



WHAT DO WE KNOW ABOUT COMMUNITY HEALTH WORKERS? A SYSTEMATIC REVIEW OF EXISTING REVIEWS

Human Resources for Health Observer Series No 19



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This review was conducted in the scope of preparation of the 2018 WHO Guideline on Health policy and system support to optimize community health worker programmes. Updates to the Guideline, which are not explicitly planned at the date of this publication, will include evidence generated subsequent to the completion of this review.



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Executive summary

Community health workers (CHWs) are health care providers who live in the community they serve and receive lower levels of formal education and training than professional health care workers such as nurses and doctors. This human resource group has enormous potential to extend health care services to vulnerable populations, such as communities living in remote areas and historically marginalized people, to meet unmet health needs in a culturally appropriate manner, improve access to services, address inequities in health status and improve health system performance and efficiency.

While the popularity of these programmes has fluctuated over the past 50 years, national governments increasingly are seeking to initiate, scale up or re-invigorate CHW programmes, particularly in low- and middle-income countries (LMIC) (Perry et al., 2017; Schneider et al., 2016). Integrating these programmes into the national health system can extend the benefits of CHWs to large populations, far beyond what can be achieved by smaller scale programmes run by nongovernmental organizations. Additionally, integrating CHW programmes into the national health system affords CHWs wider and more sustainable financial, administrative and regulatory support through being woven into the fabric of public health programming.

Evidence-based guidance is necessary to inform policy-makers, researchers and advocates considering health system integration, particularly on: a) how CHW programmes can best be designed and operated; b) the optimal types and numbers of interventions that CHWs can provide and how they can best be provided; and c) the optimal approaches to service delivery. To meet this need, the World Health Organization commissioned a systematic review of existing reviews of CHW programmes.

We searched 11 electronic databases for review articles on CHWs published between 1 January 2005 and 15 June 2017 and included articles that were reviews (systematic or non-systematic) and focused on CHWs (health workers with no more than 2 years of training and who are based in the community). Data from the included articles were extracted on a range of topics relevant to the integration of CHWs into health systems, including CHW roles and capacities, training, deployment, remuneration and incentives, and support and supervision. For the systematic reviews included in our study, their methodological quality was assessed using the 11-item validated Assessing the Methodological Quality of Systematic Reviews (AMSTAR) criteria.

From 4139 unique references identified by the search, we identified 122 relevant reviews, including 75 systematic reviews, of which 34 were meta-analyses. Quality assessment showed that 6 of the 11 AMSTAR indicators of quality were met by the vast majority (90% or more) of the eligible reviews, while the remaining 5 were less commonly met (item 2: duplicate data screening/title review and data extraction; item 4: grey literature included; item 5: included and excluded studies listed; item 7: quality assessment conducted; and item 10: publication bias assessed through a funnel plot).

Most of the reviews were from LMICs (n=83) and focused on the following interventions: primary health care (n=14), child health (n=13) and maternal and child health (n=14). Reviews of CHW programmes in high-income countries (n=29) tended to focus on noncommunicable diseases (n=12) and outreach to specific underserved groups (n=7).

Community health workers perform a variety of tasks, which can be clustered into six overlapping roles:

- delivering diagnostic, treatment or clinical care;
- encouraging uptake of health services;
- providing health education and behaviour change motivation;
- data collection and record-keeping;
- improving relationships between health system functionaries and community members; and
- providing psychosocial support.

In supportive contexts, CHWs can successfully handle even complex health counselling and health care treatment tasks such as:

- providing human immunodeficiency virus (HIV) counselling that is comparable or better than higher level health care workers;
- delivering injectable contraceptives; or
- conducting rapid malaria diagnosis tests.



There is some evidence that being tasked with some curative tasks as opposed to solely providing health education or psychosocial support may increase CHW motivation.

Community health worker training must impart technical knowledge and skills as well as socially oriented capacities (e.g. counselling and interpersonal communication). Effective training requires that classroom sessions be supplemented by ongoing in-field mentoring. One review noted that training can improve CHW performance if imparting knowledge and skills is complemented by strategies to enable CHWs to gain a sense of mastery and self-efficacy, increase their self-esteem, and assure CHWs that there is back-up support available to them. There was no direct evidence linking training duration or training approaches to health outcomes. However, training was found to positively influence CHW motivation, job satisfaction and performance.

There is some evidence that CHWs with higher levels of formal education prior to becoming CHWs are more effective (for example, in record-keeping, diagnosing childhood illness and appropriately counselling clients). However, these same CHWs may be more likely to drop out after deployment.

Many reviews highlighted community embeddedness as an important enabler of CHW programme success. The community's acceptance of CHWs and its sense that the CHW programme is locally appropriate and community-owned (at least in part) is associated with CHW retention, motivation, performance, accountability, support and, ultimately, with the acceptability and uptake of the work of CHWs.

Twelve studies found evidence of cost-effectiveness, with particularly strong evidence supporting task shifting for HIV care in low-income countries. However, three studies found inconclusive or no evidence on cost-effectiveness and one study noted that costing methods vary across studies, making it difficult to generate clear conclusions and to adequately account for the opportunity costs borne by CHWs for volunteering their time.

Regular provision of supplies is essential to maintain CHW programme effectiveness, productivity, and respect of CHWs by the community. Lack of supplies (drugs, educational materials) is demotivating for CHWs.

The optimal size of a CHW's catchment area depends on the context, including the frequency of contact with each family required; geography, weather and transportation; nature of services provided; and anticipated time commitment from the CHW. A high workload can reduce CHW motivation, satisfaction, efficacy and retention.

Financial remuneration (salaries, financial incentives, or income from selling services or commodities) and non-financial incentives

(community respect, trust and recognition; personal growth and learning; or career opportunities) are important motivators for CHWs. Satisfaction (or dissatisfaction) with incentives is closely linked to CHW motivation and performance (or lack thereof). Insufficient financial remuneration is a cause of attrition among CHWs in LMICs.

Training and supervision were often mentioned as elements critical for the effectiveness of CHWs, and there is some evidence regarding the benefits of training and supervision on CHW performance. However, few details of the supervision structure (type of supervisor, frequency of supervision and support to supervisors) contributing to success were mentioned and few studies have tested which approaches work best or how they are best implemented.

Relatively more (and higher quality) evidence is available on the effectiveness of CHWs in delivering specific health interventions than on effective approaches and cross-cutting strategies to integrate and support CHWs in health systems and optimize their performance. In particular, our review highlights the need for additional review work on:

- the voices of CHWs themselves;
- issues of social justice, gender and CHW rights;
- measurement of performance of CHWs individually and of CHW programmes;
- additional evidence on CHW management systems, including: a) integration in and support by health teams; and b) different strategies for CHW remuneration;
- optimization of approaches to training and supervision;
- exploration of the potential benefits of CHWs as community change agents; and
- the influence of health system decentralization, social accountability initiatives, and governance of CHW programmes.

This summary of the existing evidence in the review literature regarding CHW programme effectiveness and approaches to integrating CHWs into health systems can support implementation of new national CHW programmes and strengthening current ones. This review provides a mapping of available review literature and will be supplemented by the forthcoming WHO guidelines on health policy and systems support for CHW programmes, which will present in-depth assessments of evidence on a variety of topics, drawing from primary research.

2. Methods

2.1 Data sources and search strategy

We searched for articles published between 1 January 2005 and 15 June 2017 in 11 electronic databases: PubMed, Embase, PASCAL Biomed, the Cochrane Library, Ovid's Global Health, WHO Global Health Regional Libraries, the Database of Abstracts of Reviews of Effects (DARE), Epistemonikos, Health Systems Evidence, PROSPERO and the National Guideline Clearinghouse of the United States Department of Health and Human Services. Searches were developed and conducted by an academic librarian (co-author Margaret Gross) and peer reviewed by a second librarian prior to implementation.

The systematic literature search used a combination of controlled vocabulary and keywords for two concepts: a) reviews, and b) community health workers (e.g. "community health worker", "lay health worker", "close-to-community provider"). We used the validated systematic review filter for PubMed (Shojania & Bero, 2001) and expanded it to catch 30 key articles. Similarly for Embase, we used the validated Wilczynski & Haynes, "small drop in specificity, substantive gain in sensitivity" systematic review query (Wilczynski et al., 2007) and expanded it with additional terms (metanalysis; review:ti), to include, for example, all titles with the word "review" in them. In the other nine databases, we did not use pre-developed review filters but instead used simpler search strings for the concept "review." We did not limit language. All titles and abstracts relevant to our study were retrieved and searched for full text. See [Appendix 1](#) for the full PubMed search strategy.

2.2 Study selection

2.2.1 Eligibility criteria and screening

The articles were screened against the inclusion and exclusion criteria. The inclusion criteria were: a) review; and b) focus on CHWs. We included systematic reviews as well as non-systematic reviews (such as realist, narrative, scoping and literature reviews) because many non-systematic reviews provided insight into CHW programme design and health system integration. Our inclusive approach brought together

reviews on CHWs that used a wide range of synthesis methods to comment on many features of CHW programmes, going beyond the effectiveness focus of systematic meta-analysis.

We defined CHWs as health workers based in communities (i.e. conducting outreach from their homes and beyond primary health care facilities or based at peripheral health posts that are not staffed by doctors or nurses), who are either paid or volunteer, who are not professionals, and who have fewer than 2 years training but at least some training, if only for a few hours. Adhering closely to this definition led us to include some programmes, such as those for peer support helpers and traditional birth attendants (TBAs) with some training, that reflect divergent and context-specific understandings of the term "CHW".

Exclusion criteria were: a) not a review (i.e. presenting primary research data, protocols, or commentaries); b) no explicit mention of CHWs; c) focused on health workers with more than 2 years of training; d) focused on clinic-based health workers; or e) focused on interventions of relevance to all primary health care practitioners (e.g. the active management of the third stage of labour or optimal vaccination strategy). All titles and abstracts were screened by two reviewers. Discrepancies were resolved through discussion, with any remaining disagreement resolved by the senior author (Henry Perry). The full texts of included articles were retrieved and screened again to ensure they met the inclusion criteria.

2.2.2 Data extraction

The following data from the included articles were extracted: a) general characteristics of the review; b) review summary; and c) findings relevant to health system integration. General characteristics included: regional focus, review type, population of focus, health issue(s) addressed, and nature of the intervention(s). The article summary we prepared consisted of the specific research question or objective of the article and the main findings. Specific findings from the reviews relevant to health system integration were extracted using a health system integration framework, as outlined in [Table 2.1](#).



Table 2.1 Data extraction framework on health system integration of community health workers

Component	Specific Data Extracted
Training	What does the article tell us about duration, content or delivery modalities of pre-service training and about optimizing CHW competencies?
Deployment	What does it tell us about how CHWs should be assigned to locations, ratios of CHW to population, geographic distribution and so forth?
Performance measurement	What does it tell us about measuring, monitoring or evaluating the performance of CHWs, including monitoring by the community and use of the health information system?
Remuneration and incentives	What does it tell us about remuneration and incentives (financial and non-financial)?
Support and supervision	What does it tell us about supporting and supervising CHWs, including information on their relationships with other health providers?
Health/service/ programme-related effectiveness	What does it tell us about the effectiveness of CHWs in providing specific health services or interventions?
Cost-effectiveness	What does it tell us about CHW cost-effectiveness?
Community embeddedness and community acceptability	What does it tell us about community embeddedness, including the acceptability of CHWs to communities and community perceptions of CHWs?
Infrastructure and supplies	What does it tell us about the infrastructure and logistical requirements of CHWs?
Equity	What does it tell us about the equity implications of CHWs?
Integration	What does it tell us about CHW integration with the health system, including issues of scale up and how the national health system integrates CHWs into its programme?
Roles and capacities	What does it tell us about the roles and capacities of CHWs, including the jobs they can do, skills they can master, and tasks they can be given?
Other	Other notes, particularly on whether the paper discussed negative externalities, unintended consequences, and any other changes in the system due to a given change in human resource for health policies or interventions.

