wage. This may reflect ongoing discussions about how best to remunerate this cadre.[39 40] This review also provides a synthesis of various cost metrics frequently reported by studies, such as cost/capita (median $6.02, n=18), cost/service (median $1.54, n=9) and cost/CHW per year (median $3793, n=8). These may be useful for planning and budgeting purposes, though medians should be interpreted with caution, given the wide ranges they draw from. Further, although all included studies reported on horizontally integrated CHWs, there was still considerable variability in CHW programme scale, service areas and compensation methods, which might help explain the wide range of cost estimates.

Our article summarises findings on both cost-effectiveness and affordability. Only three studies assessed cost-effectiveness, by comparing the cost per LYG against GDP per capita thresholds—an approach which has fallen out of use.[41] All three studies concluded that CHW programmes were cost-effective. On affordability, only two studies reported on this. The study from Nepal concluded that funds required for a CHW cadre remunerated at either current wage (approx. $191/month) or national minimum wage (approx. $1,829/year) may be 'quite feasible', given increased government spending on health. The study by Taylor *et al* concluded that affordability of CHW programmes is lowest when funded solely by central government healthcare expenditure with paid CHWs earning $80/month, but much higher when funded by the Abuja declaration target plus 2% GDP, especially with volunteer CHWs. Of note, this study does not incorporate the cost savings to the health system, which would further improve affordability. Importantly, the inclusion of full-time volunteers in economic analyses and forecasting is no longer aligned with best practices, as the WHO's 2018 guidelines recommend financially compensating CHWs.[5] Another challenge is that there is a lack of general consensus on how to manage the affordability of healthcare interventions and the timeframe over which this is evaluated.[42 43]

The difference between cost-effectiveness and affordability may be confusing for readers to interpret, and these terms may erroneously be used interchangeably. Cost-effectiveness aims to compare costs against outcomes for two or more alternatives (or against a set threshold) to show which delivers more or better outcomes at the lowest cost (or falls within the acceptable threshold), while affordability speaks to the government's ability to fund the programme or intervention. Past research has found that the majority of studies conclude that interventions are cost-effective using the GDP/capita thresholds, which have faced criticism for failing to consider local resource availability, such as health opportunity costs, and for being less useful in decision-making since it often results in most interventions being labelled as cost-effective. Bilinski *et al*[44] highlight four reasons why there may be a divergence between cost-effectiveness and affordability: the potential overestimation of the willingness-to-pay threshold in CEA; differing perspectives in budget impact analyses and CEA (eg, the inclusion of cost savings borne by the patient, rather than the payer); the time horizon of the costs and discounting, where CEA typically discounts future costs and benefits, potentially skewing the perceived value of interventions with delayed benefits.

Our review confirms that methodological inconsistencies and variability in reporting—such as the lack of adherence to reporting guidelines highlighted in the 2015 review—remain persistent challenges. Notably, the use of different outcome measures, often focused on vertical service provision (eg, number of antenatal care appointments or medications distributed), fails to capture the full range of services provided by horizontal CHWs in a single metric. They also do not provide information about the impact or effectiveness of the intervention in terms of health outcomes. Finally, they make it impossible to compare findings with other horizontal CHW programmes. These findings underscore the need for researchers to use appropriate research methods, to use country-specific thresholds that better reflect local contexts when assessing cost-effectiveness and resource constraints and to consider affordability.[45–49] Ultimately, each payer will establish their own criteria for determining good value for money in their context. In a country like Liberia, where more than half of the malaria burden is addressed by CHWs, allocating a quarter of the health budget to community health may be reasonable.[50] In a setting with a different disease burden and patient distribution, facing steep budget cuts, a 6.7% allocation—like the one described in the study conducted by Taylor *et al*—might be considered excessive, even were it feasible.

Finally, it is important to remember that cost-effectiveness and affordability are important decision-making criteria from an economic standpoint, but the inclusion of particular interventions and their delivery in national health services is normally guided by a wider range of criteria—among others burden of disease, equity, feasibility, decision-making based on personal relationships, political priorities and donor interests.[51–54]

Strengths and limitations

This study has several strengths. First, it addresses a significant gap in the literature by providing an updated and comprehensive review of economic evaluations of integrated horizontal CHW programmes in LMICs from 2015 to 2024. This focus allows for a detailed exploration of a specific type of CHW intervention that has been suggested to be more sustainable and cost-effective than vertical approaches. Additionally, the inclusion of both published and grey literature, with no restrictions on language, enhances the breadth and depth of the evidence base.

However, the study also has limitations. While this study defines integrated horizontal CHW programmes as those addressing multiple disease areas through broad-based approaches, we acknowledge that this definition may not fully capture nuanced differences in programme maturity (new vs existing) or funding characteristics (eg, national vs donor-funded). Future research could incorporate more granular analyses to explore how these factors influence costs and economic outcomes. While the review does not exclude studies based on quality (as per accepted scoping review guidelines), the heterogeneity in methodologies and reporting standards across studies, plus data gaps, presents challenges in synthesising the data and drawing definitive conclusions. It should also be noted that the majority of scenarios included in this review were from sub-Saharan Africa (n=36; 85.7%). There was also significant variability in comparator groups, complicating the interpretation of cost-effectiveness.

Directions for future research

While our review found that most CHW programmes were deemed cost-effective using GDP-per-capita thresholds, this was based on only three studies and outdated methods. Similarly, just two studies assessed affordability, limiting the field's ability to determine whether effective programmes are also financially feasible at scale. This highlights a major gap: even when CHW programmes appear cost-effective, lack of affordability analysis makes it difficult for governments and donors to determine whether such programmes can be sustainably funded. As a result, policy decisions may be made with incomplete financial insight, especially in resource-constrained settings where opportunity costs are high.

While most studies in this review focused on sub-Saharan Africa, the under-representation of regions like Latin America and Southeast Asia suggests gaps in the global understanding of CHW programme effectiveness across diverse contexts. Future research should explore these regions to provide a more comprehensive perspective. Similarly, the lack of studies addressing patient costs should be explored in future research, as one key benefit of CHW programmes is their ability to eliminate geographic barriers and the associated expenses.

Compared to the 2015 review by Vaughan *et al*,[15] which included only four horizontal programme studies, little has changed in terms of methodological variability and reporting inconsistencies between studies, thus limiting comparability and generalisability regarding costs, cost-effectiveness and affordability of these programmes. This fragmentation suggests that economic evaluations are often highly context-specific and may lack the methodological rigour or standardisation needed for cross-programme comparison. For funders and policymakers, this presents a challenge: even when studies suggest CHWs are cost-effective or affordable, the lack of consistent, comparable and conclusive data limits the confidence with which these findings can inform broader investment decisions.

Given the lack of methodological consistency across studies, which complicates comparison, we propose developing a reference case. This would establish guidelines on study design, perspective selection and outcome measures, improving consistency and comparability across studies and making them more useful for policy-making.

For future studies, it is essential that authors (1) clearly report cost-effectiveness and affordability using appropriate methods, such as the CHEERS checklist and (2) present actionable investment recommendations in a format that is easily understood by key stakeholders responsible for funding decisions. For cost-effectiveness assessments, we recommend using DALYs as a standard measure, while acknowledging the challenge of attributing outcomes solely to CHWs, since they do not operate in isolation. Comparisons should also be made against other interventions implemented in the same setting or aligned with country-specific thresholds. Presenting results in DALYs averted is also beneficial since the burden of disease is expressed in DALYs, and therefore benefits can then be presented as a portion of the overall burden of disease. For affordability, we suggest budget impact analysis and a recognition that country-specific data will be required to accurately draw conclusions across diverse contexts. For both types of analyses, it is crucial to account for the true cost of interventions, including fair remuneration for CHWs. This comprehensive approach ensures that financial evaluations reflect the actual investment required for sustainable CHW programmes.