2.2.3 Assessment and reporting on methodological quality

Two authors (S Wilson Beckham and Margaret Gross) rated each systematic review using Assessing the Methodological Quality of Systematic Reviews (AMSTAR) criteria (Shea et al., 2007), which is a validated quality assessment for review articles consisting of 11 items. Reviews that we included but were not systematic were not rated with AMSTAR. These same two authors each rated the same 10 systematic reviews using the AMSTAR quality rating, discussed their findings together, and then came to a consensus on how to apply the AMSTAR criteria before rating the remainder of the systematic reviews.

All review articles that were systematic reviews were assessed for quality using the AMSTAR criteria. We classified reviews as non-systematic if the authors explained that they had not carried out a systematic approach or if they had no clear predefined methodology for obtaining articles and analysing/synthesizing the findings.

Although AMSTAR was designed to rate the quality of systematic reviews of randomized controlled trials (RCTs), most of the included systematic reviews that met our selection criteria were composed of studies using non-experimental methodologies. We found that for the systematic reviews selected for our study, some of the AMSTAR criteria were not readily applicable or were subject to interpretation. Thus, a

consensus was reached among the reviewers on how to apply some of the checklist items as follows:

- AMSTAR item 1: Was a priori design provided?
 - Articles received a “yes” rating if the research question and inclusion criteria were established before the review was conducted.
- AMSTAR item 2: Was there duplicate study selection and data extraction?
 - Articles in this review were given a “yes” rating only if there was duplicate review at both screening and data extraction.
- AMSTAR item 3: Was a comprehensive literature search performed?
 - Articles in this review were given a “yes” rating only if at least two databases were searched.
- AMSTAR item 4: Was the status of publication (i.e. grey literature) used as an inclusion criterion?
 - Articles were given a “yes” rating if the authors searched grey literature.
- AMSTAR item 5: Was a list of studies (included and excluded) provided?
 - Relaxed interpretation: Articles were given a “yes” rating only if the studies included in the review were listed (it was not

necessary to provide a list of excluded studies in order to receive a “yes”). We decided to create this relaxed criterion because we noted that requiring a list of excluded articles was highly restrictive and met by very few reviews.

- Strict interpretation: Articles were given a “yes” rating only if included and excluded articles were listed.
- AMSTAR item 6: Were the characteristics of the included studies provided?
 - Articles received a “yes” if data on the participants, interventions and outcomes from the original studies were presented in aggregated form, such as a table.
- AMSTAR item 7: Was the scientific quality of the included studies assessed and documented?
 - Articles received a “yes” if authors assessed the quality of the studies included in their review.
- AMSTAR item 8: Was the scientific quality of the included studies used appropriately in formulating conclusions?
 - Articles received a “yes” if the authors considered the results of their quality assessment in the analysis and the conclusions of the review.
- AMSTAR item 9: Were the methods used to combine the findings of studies appropriate?
 - We decided to apply this specifically to meta-analyses and meta-synthesis; if no meta-analysis or meta-synthesis was conducted, we gave a rating of “not applicable.”
- AMSTAR item 10: Was the likelihood of publication bias assessed?
 - Relaxed interpretation: No funnel plot/quantitative summary measure was needed to receive a “yes.” If the authors acknowledged possibilities of publication bias and how that might influence their results, we assigned a “yes.” We decided to create this relaxed criterion because many experts consider funnel plots not to be useful for assessing publication bias,

some of the reviews were qualitative or mixed, with funnel plots not widely used.

- Strict interpretation: A funnel plot/quantitative summary measure was needed to receive a “yes”. Two articles that discussed not being able to construct a funnel plot due to insufficient data (Kew et al., 2016; Oyo-lta et al., 2016) were still given a “yes” assessment because their non-use of a funnel plot was appropriate.
- For qualitative meta-synthesis reviews (Glenton, Colvin et al., 2013; Hall et al., 2017; Ma et al., 2016; Tso et al., 2016), we considered an assessment of bias to be not applicable.
- AMSTAR item 11: Was the conflict of interest included?
 - As long as the authors listed their own conflicts of interest and funding sources, we assigned a “yes” to this item; there was no need to list conflicts/sources for each article included in the respective review in order to assign a “yes” to this item.

After the initial 10 reviews were completed in duplicate and a consensus obtained on how to proceed, the remaining systematic reviews were rated by one reviewer; a random sample of 10% of systematic reviews were rated in duplicate to check agreement. Disagreements were limited and resolved through discussion.

2.2.4 Data analysis

Data were extracted using the above framework in Microsoft Excel (Table 2.1). Findings for the articles were read by component (i.e. all the data extracted from all the reviews on each topic, such as training, deployment, etc., were read together). The findings were synthesized on a component-by-component basis to enable themes to be identified and described.

We report our findings based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Liberati et al., 2009). However, some of these guidelines are not appropriate for our review since most of the findings cannot be expressed quantitatively and summary measures based on calculations are not possible.



which tasks to perform based on factors such as feasibility or preference. They draw on several papers to conclude that CHWs are more likely to succeed when they have a clear role and limited number of tasks.

Several reviews noted that CHWs can handle curative tasks. Kok, Dieleman et al. (2015) suggest having more curative tasks was found to increase CHW motivation. Malarcher et al. (2011) found that trained CHWs could satisfactorily deliver injectable contraceptives – depot medroxyprogesterone acetate (DMPA) and also could initiate DMPA use, which involves screening women and counselling them on side-effects. In fact, two studies (one from Bangladesh and one from Uganda) in the Malarcher et al. (2011) review found no difference in the quality of counselling on side-effects between CHWs and clinic-based providers. Furthermore, Mwai et al. (2013) found that

the quality of HIV counselling offered by CHWs in Malawi and South Africa was comparable or better than that provided by trained health care workers. Paintain et al. (2014) found that CHWs were as good or better than facility-based health care providers at providing appropriate malaria treatment; however when community-level management of pneumonia was integrated with malaria diagnosis and treatment, CHW performance varied more.

Koon et al. (2013) reported one study that provided limited evidence that pre-existing CHWs providing family planning services and case management of sexually transmitted infections successfully could add adolescent health education activities to their role. Gogia et al.'s (2011) systematic review of the evidence on community intervention packages to reduce neonatal mortality found mixed evidence of the benefit of

Table 3.5 Focal health issues in the included reviews

Focal health issue	Regional focus of studies included in the review			
	LMICs	HICs	LMICs and HICs	Total
System-level/multiple/general				
Multiple primary health care interventions	14	1	0	15
Health system*	7	3	0	10
Underserved groups (e.g. Latinos in the United States)	0	7	0	7
CHW rights/well-being	3	0	0	3
Maternal and child health				
Child/neonatal health	13	1 [#]	1 [#]	15
Maternal and child/neonatal health	14	0	1	15
Vaccination	4	0	1	5
Maternal health**	3	1	0	4
Contraception	3	0	0	3
Breastfeeding	0	1	1	2
Disease-specific: noncommunicable				
Diabetes	0	5	0	5
Cancer	1	3	0	4
Mental health ^{***}	4	2	0	6
Other (vascular disease, hypertension, asthma) #	0	2	1	3
Disease specific: infectious				
HIV	7 ^{##}	0	4	11
Malaria	6	0	0	6
Other infection (Buruli ulcer, tuberculosis, hepatitis B & C, neglected tropical disease)	3	1	0	4
Other: adolescent health (2), physical activity, palliative care				
	1	2	1 [^]	4
Total	83	29	10	122

* CHW programme scale up (Pallas et al., 2013); CHW programme integration (Zulu et al., 2014); peer telephone calls for multiple health issues (Dale et al., 2008); intervention design factors that influence CHW performance (Kok, Dieleman et al., 2015); role of allied health assistants in the health system (Lizarondo et al., 2010; Stanhope & Pearce, 2013); the dimensions of community health worker programmes (South et al., 2013).

** Two articles on maternal mental health are classified under maternal health (Jones et al., 2014; Rahman et al., 2013).

Review classified under child health but also dealt with chronic NCDs: one on paediatric chronic disease (Raphael et al., 2013) and one on childhood asthma (Postma et al., 2009).

Review on adult chronic disease in South Africa primarily dealt with HIV but 5 of the 29 articles were on mental health (Petersen et al., 2014).

^ Review on CHWs for palliative care (Horey et al., 2015) with no articles meeting the inclusion criteria; the search included LMICs and HICs.



including asphyxia/sepsis management alongside general home visits for newborns. The addition of asphyxia/sepsis management in the intervention package resulted in a lower relative risk (RR) for neonatal mortality (RR: 0.65, 95% confidence interval (CI): 0.47–0.89), compared with those that did not include this addition (RR: 0.76, 95% CI:

0.59–0.98). However, with meta-regression, after controlling for type of intervention (home visitation without and with management of asphyxia and/or sepsis), baseline neonatal mortality rate, and programme coverage, asphyxia/sepsis management had no independent influence on mortality risk reduction.

Table 3.6 Health system functions of community health workers

General category of CHW function	Specific functions mentioned in reviews
<p>1. Deliver diagnostic, treatment and other clinical services</p> <ul style="list-style-type: none"> ▪ Identify, assess and deliver treatment, as appropriate, to sick community members ▪ Provide medicines and other pharmaceuticals ▪ Directly provide care and treatment 	<p>Use rapid diagnostic tests (RDTs) for malaria (Boyce & O'Meara, 2017; Kamal-Yanni et al., 2012; Ruizendaal et al., 2014) and HIV (Bemelmans et al., 2016; Flynn et al., 2017); determine if a child's breathing is dangerously rapid (Noordam et al., 2014); identify high-risk pregnancies (Gogia et al., 2011); monitor clinical symptoms and signs of drug toxicity in people living with HIV and refer when appropriate (Kredo et al., 2014); monitor the effects of mental health-related medications (van Ginneken et al., 2013); conduct breast cancer screening exams (Wadler et al., 2011); measure and monitor blood pressure (Brownstein et al., 2007).</p> <p>Dispense contraceptives (Scott et al., 2015); administer injectable contraceptives (Malarcher et al., 2011); distribute antiretroviral drugs (Kredo et al., 2014), iron folic acid tablets (Sibley et al., 2012) or vitamin A (Sibley et al., 2012); malaria treatment (Paintain et al., 2014; Sibley et al., 2012).</p> <p>Perform home deliveries (Kok, Dieleman et al., 2015; Ribeiro Sarmiento, 2014; Silveira Feyer et al., 2013); vaccinate children (Glenton et al., 2011); provide community-level diagnosis and treatment for pneumonia, malaria and other infectious diseases (Amouzou et al., 2014; Kabaghe et al., 2016; Sazawal & Black, 2003); and provide psychosocial stimulation, psychotherapy and counselling to prevent mental, neurological and substance use disorders (Mutamba et al., 2013).</p>
<p>2. Assist with appropriate utilization of health services, make referrals</p>	<p>Help ethnic minorities in the USA make and keep medical appointments for cancer screening (Hou & Roberson, 2015) or for diabetes management (Cherrington et al., 2008; Hunt et al., 2011; Little et al., 2014); help people with hypertension in the USA access health insurance (Brownstein et al., 2007); help pregnant women with birth planning and preparedness to facilitate institutional delivery (Bhutta et al., 2011; Gogia & Sachdev, 2016); mobilize communities around maternal and neonatal health practices (Lassi & Bhutta, 2015); refer women to health facilities for delivery (Sibley & Sipe, 2006; Sibley et al., 2012); encourage access and adherence to HIV care (Bemelmans et al., 2016; Hall et al., 2017; Ma et al., 2016; Tso et al., 2016); or find underserved groups and encourage them to have their children immunized (Patel & Nowalk, 2010).</p>
<p>3. Provide health education and behaviour change motivation to community members</p>	<p>Provide education to reduce HIV stigma (Mwai et al., 2013) or promote behaviours that reduce the risk of acquiring HIV (Petersen et al., 2014); assist with family planning (Scott et al., 2015); encourage physical activity among those with NCDs (Costa et al., 2015); promote exclusive breastfeeding (Sibley et al., 2012), antenatal and postnatal care and family planning (Sibley et al., 2012); advise on tetanus vaccination (Sibley et al., 2012) or family planning (Sibley et al., 2012); provide education on cancer (Gibbons & Tyrus, 2007; Hou & Roberson, 2015), hypertension (Brownstein et al., 2007) and diabetes (Cherrington et al., 2008; Norris et al., 2006); reduce childhood asthma-triggering behaviours and environmental pathogens that provoke asthma (Postma et al., 2009; Raphael et al., 2013).</p>
<p>4. Collect and record data</p>	<p>Perform general clerical duties (Lizarondo et al., 2010) and data collection, including using mHealth tools (Agarwal et al., 2015; Braun et al., 2013); identify and report on malaria outbreaks (Källander et al., 2013), monitor medicine stocks and notify government agencies when stocks are low to prevent stock-outs (Källander et al., 2013; Kamal-Yanni et al., 2012).</p>
<p>5. Improve relationships between health services and communities</p>	<p>Act as mediators between individuals and health services (e.g. to improve provider responsiveness to patient needs) (Brownstein et al., 2007); act as cultural mediators (Bornstein & Stotz, 2008) (e.g. between Aboriginals and non-Aboriginals in Australia) (Mercer et al., 2014); serve as patient advocates (e.g. for those with diabetes) (Cherrington et al., 2008; Hunt et al., 2011) or cancer (Hou & Roberson, 2015) in the USA, or for mental health care in LMICs (Bornstein & Stotz, 2008; Stacciarini et al., 2012); serve as community advocates (e.g. for Latino communities in the USA (Rhodes et al., 2007).</p>
<p>6. Provide psychosocial support</p>	<p>Form support groups for people with HIV (Jaskiewicz & Tulenko, 2012; Mwai et al., 2013) or women (Lassi & Bhutta, 2015; Prost et al., 2013); provide anti-retroviral treatment adherence reminders (Mwai et al., 2013); provide one-to-one psychosocial support to reduce maternal depression (Hoeft et al., 2017; Rahman et al., 2013), to prevent mental, neurological and substance use disorders (Mutamba et al., 2013), for people with hypertension (Brownstein et al., 2007), or for USA Latino parents of youth with mental health issues (Hoeft et al., 2017); support adherence to drug regimens by sending short messages to mobile phones to remind people living with HIV to take their medication (Wouters, Van Damme et al., 2012).</p>