The review also highlights a significant gap in reporting gender distribution within CHW programmes, with only one study identified in this review providing this data.[55] Given the profound impact of gender dynamics on CHW programme effectiveness,[56] this omission is critical. The lack of gender-responsive analysis not only limits understanding, but risks perpetuating these inequities within a female-dominated workforce.[57 58] Future studies must prioritise collecting gender-disaggregated data and conducting gender-sensitive analyses to ensure that CHW programmes are both equitable and effective.

Reflexivity statement

This study was conducted by a team of researchers from both high-income countries and LMICs, including perspectives from CHWs themselves. The diverse composition of the research team enabled us to better contextualise and interpret the meaning of the study findings in relation to CHW programmes across different contexts. Researchers from LMICs (and CHWs in particular) brought valuable insights regarding the local challenges and opportunities associated with implementing CHW programmes, especially in resource-limited settings. Having female CHWs as part of the authorship team was also important since they raised the issue around gaps in reporting on gender distribution within CHW programmes—a subject we have raised as important for future research to report on.

CONCLUSION

This review provides evidence of the cost-effectiveness of integrated horizontal CHW programmes, but also reveals significant gaps in the economic evaluation of these interventions. In particular, more studies are needed at the national level to evaluate CHW programmes at scale, which are crucial for understanding their broader cost-effectiveness, long-term sustainability and value for money. The current evidence base is limited by methodological inconsistencies, lack of affordability data and regional imbalances, particularly the under-representation of studies from Latin America and Southeast Asia.

CHWs play a vital role in health system strengthening, addressing health workforce shortages and improving population health outcomes. However, CHWs' full potential in strengthening health systems can be maximised only when they are optimally integrated into health systems.[59] There have been numerous calls for the integration of CHWs into national health systems, and many countries, such as Liberia[60], Kenya[61] and Rwanda,[62] have responded by initiating or expanding investments in their national CHW programmes. Integration of CHWs through horizontal CHW programmes offers an alternative delivery model that makes less intensive use of scarce resources like skilled health workers, helping to alleviate or relax the human resource constraint. This, in turn, could have an impact on cost-effectiveness in terms of expanding health impact while reducing inputs. Additional research on cost-effectiveness of horizontal proCHW programmes will be of particular importance in building the case for investment in these programmes.

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REFERENCES

1 Ballard M, Madore A, Johnson A, *et al*. Concept note: community health workers. Harvard Business Publishing; 2018. Available: https://projects.iq.harvard.edu/sites/projects.iq.harvard.edu/files/ghd/files/ghd-c11_chw_concept_note.pdf
2 Salve S, Raven J, Das P, *et al*. Community health workers and Covid-19: Cross-country evidence on their roles, experiences, challenges and adaptive strategies. *PLOS Glob Public Health* 2023;3:e0001447.
3 Lewin S, Munabi-Babigumira S, Glenton C, *et al*. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. *Cochrane Database of Systematic Reviews* 2010;2010.
4 Pallas SW, Minhas D, Pérez-Escamilla R, *et al*. Community health workers in low- and middle-income countries: what do we know about scaling up and sustainability? *Am J Public Health* 2013;103:e74–82.
5 Cometto G, Ford N, Pfaffman-Zambruni J, *et al*. Health policy and system support to optimise community health worker programmes: an abridged WHO guideline. *Lancet Glob Health* 2018;6:e1397–404.
6 Neupane D, Kallestrup P, McLachlan CS, *et al*. Community health workers for non-communicable diseases. *Lancet Glob Health* 2014;2.
7 Olaniran A, Madaj B, Bar-Zev S, *et al*. The roles of community health workers who provide maternal and newborn health services: case studies from Africa and Asia. *BMJ Glob Health* 2019;4:e001388.
8 O'Donovan J, O'Donovan C, Nagraj S. The role of community health workers in cervical cancer screening in low-income and middle-income countries: a systematic scoping review of the literature. *BMJ Glob Health* 2019;4:e001452.
9 O'Donovan J, Verkerk M, Winters N, *et al*. The role of community health workers in addressing the global burden of ear disease and hearing loss: a systematic scoping review of the literature. *BMJ Glob Health* 2019;4:e001141.
10 Ahmed S, Chase LE, Wagnild J, *et al*. Community health workers and health equity in low- and middle-income countries: systematic review and recommendations for policy and practice. *Int J Equity Health* 2022;21:49.
11 Africa CDC. Accelerating investment in community health workforce programs in Africa, Available: https://africacdc.org/news-item/accelerating-investment-in-community-health-workforce-programs-in-africa/ [Accessed 17 Apr 2025].
12 Msuya J. Horizontal and vertical delivery of health services: what are the trade offs (Making services work for poor people' prepared for the world development report 2004/5). The World Bank; 2005. Available: https://d1wqtxts1xzle7.cloudfront.net/51885741/269420Msuya1WDR1Background1paper-libre.pdf?1487695284=&response-content-disposition=inline%3B+filename%3DHorizontal_and_Vertical_Delivery_of_Heal.pdf&Expires=1727959762&Signature=agTrww1g~3g3x6eC1~OV14Zyl2Jw3GiMyi~le4jHflETvdHMkfBdzxDdXX~75LvFoLoBSraKPvcLACCW0EhxzvnwYsFbjJsybK3W2qnXTZJWV0OGIxWNPF0gxZKefAABysF5KA7TxBRceg-k~JZ46xlnbiU8BMs9lxg5pCkTaCab93QIN5eBhwjvtJ0Lr97ijii9z11KxiF9ZoZX0hkvVwRqu5DYYsIMBB-cDQ8cOgfbC--PYRP5zm1FtpOD7eCxWLbmrUb3zTFrbCJokNjSV-dpitbfg6M4pxHWWmSDIpdhxozFNdZxT6KvKOH1wcXLEMwde2MVBUVS-B5aVGJNrQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA
13 Masis L, Gichaga A, Zerayacob T, *et al*. Community health workers at the dawn of a new era: 4. Programme financing. *Health Res Policy Syst* 2021;19:107.
14 Cairncross S, Periès H, Cutts F. Vertical health programmes. *The Lancet* 1997;349:S20–1.
15 Vaughan K, Kok MC, Witter S, *et al*. Costs and cost-effectiveness of community health workers: evidence from a literature review. *Hum Resour Health* 2015;13:71.
16 Bowser D, Okunogbe A, Oliveras E, *et al*. A Cost-Effectiveness Analysis of Community Health Workers in Mozambique. *J Prim Care Community Health* 2015;6:227–32.
17 McCord GC, Liu A, Singh P. Deployment of community health workers across rural sub-Saharan Africa: financial considerations