3.5 Health/service/programme-related effectiveness

Among the reviews that assessed CHW contributions to addressing specific health issues, most found that CHWs can improve health outcomes (Table 3.7), but many noted concerns about the low quality of included studies and emphasized the importance of health systems

enablers such as training and support, discussed in later sections of this report. The reviews were heterogeneous, examining diverse CHW programmes and analysing effectiveness across a range of health outcome measures. As a result, a meta-synthesis across the reviews was unfeasible. Thus, while Table 3.7 summarizes evidence on CHW contributions to health outcomes, we encourage readers to refer to the key findings of each individual review, which follow.

Table 3.7 Community health worker capacities for delivering specific health interventions

Health issue	Setting	
	High-income countries	Low- and middle-income countries
Multiple primary health care interventions	Most CHW programmes focused on underserved populations in HICs, such as ethnic/racial minorities, economically marginalized, rural populations or immigrant groups (Hoeft et al., 2017; Hunt et al., 2011; Mercer et al., 2014; Rhodes et al., 2007; Shommu et al., 2016; Viswanathan et al., 2009; Zhou et al., 2016). CHW interventions, such as through peer-support telephone calls (Dale et al., 2008) or home visits (Abbott & Elliott, 2017), can be effective for a wide range of health issues, including increasing knowledge about parenting (Abbott & Elliott, 2017), disease prevention (moderate strength of evidence) (Viswanathan et al., 2009), influenza prevention (Abbott & Elliott, 2017), promotion of home safety (Abbott & Elliott, 2017), increasing parenting self-efficacy (Abbott & Elliott, 2017), patient enrolment in research (Gibbons & Tyrus, 2007), uptake of early intervention services (Gibbons & Tyrus, 2007), increasing access to primary health care for screening (Shommu et al., 2016), improving workplace safety (low strength of evidence) (Viswanathan et al., 2009) and disease prevention (mixed evidence) (Viswanathan et al., 2009), and reducing urgent care visits (Abbott & Elliott, 2017). CHWs can reduce obesity among postpartum teens (Abbott & Elliott, 2017), improve nutritional eating habits (Gibbons & Tyrus, 2007), and increase physical activity (Costa et al., 2015).	CHW programmes can promote equity of health care access and utilization by reducing inequities relating to place of residence, gender, education and socioeconomic position, and supporting more equitable uptake of referrals (McCollum et al., 2016), including low-quality evidence from Brazil (Giugliani et al., 2011). Deploying refugees or internally displaced persons as CHWs to provide basic health services to women, children and families in camps can increase service coverage, knowledge about disease symptoms and prevention, uptake of treatment and protective behaviours, and access to reproductive health information (some evidence, weak quality) (Ehiri et al., 2014). There was no clear evidence for equitable quality of services provided by CHWs, and there was limited information regarding the role of CHWs in generating community action to respond to social determinants of health (McCollum et al., 2016). There is some evidence (moderate quality) that CHWs are effective in providing health education (Gilmore & McAuliffe, 2013) and psychosocial support (Gilmore & McAuliffe, 2013). There is an absence of evidence on CHW potential to support palliative care in communities (Horey et al., 2015).
Reproductive, maternal, neonatal and child health		
Neonatal/child health	CHW interventions can be effective in increasing infant-stimulating home environment scores (Abbott & Elliott, 2017), reducing psychiatric diagnoses among children (Abbott & Elliott, 2017), improving child development (Gibbons & Tyrus, 2007), and improving child well-being (mixed evidence) (Viswanathan et al., 2009).	CHWs providing community-based care for infants and children in resource-limited settings can reduce neonatal, infant and child mortality and morbidity (e.g. from malaria, pneumonia and diarrhoea) (Amouzou et al., 2014; Christopher et al., 2011; Darmstadt, Lee et al., 2009; Gogia et al., 2011; Gogia & Sachdev, 2016, 2010; Lassi & Bhutta, 2015; Lewin et al., 2010; Sazawal & Black, 2003; WHO & Global Health Workforce Alliance, 2010; Wilson et al., 2011). While there is high-quality evidence that home-based neonatal care reduces neonatal and perinatal mortality in South Asian settings with high neonatal mortality rates and poor access to health facility-based care (Gogia & Sachdev, 2010; 2016) other reviews reported mixed results, with some individual empirical studies included in reviews not showing improvements in CHW intervention areas (Amouzou et al., 2014). Evidence of the impact of CHW interventions on neonatal outcomes is promising but of moderate quality (Darmstadt, Lee et al., 2009) and on CHW capacity to provide skilled birth care is of low quality (Darmstadt, Lee et al., 2009).

Continued



Table 3.7 Community health worker capacities for delivering specific health interventions (continued)

Health issue	Setting	
	High-income countries	Low- and middle-income countries
Contraception	CHW interventions have been found to reduce unplanned repeat births among adolescents (Abbott & Elliott, 2017; Maravilla et al., 2016) but there was no significant association detected in terms of reducing the number of repeated pregnancies (Maravilla et al., 2016).	CHWs were able to deliver injectable contraception safely and effectively, with high quality and with high levels of patient satisfaction (Dawson, Brodie/ Buchan? et al., 2014; Malarcher et al., 2011), and initiate their use (which involves screening women and counselling them on side-effects), with no difference in the quality of counselling on side-effects between CHWs and clinic-based providers (Malarcher et al., 2011). Most (93%) studies indicated that CHW family planning programmes increased the use of modern contraception and most (83%) reported an improvement in knowledge and attitudes concerning contraceptives (Scott et al., 2015). CHWs can provide counselling on contraceptives, provide contraceptives and refer people to health facilities for more specialized care (Scott et al., 2015).
Breastfeeding	CHW interventions can be effective for increasing breastfeeding continuation (Dale et al., 2008; Kaunonen et al., 2012), attempts and duration (Abbott & Elliott, 2017), initiation, duration and exclusivity (Chapman et al., 2010).	The use of CHWs compared with usual health care services, probably increases breastfeeding (Lewin et al., 2010) and there is some evidence of moderate quality that CHWs are effective in exclusive breastfeeding promotion (Gilmore & McAuliffe, 2013). CHWs in Brazil have demonstrated effectiveness in increasing the prevalence of breastfeeding (Giugliani et al., 2011) and delaying the introduction of bottle feeding (Giugliani et al., 2011).
Noncommunicable diseases		
Diabetes	There is weak evidence that CHW interventions improve knowledge of medication-label reading among diabetics (Viswanathan et al., 2009); improve self-management (Small et al., 2013) (low strength of evidence), (Viswanathan et al., 2009); decrease glycaemia (Small et al., 2013) (mixed evidence), (Hunt et al., 2011) (modest reduction), (Palmas et al., 2015). There is no evidence that telephone interventions provided by lay and peer-support workers improve mental health or quality of life among diabetics (Small et al., 2013). For children with Type 1 diabetes, CHWs improved glycaemic control and decreased hospitalizations (Raphael et al., 2013).	CHW capacity in addressing diabetes in LMICs was not reported in the systematic review literature.
Cancer	CHW interventions – peer-support phone calls (Dale et al., 2008); home visits (Abbott & Elliott, 2017) – can be effective in increasing cancer screening rates (Abbott & Elliott, 2017; Dale et al., 2008; Gibbons & Tyrus, 2007; Shommu et al., 2016; Wells et al., 2011); knowledge about prostate cancer (but not screening) (Abbott & Elliott, 2017); cancer screening (moderate evidence) (Viswanathan et al., 2009); planned use of cancer screening tests (mixed evidence) (Viswanathan et al., 2009); breast self-examination (mixed evidence) (Viswanathan et al., 2009).	Only one non-systematic review (Wadler et al., 2011) discussed the potential of CHW to address cancer in LMICs, and did not provide evidence on CHW capacity.
Mental health	CHW interventions can reduce depression (Abbott & Elliott, 2017) and stigma toward depression treatment (one study) (Hoeft et al., 2017), improve depression knowledge and efficacy to seek treatment (Hoeft et al., 2017), and produce beneficial changes in health status measures in many, but not all, studies (Wahlbeck et al., 2017). CHW interventions in children with chronic conditions may lead to modest improvements in parental psychosocial outcomes (Raphael et al., 2013) and parental quality of life (Raphael et al., 2013).	CHW-led interventions can reduce the burden of mental, neurological and substance-use disorders, including depression and post-traumatic stress disorder among adults (evidence from three studies) (Mutamba et al., 2013); and can also improve child mental health outcomes (evidence from four studies) (Mutamba et al., 2013). Non-specialist providers, usually CHWs, are more effective than usual care or delayed treatment (waitlisted) groups in the provision of mental health treatments, generally for depression or post-traumatic stress (Singla et al., 2017). Non-specialist health workers (NSHWs), which in this review (van Ginneken et al., 2013) included both professionals (e.g. doctors, nurses and social workers) and CHWs (22 of the 38 studies), compared with usual health care services, have some promising benefits in improving outcomes for general and perinatal depression, post-traumatic stress disorder and alcohol-use disorders, and outcomes for patients with dementia and their caregivers (evidence mostly of low or very low quality) (van Ginneken et al., 2013).