and operational assumptions. Bull World Health Organ 2013;91:244–53B.
18 Prinja S, Jeet G, Verma R, et al. Economic analysis of delivering primary health care services through community health workers in 3 North Indian states. PLoS One 2014;9:e91781.
19 Mahmud N, Rodriguez J, Nesbit J. A text message-based intervention to bridge the healthcare communication gap in the rural developing world. Technol Health Care 2010;18:137–44.
20 Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med 2018;169:467–73.
21 O'Donovan J, Ballard M, Kumar M, et al. Evidence on Economic Evaluations of Community Health Worker Programmes in Low- and Middle-Income Countries: A Protocol for a Scoping Literature Review (2015-2023), 2015. Available: https://osf.io/5bwcp/ [Accessed 03 Oct 2024].
22 Olaniran A, Smith H, Unkels R, et al. Who is a community health worker? - a systematic review of definitions. Glob Health Action 2017;10:1272223.
23 Ballard M, Olaniran A, Iberico MM, et al. Labour conditions in dual-cadre community health worker programmes: a systematic review. Lancet Glob Health 2023;11:e1598–608.
24 Drummond MF, Sculpher MJ, Claxton K, et al. Methods for the Economic Evaluation of Health Care Programmes. Oxford: Oxford University Press, 2015.
25 Turner HC, Archer RA, Downey LE, et al. An Introduction to the Main Types of Economic Evaluations Used for Informing Priority Setting and Resource Allocation in Healthcare: Key Features, Uses, and Limitations. Front Public Health 2021;9:722927.
26 van Mastrigt GAPG, Hiligsmann M, Arts JJC, et al. How to prepare a systematic review of economic evaluations for informing evidence-based healthcare decisions: a five-step approach (part 1/3). Expert Rev Pharmacoecon Outcomes Res 2016;16:689–704.
27 World Bank Country and Lending Groups – World Bank Data Help Desk, Available: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups [Accessed 03 Oct 2024].
28 Bennett R, Marcus TS, Abbott G, et al. Scaling community-based services in Gauteng, South Africa: A comparison of three workforce-planning scenarios. Afr J Prim Health Care Fam Med 2018;10:e1–7.
29 Covidence Systematic Review Software, Available: https://www.covidence.org/ [Accessed 11 Apr 2024].
30 DataBank. World Development Indicators, Available: https://databank.worldbank.org/source/world-development-indicators/Series/PA.NUS.FCRF [Accessed 03 Oct 2024].
31 IMF. World economic outlook (weo) database. Available: https://www.imf.org/en/Publications/WEO/weo-database/2024/April/download-entire-database [Accessed 03 Oct 2024].
32 Husereau D, Drummond M, Augustovski F, et al. Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. BMJ 2022;376:e067975.
33 Assebe LF, Belete WN, Alemayehu S, et al. Economic evaluation of Health Extension Program packages in Ethiopia. PLoS One 2021;16:e0246207.
34 McPake B, Edoka I, Witter S, et al. Cost-effectiveness of community-based practitioner programmes in Ethiopia, Indonesia and Kenya. Bull World Health Organ 2015;93:631–639A.
35 Bennett R, Marcus TS, Abbott G, et al. Modelling cost benefit of community-oriented primary care in rural South Africa. Afr J Prim Health Care Fam Med 2020;12:e1–8.
36 Hauc SC, Tshering D, Feliciano J, et al. Evaluating the effect of village health workers on hospital admission rates and their economic impact in the Kingdom of Bhutan. BMC Public Health 2020;20:1277.
37 Nepal P, Schwarz R, Citrin D, et al. Costing Analysis of a Pilot Community Health Worker Program in Rural Nepal. Glob Health Sci Pract 2020;8:239–55.
38 Taylor C, Griffiths F, Lilford R. Affordability of comprehensive community health worker programmes in rural sub-Saharan Africa. BMJ Glob Health 2017;2:e000391.
39 Ballard M, Westgate C, Alban R, et al. Compensation models for community health workers: Comparison of legal frameworks across five countries. J Glob Health 2021;11:04010.
40 Nolen S, Negeri T. 'Only god can thank you': female health workers fight to be paid. The New York Times; 2023. Available: https://www.nytimes.com/2023/09/21/health/community-health-worker-pay.html
41 Evans C, Tavakoli M, Crawford B. Use of quality adjusted life years and life years gained as benchmarks in economic evaluations: a critical appraisal. Health Care Manag Sci 2004;7:43–9.