Continued



Table 3.7 Community health worker capacities for delivering specific health interventions (continued)

Health issue	Setting	
	High-income countries	Low- and middle-income countries
Asthma	Peer-support telephone calls can be effective for increasing the number of asthma-free days (Abbott & Elliott, 2017) as well as the use of bedding encasements for asthma patients (moderate strength of evidence) (Viswanathan et al., 2009). While some CHW interventions for children with asthma decreased rapid breathing episodes, activity limitation, and asthma exacerbations, and increased the number of symptom-free days, results were inconsistent and risk of bias was often unclear (Raphael et al., 2013). Lay and peer interventions for adolescents with asthma could lead to small improvements in asthma-related quality of life (weak evidence) but there was insufficient evidence on asthma control, exacerbations and medication adherence (Kew et al., 2016).	CHW capacity in addressing asthma in LMICs was not reported in the systematic review literature.
Other NCDs (chronic disease, hypertension)	Peer-support telephone calls can be effective for diet change in post-myocardial infarction patients (Dale et al., 2008). CHW interventions may improve chronic disease management among children – modest improvements in reduced urgent care use (Raphael et al., 2013), decreased symptoms (Raphael et al., 2013), and fewer missed work and school days (Raphael et al., 2013) – and adults (Shommu et al., 2016), including improvements in blood pressure among adults with hypertension (Brownstein et al., 2007; Gibbons & Tyrus, 2007), in self-management behaviours, including appointment keeping and adherence to antihypertensive medications (Brownstein et al., 2007), and in health care utilization (e.g. fewer emergency visits and an increased proportion of patients having a nurse or physician) (Brownstein et al., 2007).	CHW capacity in addressing other NCDs in LMICs was not reported in the systematic review literature.
Infectious diseases		
HIV	Task sharing to CHWs may enhance emotional support and increase retention in care, and better link people with HIV to care (one qualitative study) (Hall et al., 2017; Ma et al., 2016; Tso et al., 2016).	Task sharing from higher level providers and clinic-based care to CHWs was generally acceptable to individuals living with HIV (Hall et al., 2017; Ma et al., 2016). This may enhance dignity and quality of life (Mwai et al., 2013) and increased retention in care (Hall et al., 2017; Mwai et al., 2013), without decreasing the quality of care (Kredo et al., 2014) or patient outcomes (such as virologic failure and mortality) (Mdege et al., 2013; Mwai et al., 2013; Wouters et al., 2012). Task sharing and community outreach involving CHWs effectively links people living with HIV to care (Tso et al., 2016).
Malaria	CHW capacity in addressing malaria in HICs was not reported in the systematic review literature.	There is some evidence of moderate quality that CHWs are effective in malaria prevention (Gilmore & McAuliffe, 2013; WHO & Global Health Workforce Alliance, 2010). CHWs can perform RDTs with high sensitivity and specificity, and display high levels of adherence to treatment guidelines (Boyce & O'Meara, 2017; Kabaghe et al., 2016; Kamal-Yanni et al., 2012; Paintain et al., 2014; Ruizendaal et al., 2014). There was insufficient research to enable an effect on morbidity or mortality to be estimated (Ruizendaal et al., 2014).
Other infections	Home visits from CHW can be effective in increasing hepatitis B testing (Abbott & Elliott, 2017); increasing HBV testing uptake (moderate quality evidence) (Zhou et al., 2016).	CHW interventions have helped decrease the incidence of tuberculosis (WHO & Global Health Workforce Alliance, 2010) and contributed to the control of neglected tropical diseases (NTDs) (Corley et al., 2016). They can support the control of Buruli ulcer in sub-Saharan Africa (Vouking et al., 2013). CHWs probably increase the number of people with tuberculosis who are cured, though they do not appear to affect the number of people who complete preventive therapy (Lewin et al., 2010).

Continued

We now present the core findings of each of the 122 included reviews, according to setting and topic category (presented in the same order as **Table 3.7**. High-income country reviews are presented first, then LMIC reviews.

Nine reviews included literature from both HIC and LMIC settings (Chapman et al., 2010; Flynn et al., 2017; Glenton, Colvin et al., 2013; Glenton et al., 2011; Hall et al., 2017; Kew et al., 2016; Ma et al., 2016; Raphael et al., 2013; Tso et al., 2016). Chapman et al. (2010) on peer counselling to support breastfeeding, Kew et al. (2016) on asthma, and Raphael et al. (2013) on paediatric chronic conditions included primarily high-income setting data and are thus in the HIC sections. Four reviews on HIV (Flynn et al., 2017; Hall et al., 2017; Ma et al., 2016; Tso et al., 2016) and one review on maternal and child health (Glenton, Colvin et al., 2013) included primarily LMIC literature and are thus presented in the LMIC sections. Glenton et al. (2011), on CHW involvement in immunization

coverage, is in the LMIC section in order to cluster it with the other three reviews on vaccination coverage, which are LMIC specific. As mentioned earlier, a tenth review (Horey et al., 2015), on training and support for CHWs to provider palliative care, did not identify any studies for inclusion and thus has no findings to summarize in this section.

Systematic reviews are labelled SR and systematic reviews that include a meta-analysis are labelled SR MA. All non-systematic reviews are labelled NSRs.

3.5.1 Community health worker roles, capacities and health outcomes as reported in reviews from HICs

Four reviews examined CHWs in HIC settings addressing multiple primary health care (Dale et al., 2008) and health system (Lizarondo et al., 2010; South et al., 2013; Stanhope & Pearce, 2013) issues (**Table 3.8**).

Table 3.8 Multiple primary health care and health system-related HIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Dale	2008	SR MA	There is some evidence from HICs that peer-support telephone calls can be effective for certain health-related concerns (mammography screening, diet change in post-myocardial infarction patients, breastfeeding continuation, and reducing depressive symptoms in mothers with postnatal depression).
Lizarondo	2010	NSR	There is consensus in the HIC literature that allied health assistants (CHWs) make a valuable contribution to allied health care. However, ongoing barriers to their effective use persist. CHWs have duties that require contact with patients (such as administration of clinical services, preparation of patients, patient education and supervision of patients) and duties that do not require direct patient contact (such as administrative and clerical duties).
South	2013	NSR	In HICs, the features of CHW programmes can be grouped into four dimensions: intervention, role, professional support/service and the community. More account needs to be taken of the variations among CHW programmes. The dimensions of these CHW programmes should not be mutually exclusive, as many programmes seek to combine various roles in a hybrid fashion, and, furthermore, roles may evolve over time. Bridging models (where CHWs connect underserved communities to health services) are prominent in studies carried out in North America; however, the roles can also involve peer education and culturally appropriate support.
Stanhope	2013	SR	CHWs in HICs are being employed in a range of settings, and they appear to be effective in terms of process measures and stakeholder perceptions. They are well accepted by clients, provide clients with more therapy time (e.g. for speech therapy or physiotherapy), and free up time for health professionals to perform other duties.

Seven reviews examined CHWs in HIC settings addressing health issues specifically facing underserved populations: five on racial and ethnic health disparities in the United States of America (Abbott & Elliott, 2017; Gibbons & Tyrus, 2007; Islam et al., 2015; Rhodes et al., 2007;

Viswanathan et al., 2009), one on Aboriginal health in Australia (Mercer et al., 2014) and one on immigrant and ethnic minority health care in the United States of America and Canada (Shommu et al., 2016) (**Table 3.9**).



Table 3.9 Underserved population-related HIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Abbott	2017	SR	Focus on efforts to address social determinants of health through home visiting for racial and ethnic minorities in the United States of America. Of the 39 included studies, 20 involved CHWs alone or in teams conducting community and home visitation interventions. Evidence from experimental studies (e.g. intervention vs control) found that home visits conducted by CHWs alone or in teams can positively influence a range of health-related behaviours, understandings and attitudes among marginalized people, including: improving parenting knowledge, knowledge of influenza prevention, home safety, self-efficacy, pap screening, hepatitis B testing, knowledge about prostate cancer (but not screening) and mammography attainment; increasing breastfeeding attempts and duration, number of asthma-free days, and infant-stimulating home environment scores; reducing depression, urgent care visits, obesity among postpartum teens, unplanned repeat births among adolescents, and psychiatric diagnoses among children.
Gibbons	2007	SR	Focus on the role of CHWs in addressing racial and ethnic disparities in health status and health care in the United States of America. The available evidence from RCTs in the United States of America suggests positive benefits may be attributable to the use of CHWs. CHWs in the United States of America conduct home visits, make referrals and lead counselling sessions. They also provide education (e.g. giving colorectal cancer information) and organize activities.
Islam	2015	NSR	CHW programmes for Asian American, Native Hawaiian and Pacific Islander communities in the United States of America do not adequately address the ethnic and cultural diversity in these populations. CHW programmes should be geographically expanded to reach these populations across the country. CHWs are underutilized in addressing a range of health issues in these communities, including mental health disparities, HIV/ AIDS and occupational health/injuries.
Mercer	2014	SR	In Australia, workplace culture and environments impact on the experiences of Aboriginal health workers (who are CHWs) and non-Aboriginal health care providers working in collaborative clinical arrangements. When Aboriginal health workers and non-Aboriginal health care providers are empowered to work in a successful clinical partnership, through an enabling workplace, there is a great benefit for both the health professional and Aboriginal health worker, the Aboriginal community and the health service.
Rhodes	2007	NSR	CHWs have been used to promote health in United States of America Hispanic/Latino communities for a range of issues, including cancer screening, cardiovascular health, prenatal care, and diabetes management. Roles include providing advice, facilitating referrals, distributing materials, serving as role models, and advocating on behalf of community members. Most CHWs were female, and training ranged from 6 to 160 hours. Only 14 of the 37 studies identified offered evidence of effectiveness, 12 of which used controls or a comparison group; all showed positive outcomes.
Shommu	2016	SR	Community health navigators (health care workers who support patients to obtain appropriate health care) can improve chronic disease management and access to primary health care for screening (e.g. cancer screening or body mass index assessment) for immigrant and ethnic minority adults. The one Canadian study included in the review also reported positive outcome of navigators among immigrant women. While navigator interventions have not been fully explored in Canada, in the United States of America many studies have demonstrated significant improvements in immigrant health outcomes.
Viswanathan	2009	SR MA	In the United States of America, CHWs can serve as a means of improving outcomes for underserved populations for some health conditions. There is moderate evidence that CHW interventions improve the knowledge of participants on disease prevention and cancer screening, and there is weak evidence that CHW interventions improve knowledge of medication label reading among diabetics. Studies suggested that CHW interventions result in improvements in participant behaviour when compared with alternatives such as a community intervention (not further defined), a lower intensity CHW intervention, and usual care (without a CHW) combined with a pamphlet. The strength of evidence is moderate for the use of bedding encasements for asthma, and low for workplace safety and diabetes mellitus. The evidence for disease prevention, improving the environment for child well-being, planned use of cancer screening tests, and breast self-examination is mixed. CHWs provided interventions in health promotion and disease prevention, injury prevention, maternal and child health, cancer screening and chronic disease management, with varying degrees of effectiveness.

Five reviews examined CHWs in HIC (or primarily HIC) settings on maternal and child health issues: two on breastfeeding support (Chapman et al., 2010; Kaunonen et al., 2012), one on maternal mental

health (Jones et al., 2014), one on childhood asthma (Postma et al., 2009) and one on paediatric chronic disease (Raphael et al., 2013) (Table 3.10).

Table 3.10 Maternal and child health HIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Chapman ¹	2010	NSR	The overwhelming majority of evidence from RCTs indicates that peer counsellors improve rates of breastfeeding initiation, duration and exclusivity, and this leads to decreases in the incidence of infant diarrhoea and duration of lactational amenorrhoea. Breastfeeding peer counselling can be scaled up in both developing and developed countries.
Jones	2014	SR MA	In HICs, access to the right type of peer support can positively impact women's perinatal mental health. It is important to recognize the risk of isolation and to establish pathways of referral to peer support networks. Practitioners must nurture peer support networks in perinatal care. More research is required to establish the most successful formats/structures of peer support.
Kaunonen	2012	SR	In HICs, individual support and education were the most common peer interventions for breastfeeding support. 12 of the 15 studies reporting breastfeeding continuation showed peer support to be effective.
Postma	2009	NSR	In the United States of America, CHW-delivered environmental interventions for paediatric asthma were consistently shown to have positive outcomes, including decreased asthma symptoms, daytime activity limitations, and use of emergency and urgent care. CHWs were effective in counselling to improve patient well-being and reducing asthma-triggering behaviours as well as in providing social and emotional support.
Raphael ²	2013	SR	CHW interventions in children with chronic conditions may lead to modest improvements in urgent care use, symptoms and parental psychosocial outcomes. The improved outcomes that were most commonly reported included reduced urgent care use, decreases in symptoms, fewer missed work and school days, and increased parental quality of life. For children with asthma, CHWs decreased rapid breathing episodes per month, activity limitation, and asthma exacerbations per year, and they also increased the number of symptom-free days per year. For Type 1 diabetes, CHWs improved glycaemic control and decreased hospitalizations in intervention groups. CHWs interacted with families at the time of home visits or through phone calls or e-mails. The CHWs in the 11 studies of asthma primarily focused on education about environmental trigger reduction, provision of engineering controls (e.g. air filters and mattress encasements), asthma action plans, medication management, and increasing parental recognition of symptoms.