42 Antoñanzas F, Terkola R, Overton PM, et al. Defining and Measuring the Affordability of New Medicines: A Systematic Review. Pharmacoeconomics 2017;35:777–91.
43 Pearson SD. The ICER Value Framework: Integrating Cost Effectiveness and Affordability in the Assessment of Health Care Value. Value Health 2018;21:258–65.
44 Bilinski A, Neumann P, Cohen J, et al. When cost-effective interventions are unaffordable: Integrating cost-effectiveness and budget impact in priority setting for global health programs. PLoS Med 2017;14:e1002397.
45 Bertram MY, Lauer JA, De Joncheere K, et al. Cost-effectiveness thresholds: pros and cons. Bull World Health Organ 2016;94:925–30.
46 Leech AA, Kim DD, Cohen JT, et al. Use and Misuse of Cost-Effectiveness Analysis Thresholds in Low- and Middle-Income Countries: Trends in Cost-per-DALY Studies. Value Health 2018;21:759–61.
47 Robinson LA, Hammitt JK, Chang AY, et al. Understanding and improving the one and three times GDP per capita cost-effectiveness thresholds. Health Policy Plan 2017;32:141–5.
48 Kazibwe J, Gheorghe A, Wilson D, et al. The Use of Cost-Effectiveness Thresholds for Evaluating Health Interventions in Low- and Middle-Income Countries From 2015 to 2020: A Review. Value Health 2022;25:385–9.
49 Marseille E, Larson B, Kazi DS, et al. Thresholds for the cost-effectiveness of interventions: alternative approaches. Bull World Health Organ 2015;93:118–24.
50 Rozelle JW, Korvah J, Wiah O, et al. Improvements in malaria testing and treatment after a national community health worker program in rural Liberia. Journal of Global Health Reports 2021;5:e2021073.
51 Hayati R, Bastani P, Kabir MJ, et al. Scoping literature review on the basic health benefit package and its determinant criteria. Global Health 2018;14:26.
52 Horton S. Cost-effectiveness analysis in disease control priorities, third edition. In: Jamison DT, Gelband H, Horton S, et al, eds. *Disease control priorities: improving health and reducing poverty*. Washington (DC): The International Bank for Reconstruction and Development / The World Bank, 2017.
53 Kumar MB, Taegtmeyer M, Madan J, et al. How do decision-makers use evidence in community health policy and financing decisions? A qualitative study and conceptual framework in four African countries. Health Policy Plan 2020;35:799–809.
54 Griffiths UK, Legood R, Pitt C. Comparison of Economic Evaluation Methods Across Low-income, Middle-income and High-income Countries: What are the Differences and Why? Health Econ 2016;25 Suppl 1:29–41.
55 Schurer JM, Fowler K, Rafferty E, et al. Equity for health delivery: Opportunity costs and benefits among Community Health Workers in Rwanda. PLoS One 2020;15:e0236255.
56 Do women make the most effective community health workers, 2021. Available: https://www.exemplars.health/stories/women-make-the-most-effective-community-health-workers [Accessed 03 Oct 2024].
57 Rebuild Consortium. The Gendered Experience of Close to Community Providers during COVID-19 Response in Settings: A Multi-Country Analysis, Available: https://www.rebuildconsortium.com/resources/gendered-experience-close-to-community/ [Accessed 03 Oct 2024].
58 Learning on health system resilience. ReBUILD for Resilience [Internet]. Rebuild Consortium, Available: https://www.rebuildconsortium.com/projects/cross-country-learning-on-health-system-resilience-synthesis-of-opm-findings-on-the-role-of-community-health-workers-in-covid-19-and-on-governance-for-health-system-responses-to-emergencies/ [Accessed 03 Oct 2024].
59 Mupara LM, Mogaka JJO, Brieger WR, et al. Community Health Worker programmes' integration into national health systems: Scoping review. Afr J Prim Health Care Fam Med 2023;15:e1–16.
60 Ministry of Health. National Community Health Program Policy 2023-2032 Liberia, Available: https://lastmilehealth.org/wp-content/uploads/2023/07/NCHP-Policy-2023-2032.pdf
61 Ministry of Health. Kenya Community Health Policy 2020-2030, Available: https://chu4uhc.org/wp-content/uploads/2023/08/Kenya-Community-Health-Policy-Signed-1.pdf
62 National Community Health Policy, 2024. Available: https://www.moh.gov.rw/news-detail/national-community-health-policy [Accessed 03 Oct 2024].
63 UW Research. WORKSHEET Human Subjects Research Determination. UW Research, Available: https://www.washington.edu/research/forms-and-templates/worksheet-human-subjects-research/ [Accessed 03 Oct 2024].