¹ Of the seven RCTs included, all but one (Mexico) were from HICs.

² Global focus but majority HIC literature.

Thirteen reviews examined CHWs in HIC settings (or majority HIC settings) addressing NCDs: five on diabetes, three on cancer, two on

mental health, and one each on vascular disease, hypertension and asthma (Table 3.11).

Table 3.11 Noncommunicable disease HIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Diabetes			
Cherring-ton	2008	NSR	United States of America only: five CHW roles in diabetes management were identified: educator, case manager, role model, programme facilitator, advocate. Roles, responsibilities and training varied greatly, as did outcomes that were assessed. Future studies are needed regarding how to integrate CHWs into diabetes programmes.
Hunt	2011	SR	United States of America only: community health advisor interventions for people with Type 2 diabetes were based on providing culturally appropriate care and resolution of health disparities within minority populations in the United States of America. Typically, community health advisors had diabetes themselves. Major roles of community health advisors included working as a supporter, educator, case manager, advocate and programme facilitator. Activities included: coordinating educational programmes, conducting educational courses for patients, serving as a link between patients and health care professionals, providing counselling, and leading peer-support meetings. The effectiveness of interventions by community health advisors was mixed. Decreases in HbA1c (a marker for diabetes) were noted in several studies, but in some cases the change was not statistically significant.

Continued



Table 3.11 Noncommunicable disease HIC reviews (continued)

First author	Date	Review type	Main outcomes and CHW roles
Little	2014	SR	Seven out of 12 RCTs on CHW-delivered interventions for Latinos with Type 2 diabetes in the United States of America reported statistically significant improvements in glucose levels as measured by HbA1c. The methodological quality was good but there were inconsistencies in the reporting of key information. Future research should: i) report in greater detail CHW background, training and supervision; ii) examine factors associated with intervention effectiveness; and iii) provide data on cost and cost-effectiveness. CHWs led the intervention either alone, in pairs, or as part of a team (not further specified), with responsibilities including educating, advocating, supporting and coordinating logistics. CHWs were described as paid staff in six studies.
Norris	2006	NSR	Diabetes patients were generally satisfied with their contacts with CHWs, and patient knowledge about diabetes increased. Improvements in physiological measures were noted for some interventions, and positive changes in lifestyle and self-care were noted in numerous studies. There were few data on economic outcomes, but several studies demonstrated a decrease in inappropriate health care utilization. CHW roles varied from substantial involvement in patient care to simply assisting with implementing education sessions taught by other health professionals.
Palmas	2015	SR MA	CHW interventions showed a modest reduction in glycaemia (level of HbA1c) compared with usual care. CHW roles included facilitating group classes, contacting patients by telephone and conducting outreach. The number of CHW-participant encounters varied widely. In terms of cost-effectiveness, one study suggested that a CHW programme in diabetes care could save US\$ 2000 annually per Medicaid participant, and one study found that an outreach programme for underserved men in Denver, Colorado, could yield a return on investment of US\$ 2.28 per dollar invested.
Cancer			
Hou	2015	NSR	In the United States of America, community and clinic health navigators for cancer screening promotion had similar roles and responsibilities. Most of the navigator interventions increased cancer screening knowledge and behaviours versus usual care or comparison groups. Navigator roles included: reaching out to participants via mail, phone or face-to-face contact; providing information or hosting educational events; providing counselling; sharing personal testimony; providing logistical support, particularly helping schedule screening; serving as a translator or advocate; and/or gathering information about access to cancer care screenings.
Martínez-Donate	2009	SR	In the United States of America, there is limited evidence of effectiveness of CHW interventions to promote breast and cervical cancer screening among Latinas. Most studies used weak methodological designs. Only 5 of the 14 included studies involved an experimental or quasi-experimental design with a comparison group and pre- and post-test measures. Of these five, only two found evidence of effectiveness.
Wells	2011	NSR	In the United States of America, CHW interventions are associated with a statistically significant increase in rates of screening mammography. These interventions tend to have stronger effects in specific settings and study designs, as well as when participants and CHWs were similar ethnically or racially.
Mental health			
Hoelt	2017	SR	In rural settings, there are several existing models for how CHWs can be involved in mental health care delivery, such as home visitation for pregnant women on Medicaid, support for parents of Latino youth with mental health problems, or door-to-door outreach for stress management, substance abuse, domestic violence, depression and anxiety. In terms of efficacy, a CHW-led project on depression with an immigrant Latina population created a fotonovela (a small illustrated storybook), which resulted in improved depression knowledge, improved efficacy to seek treatment and decreased stigma toward depression treatment. Provider education, supervision and partnerships with local communities can support task sharing. Challenges, such as confidentiality, are often not addressed in the literature.
Wahlbeck	2017	NSR	While beneficial mental health effects of housing and active labour-market interventions have been documented in randomized trials, the evidence for interventions at service and community level is considerably weaker, reflecting challenges in assessing effectiveness of complex and context-dependent interventions by traditional effectiveness study designs. Nonetheless, community outreach health workers were able to produce beneficial changes in health status measures in many, but not all, studies. In addition, the lack of evidence of effectiveness of many promising higher level interventions such as community coalitions, health mediators, social prescriptions and debt advice does not mean they are not effective. Although policies can rarely be evaluated in empirical intervention studies, existing studies point towards the positive mental health impacts of many non-health policies, especially so for social, labour market and housing policies.

Continued

Table 3.11 Noncommunicable disease HIC reviews (continued)

First author	Date	Review type	Main outcomes and CHW roles
Hypertension			
Brownstein	2007	SR	In seven of eight RCTs from HICs, CHW interventions for people with hypertension (often underserved African Americans) showed significant improvements in blood pressure. Several significant improvements in participants' self-management behaviours were reported (including appointment keeping and adherence to antihypertensive medications), and positive changes were observed in health care utilization (e.g. fewer emergency visits, increased proportion of patients having a nurse or physician) and in health systems outcomes (e.g. provider responsiveness to patient needs). CHW roles included: i) health education on hypertension (including on treatment, emphasizing need for adherence) and lifestyle changes; ii) assisting patients in accessing services (e.g. obtaining health insurance); iii) directly providing services (measuring and monitoring blood pressure); iv) providing social support; and v) mediating between participants and the health care/social service systems.
Vascular disease			
Small	2013	SR MA	There is modest evidence from HICs that telephone interventions provided by lay workers and peer-support workers for patients with diabetes can improve self-management and levels of glycaemia (HbA1c), but there is no evidence that this intervention improves mental health or quality of life.
Asthma			
Kew ³	2017	SR MA	Although weak evidence suggests that lay-led interventions that provide peer support can lead to a small improvement in asthma-related quality of life for adolescents, benefits for asthma control, exacerbations and medication adherence remain unproven. Current evidence is insufficient to reveal whether routine use of lay-led or peer-support programmes is beneficial for adolescents receiving asthma care. Ongoing and future research may help to identify target populations for lay-led and peer-support interventions, along with attributes that constitute a successful programme.

³ Global focus but majority HIC literature.

One review examined infectious disease in HIC settings and focused on chronic viral hepatitis B and C (Zhou et al., 2016) (Table 3.12).

Table 3.12 Infectious disease HIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Zhou	2016	SR MA	A range of relatively simple, inexpensive operational interventions can substantially improve engagement and retention along the chronic viral hepatitis care continuum, thereby optimizing the implementation of screening, care and treatment programmes. Meta-analysis demonstrates that educational programmes for task sharing to culturally appropriate CHWs are effective in increasing HBV testing uptake. The six studies included in the meta-analysis were graded as moderate quality evidence. Although all CHW interventions were conducted among Asian immigrant populations in HICs, this particular type of intervention could apply to other settings as well. Training provided for the CHWs in the six studies was relatively simple and cheap.

Two review on CHWs in HIC settings were classified “other” and examined physical activity (Costa et al., 2015) and preventing adolescent repeat pregnancies (Maravilla et al., 2016) (Table 3.13).

Table 3.13 Community-based practitioner rights and well-being-related low- and middle-income country reviews

First author	Date	Review type	Main outcomes and CHW roles
Costa ⁴	2015	SR	This review examined whether physical activity promotion in interventions conducted by CHWs has positive outcomes across HICs. The authors found that 16 of the 26 studies (62%) reported positive results for different parameters of physical activity. CHWs primarily focused on health education counselling delivered in populations at risk or diagnosed with chronic NCDs. The successful interventions were conducted over a period averaging 6.5 months.
Maravilla	2016	SR MA	Although most included studies (n=9) were either of “strong” or of “moderate” quality, only two of five studies that found a significant reduction in adolescent repeated childbearing exhibited a high level of quality, as the other three failed to adjust results for confounders. Random effects modelling revealed an overall 30% decrease in repeated adolescent births (OR = 0.70; CI: 0.49–0.99) among CHW-visited areas relative to non-visited sites. On the other hand, no significant association was detected in terms of repeat pregnancies (OR = 0.96; CI: 0.70–1.28).

⁴ No regional focus mentioned but the included article appears to be from HICs.



3.5.2 Community health worker roles, capacities and health outcomes as reported in reviews from LMICs

In LMICs, 14 reviews examined CHW involvement in various aspects of primary health care (Table 3.14).

Table 3.14 Primary health care LMIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Agarwal	2015	NSR	Community health workers can learn how to use mHealth tools for: i) data collection and reporting; ii) training and decision support; iii) emergency referrals; iv) work planning through alerts and reminders; v) and improved supervision of and communication among CHWs. Two studies suggest that mHealth can improve adherence to treatment algorithms. Some 27 of 42 studies involved CHWs (23 CHWs only, 4 of CHWs).
Bornstein	2008	NSR	In Brazil, community health agents (CHAs) are mediators between the health system and the community, and between different forms of health-related knowledge. They connect community members and the health system in terms of knowledge sharing (in either direction), and in responding to the needs and demands of the population. CHAs hold both positions of power and prestige with respect to their community, and the responsibility to absorb community pressure (e.g. from those community members who are seeking favourable treatment, access, etc.). CHAs have both a patient-centred and a biomedical orientation, resulting in tension between different approaches and knowledge bases. Two principal dimensions are discussed in the literature on CHAs – the technical and the political. They are defined as a sui generis worker, completely unique, difficult to define, but with an important role that is increasingly important in the health care field. Although CHA training is well-documented technically at the ministry of health level in Brazil, there are diverse ways to implement this in practice, and CHA training varies around the country.
Bosch-Capblanch	2008	SR	Supervision is expensive. Supervision interventions generally have shown small positive effects on CHW performance. However, the quality of the studies is mixed, and outcomes varied between studies. Three out of 12 effectiveness studies included CHWs.
Bosch-Capblanch	2011	SR	It is uncertain whether supervision has a substantive positive effect on the quality of primary health care. The long-term effectiveness of supervision is unknown. Of the nine studies included in the review, only two involved supervision of CHWs.
Braun	2013	NSR	CHWs are using mHealth to collect field-based health data, receive alerts and reminders, facilitate health education sessions and conduct person-to-person communication. Programmatic efforts using mHealth focus on improving adherence to standards and guidelines, community education and training, and programmatic leadership and management practices.
Ehiri	2014	SR	There is some evidence, but of weak quality, that deploying CHWs recruited from refugees or internally displaced persons to provide basic health services to other women, children and families in camps can improve health (as defined by increased service coverage, increased knowledge about disease symptoms and prevention, increased uptake of treatment and protective behaviours, and improved access to reproductive health information).
Fulton	2011	NSR	Task sharing is an important strategy for addressing needs-based shortages and skill-mix imbalances. Role delegation to CHWs can produce adverse effects. The quality of care provided by CHWs can be suboptimal if CHWs are given complex tasks. Quality and safety concerns may arise, as well as professional and institutional resistance. Sustaining motivation and performance may be a challenge. More research is needed regarding the benefits of task sharing from the perspective of comparing outcomes with what would have been the outcomes if no role delegation had occurred.
Hill	2014	SR	Evidence suggests that improving supervision quality has a greater impact than increasing frequency of supervision alone. Supportive supervision packages, community monitoring of the work of CHWs, and quality improvement/problem-solving approaches show the most promise; however, evaluation of all strategies was weak.
Jaskiewicz	2012	NSR	The four essential elements of the work environment that affect CHW productivity are: workload, supportive supervision, supplies and equipment, and community engagement and the health system integration. There is no known ideal work environment, nor is there a known maximum number or mix of CHW job tasks that will ensure the highest level of CHW productivity. Success is more likely when CHWs have a clear job description, a limited number of tasks, standardized protocols, and job aids that match their training.

Continued

Table 3.14 Primary health care LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CHW roles
Källander	2013	NSR	Innovative mHealth applications for CHWs include the use of mobile phones as job aids, clinical decision support tools, and channels for data submission and instant feedback on performance. The most commonly documented use of mHealth was one-way text message and phone reminders to encourage follow-up appointments and healthy behaviours. Although there is vast documentation of project process evaluations, there are few studies demonstrating an impact on clinical outcomes attributable to mHealth interventions. Few mHealth applications and services operate at scale in LMICs.
Kok, Kane et al.	2015	SR	The review identifies five key contextual factors that influence the performance of CHWs: i) community and sociocultural factors: social and cultural norms, values, practices and beliefs, gender roles and norms, disease-related stigma, safety and security, and education and knowledge level of the CHW beneficiaries; ii) economic factors: the influence of poverty on one's willingness to become a CHW, on the health-care seeking behaviour of beneficiaries; and on the generalized stress experienced by CHWs and communities; iii) environmental factors: geography, distance to households, and climate (such as flooding); iv) health system policies, such as human resources policy, CHW policy, CHW-related legislation, and political commitment; and v) health system conditions, such as the functionality of health system, the availability of higher level staff, the decision-making structure, the costs of health services, and the governance/coordination structure.
McCollum	2016	SR	CHW programmes were found to promote equity of health care access and utilization by reducing inequities relating to place of residence, gender, education and socioeconomic position and supporting more equitable uptake of referrals. There was no clear evidence for equitable quality of services provided by CHWs and limited information regarding the role of the CHW in generating community engagement to respond to social determinants of health. If CHW programmes are not well planned, however, some of the barriers faced by clients at health facility level can replicate at community level.
Vaughan	2015	NSR	Existing evidence suggests that, compared with standard care, using CHWs in health programmes can be a cost-effective intervention in LMICs, particularly for TB, but also – although the evidence is weaker – in other areas such as reproductive, maternal, newborn and child health and malaria.
WHO/ GHWA	2010	NSR	Almost all the intervention studies involving CHWs showed a significant impact on reducing maternal, perinatal and neonatal mortality and on improving perinatal and postpartum service utilization indicators. CHWs provide a range of services, from safe deliveries to counselling and preventive health education to the treatment and rehabilitation of people suffering from common mental health problems. The services offered by CHWs have helped in the decline of maternal and child mortality rates and have decreased the incidence of tuberculosis and malaria.

Seven reviews examined CHWs in LMIC health systems, addressing how best to scale up and sustain CHW programmes and the factors that influence CHW programme integration into health systems (Table 3.15).

Table 3.15 Health system-related LMIC reviews

First author	Date	Review type	Main outcomes and CHW roles
Baatiema	2016	NSR	In Ghana, CHWs have played critical roles in improving health service delivery and outcomes. Examples include their contribution to guinea worm eradication, expanded immunization coverage, maternal and child health, and HIV/AIDS treatment and management. These achievements notwithstanding, however, CHWs face challenges that prevent them from being optimally productive, including capacity problems, lack of connection to the health care system, high attrition rates and inadequate supervision. There is a policy deficit regarding CHWs in Ghana. There is no national framework to guide CHWs, no formal integration into the health system, and a dearth of logistical support, capacity development, career ladder opportunities and financial incentives.
Kok, Dieleman et al.	2015	SR	CHW performance can, at least in certain settings, be enhanced through a mix of financial and non-financial incentives, frequent supervision, continuous training, and embedding CHWs in community and health systems. While supervision and training often were mentioned as facilitating factors, few studies tested which approach worked best or how these were best implemented. Clearly defined CHW roles, clear processes for communication among different levels of the health system and providing incentives in a predictable way could also strengthen CHW performance.
Loures	2010	SR	In Brazil, community health agents (CHAs) and physiotherapists interact with each other, and both play an important role in the health system. Community health agents can perform some of the functions of physiotherapists in the home, and working together, the two groups can better meet the needs of patients with physical therapy needs by providing care in the home.

Continued



Table 3.15 Health system-related LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CHW roles
Pallas	2013	NSR	Scaling up and sustaining CHW programmes in LMICs requires effective programme design and management, including adequate training, supervision, motivation, and funding; acceptability of the programme to the communities served; and securing support for the programme from political leaders and health care providers.
Pereira	2013	NSR	In Brazil, community health agents require ongoing health training in their daily work and in-service training on aspects of primary health care to enable them to consider all social determinants of health instead of taking a purely biomedical approach. The health care model must be reoriented to increase the communities' involvement in their health.
Schneider	2016	SR	Between 2005 and 2014, there have been 678 publications on CHWs from 46 countries, with the annual publication rate increasing rapidly. Half the publications reported on initiatives in Africa, a third from Asia and 11% from the Americas (mostly Brazil). The largest single focus and driver of the growth in publications was on CHW roles in meeting the Millennium Development Goals of maternal, child and neonatal survival (35% of total), followed by HIV/AIDS (16%), reproductive health (6%), NCDs (4%) and mental health (4%). Only 17% of the publications approached CHW roles in an integrated fashion. There were also distinct regional (and sometimes country) profiles, reflecting different histories and programme traditions.
Zulu	2014	NSR	Factors that may influence the health systems integration of CHW programmes in LMICs include: i) financial packages for CHWs that are consistent, predictable, appropriate and fair in relation to their tasks; ii) a workload that is considered reasonable; iii) good training; and iv) regular supervision from professional health workers. Different aspects of national CHW programmes are integrated into the health system in various ways. The acceptability and adoption of national CHW programmes by health systems has been shaped by the interaction between the perspectives of the actors within the adopting system as well as by the compatibility of CHW programmes with the health system.

Three reviews examined the rights and well-being of LMIC CHWs (Table 3.16).

Table 3.16 Community health worker rights and well-being related LMIC reviews

First author	Date	Review type	Main outcomes and CBP roles
Bhatia	2014	NSR	In India, the government has been slow to provide salary security to CHWs; CHWs are not integrated into the established, salaried team of health system workers. Performance-based incentives do not provide the financial security that is expected and needed by CHWs.
Henriques Camelo	2012	NSR	CHWs experience work-related physical and mental illnesses, such as circulatory, muscular and infectious diseases, mental disorders, stress and burnout. The management strategies CHWs use include exercise, reading, music and team meetings. Work-related conditions that CHWs experience must be reviewed, so that management strategies can be developed. CHWs need to reflect on their work-related practices and safety issues and how to minimize their health effects.
Kane	2016	NSR	CHWs programmes empower CHWs by: i) giving access to privileged medical knowledge; ii) linking them to the health system; and iii) providing them an opportunity to do meaningful work. CHWs are frustrated, however, by a sense of lack/absence of control over their work environment and feelings of being unsupported, unappreciated and undervalued. While increasingly the onus is on CHWs and CHW programmes to solve the problem of health access, attention should be given to the experiences of CHWs themselves. CHW programmes need to move beyond an instrumentalist approach to CHWs and take a more inclusive approach that also includes the career development and empowerment of CHWs.

Some 39 reviews addressed CHW involvement in maternal and child health initiatives (Table 3.17). Of these reviews, 13 specifically focused on child and neonatal health, 15 on maternal and child/neonatal health, 5 on vaccination, 3 on maternal health

and 3 on contraception. One of the reviews on maternal and child health (Glenton, Colvin et al., 2013) was global in focus but included more LMIC than HIC literature, so is presented below (Table 3.17).

Table 3.17 Maternal and child health LMIC reviews

First author	Date	Review type	Main outcomes and CBP roles
Child health			
Amouzou	2014	SR	In sub-Saharan Africa, integrated community case management programmes train CHWs to assess, classify and treat uncomplicated cases of pneumonia with antibiotics, malaria with antimalarial drugs, and diarrhoea with oral rehydration salts and zinc. Six of the eight studies showed a higher decline in mortality among children aged 2 months to 5 years in programme areas than in comparison areas, although this acceleration was statistically significant in only one study with a decline of 76% larger in intervention than in comparison areas.
Bosch-Capblanch	2014	NSR	Integrated community case management programmes, which aim to improve vulnerable communities' access to care (for childhood illnesses) through CHWs, seem to have positive effects when they involve: policy change, organizational change, standardization of clinical practices, alignment with other programmes (especially large multi-component programmes) and strong components of training, supervision and adequate and timely provision of equipment and supplies. On-site training and supervision improve clinical practices. Positive effects are demonstrated through caregiver knowledge, care-seeking behaviours, and household sickness management, but not on mortality.
Christo-pher	2011	SR	This review assessed the impact of CHWs delivering curative interventions against malaria, pneumonia and diarrhoea on under-6[mortality and morbidity in sub-Saharan Africa. The review found that mortality in children under 5 years reduced by 63% when CHWs delivered insecticide-treated nets and 36% when CHWs delivered antimalarial chemoprophylaxis in addition to curative treatment and education. However, there was limited information on programme description, context or process outcomes. Large-scale rigorous evaluations of CHW programmes are needed.
de Oliveira Castro	2015	NSR	In Brazil, CHWs can play an important role in identifying children with hearing problems as well as promoting and monitoring children's hearing health. Effective training methods include live classes, online classes, video conferencing and use of CD-ROMs.
Gogia	2011	SR MA	Neonatal care provided by CHWs was associated with reduced neonatal mortality in resource-limited settings (RR = 0.73; CI: 0.65–0.83; P < 0.0001). In trials with a baseline neonatal mortality rate less than 50/1000 live births, the relative risk of neonatal mortality among neonates receiving care from CHWs was 0.85 (CI: 0.73–0.99); while in trials with a baseline neonatal mortality rate of more than 50/1000 live births, the relative risk was 0.65 (CI: 0.54–0.77). Subgroup analysis by the type of intervention, i.e. home visits with or without community mobilization, RR = 0.71 (CI: 0.60–0.84) vs community participatory action and learning RR = 0.77 (CI: 0.61–0.96) indicates that both intervention strategies resulted in a similar reduced relative risk of neonatal mortality. While it appears logical that trials with more number of home visits should result in greater mortality reduction, this association was not consistently observed across all trials. Some studies suggest that home visits during the first 2 days of life are likely to yield the largest dividends.
Gogia	2016	SR MA	There is high-quality evidence that home-based neonatal care is associated with a reduction in neonatal and perinatal mortality in South Asian settings with high neonatal mortality rates and poor access to health facility-based care.
Gogia	2010	SR MA	Home visits for antenatal and neonatal care, together with community mobilization activities, are associated with reduced neonatal mortality (RR = 0.62; CI: 0.44–0.87) and stillbirths (RR = 0.76; CI: 0.65–0.89) in South Asian settings with high neonatal mortality and poor access to facility-based health care. Antenatal and neonatal practice indicators also significantly improved (more than one antenatal check-up, two doses of maternal tetanus toxoid, clean umbilical cord care, early breastfeeding and delayed bathing). Only one trial recorded infant deaths, and this study showed a marked reduction (RR = 0.41; 0.30–0.57). Subgroup analyses suggested a greater survival benefit when home visit coverage was ≥ 50% (P < 0.001) and when both preventive and curative interventions (including the use of injectable antibiotics) were conducted (P = 0.088).

Continued



Table 3.17 Maternal and child health LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CBP roles
Kane	2010	NSR	Interventions to improve CHW performance include: i) skills-based training of CHWs; ii) a health system that provides rigorous CHW supervision and is responsive to the CHW's client referrals; and iii) embedding the CHW in the community. Interventions applied in the context of CHW programmes embedded in local health services with beneficiaries who valued services and had unmet needs, worked if the following mechanisms were triggered: i) anticipation of being valued by the community; ii) perception of improved social status; iii) stronger relationships with beneficiaries and the health system; iv) increased self-esteem; v) sense of self-efficacy and mastery of tasks; and vi) enhanced sense of credibility, legitimacy and assurance that there was a system for back-up support. Studies also showed that if context differed, even with similar interventions, negative mechanisms could be triggered, compromising CHW performance.
Lee	2014	SR MA	This review found that, compared to physicians, trained CHWs may screen for possible bacterial infection in young infants with relatively high sensitivity (average 82%; CI: 76–88%) but somewhat lower specificity (average 69%; CI: 54–83%) (8 studies, n=11 857). Among the 14 studies that reported on health worker diagnosis of possible bacterial infection, five were about CHWs, two of which provided data that could be pooled for analysis. Both were from Bangladesh and validated CHW classification of newborns by modified Bangladeshi Integrated Management of Childhood Illness criteria compared with physician classification: 73–91% of cases of very severe disease were recognized by CHWs, with specificity of 95–98% (Baqui et al., 2009; Darmstadt, Baqui et al., 2009). The third study, from Gadchiroli India, found that CHWs could identify individual signs of neonatal illness in high agreement with physicians (mean 92.7% agreement on 46 variables) and diagnosed 89% of cases meeting clinical sepsis criteria compared with a computer diagnostic algorithm based on neonatal symptoms (Bang et al., 2005; Bang et al., 2001). The fourth study, from Nepal, found that CHWs had high levels of agreement on the major signs of neonatal sepsis compared with facility-based CHWs (Khanal et al., 2011). The fifth, from Purulia, India, was not as positive (Biswas et al., 2011). This study observed CHWs conducting home assessments for Integrated Management of Neonatal and Childhood Illnesses. These CHWs completed all aspects of the assessment in only 32% of cases and, among those cases, 35% had the correct classification in all subgroups and 34% in at least one subgroup.
Noordam	2014	NSR	Among illiterate CHWs, the use of counting beads (beads that are shifted along a string to help keep track of numbers while counting) enabled and improved the assessment and classification of fast breathing among children with possible pneumonia. However, among literate CHWs, a study found that the use of counting beads decreased the accuracy of counting breaths. The design of the beads is crucial: beads should move comfortably, and a separate bead string, with colour coding, is required for the age groups with different cut-off thresholds – eliminating more complicated calculations.
Reisman	2016	SR	Birth attendants in LMICs can acquire newborn resuscitation knowledge and skills through training, but they struggle to learn bag-mask ventilation, and there is a significant fall off in knowledge and skills after pre-service training. Refresher training, including formal, structured practice sessions, improves retention of knowledge and skills. Low rates of proficiency with bag-mask ventilation immediately after training suggest that training programmes should strengthen their emphasis on learning this technique, including methods of improving ventilation when the technique is ineffective. The review also highlights that birth attendants can acquire knowledge and skills simply by working with those who are trained rather than undergoing the training themselves, and that self-directed learning may be a viable and cost-effective strategy for improving newborn care in LMICs.
Sazawal	2003	SR MA	Community case management of pneumonia in children in developing countries involves diagnosis by CHWs through assessment of rapid breathing and, as appropriate, treatment by CHWs with antibiotics. Meta-analysis found a reduction in neonatal mortality of 27% (CI: 18–35%), infant mortality of 20% (CI: 11–28%), and children 0 to 4 years of 24% (CI: 14–33%). In the same three groups, pneumonia mortality was reduced by 42% (CI: 22–57%), 36% (CI: 20–48%), and 36% (CI: 20–49%), respectively.
Winch	2005	NSR	CHW pneumonia case management has the strongest evidence for an impact on mortality, compared with six other intervention models of care for children with malaria or pneumonia outside health facilities (e.g. CHW basic management and verbal referral; CHW basic management and facilitated referral; CHW directed fever management; family-directed fever management; CHW malaria management and surveillance; and CHW integrated multiple disease case management). In the CHW pneumonia case management model, CHWs assess child respiration, provide antibiotics for pneumonia, and refer severe cases to health facilities. Pneumonia case management by CHWs is a child health intervention that warrants considerably more attention, particularly in Africa and South Asia.

Continued

Table 3.17 Maternal and child health LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CBP roles
Maternal and child health			
Darmstadt, Lee	2009	SR MA	There is evidence of moderate quality that CHWs have a positive impact on perinatal/neonatal outcomes. CHWs can play a promising role providing pregnancy and childbirth care, mobilizing communities and improving perinatal outcomes. There is low-to-moderate evidence that training TBAs improves linkages with health facilities and perinatal outcomes. The evidence for providing skilled birth care in the community is of low quality but shows a 12% reduction in perinatal mortality and a 22–47% reduction in intrapartum related neonatal mortality.
Dawson, Brodie	2014	NSR	Between-country (HIC-LMIC) collaborations are useful for strengthening midwifery capacity (clinical-and-research-skill building, the development of tailored education programmes and the establishment of structures and systems to enhance the midwifery workforce). Collaborations are strengthened through the establishment of clear processes for communication, leadership and appropriate membership, effective management, mutual respect, as well as an understanding of the context.
Dawson, Buchan	2014	SR	CHWs were able to provide injectable contraception effectively, with high quality and with high levels of patient satisfaction. Collaborative approaches involving community members and health workers at all levels have the potential to deliver maternal and reproductive health interventions effectively if accompanied by ongoing investment in the health care system.
Gilmore	2013	SR	There is some evidence of moderate quality that CHWs are effective in malaria prevention, health education, breastfeeding promotion, promotion of essential newborn care and psychosocial support. CHWs are particularly effective for promoting mother-performed strategies such as skin-to-skin care for newborns and exclusive breastfeeding. The evidence is insufficient to draw conclusions for most interventions. More research is needed.
Giugliani	2011	SR	Community health agents in Brazil have demonstrated effectiveness in increasing the frequency of child weighings, the prevalence of breastfeeding, and delaying the introduction of bottle feeding. There is lower quality evidence the CHAs are impacting infectious diseases and NCDs as well as on reducing inequities. Given the extent of CHA utilization in Brazil (being one of the largest CHW programmes in the world and reaching a major segment of the population), more research is needed on CHA effectiveness.
Glenton, Colvin ⁵	2013	SR MA	CHWs in HICs mainly offered promotion, counselling and support, while in LMICs they offered similar services but sometimes also distributed supplements, contraceptives and other products; diagnosed and treated children with common childhood diseases; and managed uncomplicated labour/referrals. Programme recipients appreciated CHWs' skills and the similarities between themselves and the CHWs; health professionals appreciated CHWs' commitment, their contributions in reducing workload and their communication skills. However, some recipients were concerned about confidentiality or saw CHW services as not relevant or not sufficient, and some formal health care providers felt CHWs increased their workload or could cause providers to lose authority. They also worried that CHWs trained to manage uncomplicated delivery were overconfident. CHWs and recipients emphasized the importance of trust, respect, kindness and empathy. CHWs sometimes found it difficult to manage emotional relationships with recipients, feared blame, or were demotivated when their services were not appreciated. Those trained to manage labour sometimes faced patient resistance and health system shortcomings when referring women to facilities. CHWs required higher quality training, improved supervision and opportunities to share experiences with other CHWs or voice complaints. CHWs required and valued support from local leaders, the health system, and their families and were motivated by factors including altruism, social recognition, knowledge gain and career development. The authors found a range of opinions on remuneration, including that some unsalaried CHWs wanted regular payment, while others were concerned that payment might threaten their social status and that some salaried CHWs were dissatisfied with their pay levels or frustrated by inconsistent payment.
Lassi ⁶	2015	SR MA	The meta-analysis found that community intervention packages have a robust effect on reducing neonatal deaths (pooled analysis demonstrates a 25% reduction in overall neonatal deaths, 19% reduction in stillbirths and 22% reduction in perinatal mortality) and may have a possible effect on reducing maternal mortality, although the pooled result just crossed the line of no effect. Packages that disseminated education and promoted awareness related to birth and newborn care preparedness through community/women's groups were best for reducing deaths throughout the neonatal period as well as during the early neonatal period. On the other hand, packages that comprised community mobilization and health promotion strategies and home visitation by CHWs managed to reduce neonatal, perinatal deaths and stillbirths, possibly because these strategies focused on women in the antenatal period and on early newborn care as well as on the management and referral of sick newborns. When community mobilization was added to home-based neonatal care by CHWs, it significantly reduced total neonatal deaths by 44% (according to one study). When TBAs visited homes with formally trained midwives, stillbirths declined by 46%, whereas when TBAs visited homes alone no reduction in stillbirths was observed.

Continued



Table 3.17 Maternal and child health LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CBP roles
Lewin	2010	SR MA	The use of CHWs, compared with usual health care services: i) probably increases breastfeeding and up-to-date childhood immunization (meta-analysis for immunization: RR = 1.23; CI: 1.09–1.38; P = 0.0006, but heterogeneous effects I ² = 70%, P = 0.005); ii) may increase the number of parents who seek help for their sick child; iii) may lead to slightly fewer children who suffer from fever, diarrhoea and pneumonia, and iv) fewer deaths among children under 5 years. The use of CHWs, compared with people helping themselves or going to a clinic, probably leads to an increase in the number of people with tuberculosis who are cured and probably makes little or no difference in the number of people who complete preventive treatment for tuberculosis.
Miyake	2017	NSR	In fragile and conflict-affected states, community linkages and acceptance are enablers of community-level midwifery services that produce improve skilled care. Barriers to improving such care include inappropriate recruitment, non-standardized training, weak health system and community support, as well as political insecurity and violence.
Prost	2013	SR MA	Women's groups practising participatory learning and action, compared with usual care, have a positive impact on birth outcomes in low-resource settings. Meta-analyses of seven trials showed that exposure to women's groups was associated with a 37% reduction in maternal mortality (OR = 0.63; CI: 0.32–0.94), a 23% reduction in neonatal mortality (OR = 0.77; CI: 0.65–0.90), and a 9% non-significant reduction in stillbirths (OR = 0.91; CI: 0.79–1.03). Meta-regression found that increased proportion of pregnant women in groups was linearly associated with reduction in both maternal and neonatal mortality. Analysis of the four studies in which at least 30% of pregnant women participated in groups showed a 55% reduction in maternal mortality (OR = 0.45; CI: 0.17–0.73) and a 33% reduction in neonatal mortality (OR = 0.67; CI: 0.59–0.74). The intervention was cost-effective by WHO standards and could save an estimated 283 000 newborn infants and 41 100 mothers per year if implemented in rural areas of 74 priority LMIC countries.
Ribeiro Sarmiento	2014	NSR	Trained TBAs perform a wide variety of tasks, including outreach and case finding, health and patient education, referrals, home visits and care management. TBA training was significantly associated with higher numbers of referrals and greater use of facility-based care by women with obstetric complications. TBAs can identify early signs of complications during labour and delivery, and they can successfully refer mothers for treatment in health centres by skilled health workers.
Sibley	2006	NSR	In settings characterized by high mortality and weak health systems, trained TBAs can contribute to reducing mortality through participation in key evidence-based interventions. Compared with untrained TBAs, pooled meta-analysis showed that trained TBAs had a 44% increase over baseline in safe delivery (effect size: 0.35; CI: 0.19–0.51); 103% increase in clean delivery (effect size: 0.72; CI: 0.49–0.96); 53% increase in clean cord-care practices (effect size: 0.41; CI: 0.24–0.57); 117% increase in knowledge of appropriate antenatal referral (effect size 0.97; CI: 0.40–1.55); 47% increase in appropriate referral for antenatal issues (effect size 0.39; CI 0.12–0.67); and 36% increase in appropriate referral for obstetric complications (effect size 0.39; CI 0.15–0.45). Trained TBAs showed significantly improved counselling behaviour on maternal nutrition, early exclusive breastfeeding, and immunization (primarily tetanus toxoid immunization) (effect size: 15%). TBA training is associated with small but significant decreases in perinatal mortality and neonatal mortality due to birth asphyxia and pneumonia. TBAs have been trained to act as a link to more formally trained skilled birth attendants. Some have been trained to upgrade their skills and perform safe deliveries, and others have taken on expanded functions including preventive services, screening and referral.
Sibley	2012	SR	There remains insufficient evidence to establish the potential of TBA training to improve perinatal and neonatal mortality. There is evidence from one cluster RCT that trained TBAs reduce perinatal mortality, stillbirths and neonatal mortality. In a meta-analysis comparing TBAs who received additional training in resuscitation of newborns with TBAs who had received only basic training there was no significant difference in stillbirths or in early neonatal mortality. The results are promising for some outcomes (perinatal mortality, stillbirths and neonatal mortality) but more studies are needed. Trained TBAs can provide advice on the use of antenatal iron and folic acid tablets or they can distribute them. They can provide advice on or distribute antimalarials. They can advise on or distribute vitamin A. They can provide advice on tetanus vaccination, on early initiation of breastfeeding and exclusive breastfeeding during the first 6 months of life, on referral to a health facility, and on the use of antenatal and postnatal care as well as the use of family planning.

Continued

Table 3.17 Maternal and child health LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CBP roles
Silveira Feyer	2013	NSR	In Brazil, TBAs have entered their careers on the basis of family tradition, feelings of solidarity, divine calling or simply as a response to community needs. The virtues of a good TBA include patience, courage, respect, generosity of spirit and perseverance. The TBAs' knowledge and practices involved, among others, the use of herbal teas and manoeuvres at different stages of delivery. Difficulties faced by some TBAs include being far from health system and supervisory support, difficult working conditions, and lack of pay. The Brazilian health system has provisions now for paying those who attend deliveries, but TBAs struggle to access this remuneration.
Wilson	2011	SR MA	Incorporating training on maternal, perinatal and neonatal health as well as support of TBAs in developing countries reduces perinatal mortality (RR = 0.76; CI:0.64–0.88; P < 0.001) and neonatal death (RR = 0.79; CI:0.69–0.88; P < 0.001). Meta-analysis of the non-randomized studies also showed a significant reduction in perinatal mortality (RR = 0.70; CI: 0.57–0.84; P < 0.001) and neonatal mortality (RR = 0.61; CI: 0.48–0.75; P < 0.001).
Vaccination			
Corluka	2009	SR	This review sought to determine whether immunization programmes delivered by CHWs are cost-effective. Although the studies were methodologically strong, none adequately addressed affordability and sustainability, so no conclusions on cost-effectiveness could be drawn.
Glenton ⁷	2011	SR MA	Most of the studies showed that CHWs increased immunization coverage. A meta-analysis of four studies showed that CHW promotion of vaccination increased the proportion of children with up-to-date vaccinations (RR = 1.19; CI: 1.09–1.30). For the two studies where lady health workers (LHWs) provided immunization (in Papua New Guinea and Guatemala), both showed an improvement compared with a control group, but the evidence was of low quality. The remaining six studies, in which CHWs promoted immunization, showed no consistent findings.
Glenton, Khanna	2013	SR	There is evidence, but of low quality, that health professionals are confident that CHWs can deliver vaccines or other medicines using compact pre-filled auto-disposal devices to mothers and children. Some health professionals said providing adequate supervision was difficult. CHWs perceived compact pre-filled auto-disposal devices as effective and important, but feared consequences if harm should come to the recipients. No studies have yet assessed side effects or safety.
Oyo-lta	2016	SR MA	There is evidence of moderate certainty that health education at village meetings or at homes (in some cases provided by community-based practitioners) probably improves coverage with three doses of diphtheria-tetanus-pertussis vaccines (DTP3) (RR = 1.68; CI: 1.09–2.59). Regular immunization outreach (by nurse plus assistant – unclear if this includes a CHW) may improve full immunization coverage (RR = 3.09; CI: 1.69–5.67, low-certainty evidence), which may substantially improve if combined with conditional cash transfer incentives to households (RR = 6.66, CI: 3.93–11.28, low-certainty evidence). Home visits to identify non-vaccinated children and refer them to health clinics may improve uptake of three doses of oral polio vaccine (RR = 1.22, CI: 1.07–1.39, low-certainty evidence). There was low-certainty evidence that integration of immunization with other services may improve DTP3 coverage (RR = 1.92, CI: 1.42–2.59).
Patel	2010	NSR	While the limited number and poor quality of available studies make it difficult to directly compare CHW interventions with other strategies for improving immunization coverage, clearly CHWs make diverse contributions toward strengthening immunization programmes. The roles CHWs played in interventions to increase vaccination included: compiling lists or making maps of children requiring vaccination, motivating parents, and following up with vaccine defaulters. Interventions involving CHWs had a mean increase in coverage of 20%. CHWs are well-suited to aid in identifying, tracking, and providing outreach services (especially to marginalized groups) as well as in providing information, education, and other communications to community members.
Maternal health			
Byrne	2011	SR	Integration of TBAs with the formal health system can increase skilled birth attendance. Mechanisms for integration include training and supervising TBAs, collaboration skills for health workers, inclusion of TBAs at health facilities, communication systems, and clear definition of roles. Success in increasing skilled birth attendance was context-dependent (e.g. the process for selection of TBAs, level of community participation, and reduction of barriers to accessing the health system).
Rahman	2013	SR MA	In LMICs, the burden of common perinatal mental disorders can be reduced through mental health interventions delivered by supervised non-specialists and community workers (pooled effect size of -0.38; CI: -0.56 to -0.21; F = 79%). Local, trained CHWs were effective in delivering psychosocial and educational interventions to reduce maternal depression.

Continued



Table 3.17 Maternal and child health LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CBP roles
Smith	2016	NSR	All three large trials of community distribution of misoprostol included in this review found that administration of misoprostol by LHWs to women in their care was associated with some reduction in bleeding or in serum haemoglobin (a measure of anaemia) postpartum compared with placebo or standard care. Eleven trials implemented advance distribution of misoprostol, wherein pregnant women received misoprostol from LHWs during their pregnancy and were counselled (along with family members) on its use. These studies show that advance distribution of misoprostol for postpartum haemorrhage appears manageable with minimum risk and that the benefits of self-administration, especially for women who have little chance of expert care for postpartum haemorrhage, are considerable. Key programmatic considerations include the following: i) LHWs should receive adequate training on misoprostol and how to deliver information on its use to women; ii) illiterate LHWs need to have access to sufficiently intensive training; iii) an adequate supply of misoprostol should be available; iv) appropriate monitoring and reporting mechanisms should be in place for drug supply and potential misuse, LHW capacity and motivation to reach remote community members, community acceptance of misoprostol, and the need to ensure that misoprostol does not influence women's uptake of facility delivery.
Contraception			
Bellows	2015	NSR	There is some evidence that performance-based incentives for CHWs (primarily based on sales commission or payment for referral) can increase family planning uptake at the community level, but results are mixed and more research is needed. Careful attention must be paid to ethical issues and to ensuring non-coercion.
Malarcher	2011	SR	The injectable contraceptive depot medroxyprogesterone acetate (DMPA) can be provided safely in communities by appropriately trained and supervised CHWs. The benefits outweigh the potential harms. Trained CHWs had sufficient knowledge and skills for screening potential clients regarding their eligibility for the use of DMPA. Clients of CHWs receiving DMPA had outcomes equivalent to those of clients of clinic-based providers of progestin-only injectables and were satisfied with community-based provision of DMPA.
Scott	2015	SR	Of 56 studies, 93% indicated that CHW family planning programmes effectively increased the use of modern contraception, while 83% reported an improvement in knowledge and attitudes concerning contraceptives. CHWs were able to provide counselling on contraceptives, provide contraceptives, and refer to health facilities for more specialized care.

⁵ Seventeen of the CHW programmes were based in low-income countries (Bangladesh, Ethiopia, Gambia, Kenya, Malawi, Nepal, Uganda, Viet Nam, Zambia, Zimbabwe); 19 were based in middle-income countries (Brazil, Ghana, Guatemala, Honduras, India, Islamic Republic of Iran, Mexico, Nicaragua, Pakistan, Papua New Guinea, South Africa, Thailand); and 17 were based in HICs (Australia, Canada, United Kingdom of Great Britain and Northern Ireland, United States of America).

⁶ Lassi & Bhutta included 26 studies, of which one was from a HIC (Greece).

⁷ Glenton et al. (2011) included seven studies from HICs and five from LMICs. We have included it in the LMIC section to cluster the studies on CHW involvement in vaccination coverage.

Table 3.18 Noncommunicable disease LMIC reviews

First author	Date	Review type	Main outcomes and CBP roles
Cancer			
Wadler	2011	NSR	CHWs could assume three main roles along the cancer control continuum: health education, screening and patient navigation. By raising awareness about breast cancer through education, women are more likely to undergo screening. Many more women can be screened, resulting in earlier-stage disease if CHWs are trained to perform clinical breast exams.
Mental health			
Mutamba	2013	SR MA	Three adult study populations provided evidence that CHW-led interventions are effective for reducing the burden of mental, neurological and substance-use disorders, including depression and post-traumatic stress disorder. Four of the studies targeting child mental health outcomes – one using selective prevention (targeting a higher risk subgroup) and three using indicated prevention (targeting individuals identified as at-risk) – showed that the interventions were effective. CHW roles included providing psychosocial stimulation to children (in some cases along with nutritional supplements), emotional and social support, psychotherapy and counselling, as well as improving education and awareness.
Singla	2017	SR MA	Non-specialist providers, usually CHWs or peers, are more effective than usual care or delayed treatment (waitlisted) groups in the provision of mental health treatments. Most treatments targeted depression or post-traumatic stress. Treatments were usually delivered with fewer than 10 sessions over 2 to 3 months in an individual, face-to-face format in community or primary care settings. Treatments included common elements, such as non-specific engagement and specific domains of behavioural, interpersonal, emotional, and cognitive elements. The pooled effect size was 0.49 (CI: 0.36–0.62), favouring interventions provided by non-specialist providers (including CHWs). The provision of mental health care by non-specialist providers is more effective than usual care and improves access to mental health care.
Stacciarini	2012	NSR	Promotoras (CHWs) empower community members to promote mental health and prevent exacerbations of mental illness. CHWs, when trained carefully, can increase awareness and to promote mental health in populations that would otherwise have limited or no access to care. CHWs provide education, act as mediators between individuals and the health care system, advocate for both individual and community needs, and serve as role models for positive behaviours.
van Ginneken	2013	SR MA	Non-specialist health workers, a classification that includes both professionals (e.g. doctors, nurses and social workers) and CHWs working at the primary care or community level, have some promising benefits in improving people's outcomes for general and perinatal depression, post-traumatic stress disorder and alcohol-use disorders, and patient- and caregiver-outcomes for dementia. Services provided by NSHWs, compared with usual health care services, may increase the number of adults who recover from depression or anxiety (or both) 2 to 6 months after treatment; may slightly reduce symptoms for mothers with depression; may slightly reduce the symptoms of adults with post-traumatic stress disorder; probably slightly improve the symptoms of people with dementia; probably improve or slightly improve the mental well-being, burden and distress of caregivers of people with dementia; and may decrease the quantity of alcohol consumed by problem drinkers. This evidence is mostly of low or very low quality, and for some issues no evidence is available. In most studies NSHWs delivered the mental health care and addressed depression or anxiety (or both) or post-traumatic stress disorder. NSHWs can provide follow up to check on adherence, effects of medications, and side-effects. Of the 38 studies in the review, 22 used CHWs.



Table 3.19 Infectious disease LMIC reviews

First author	Date	Review type	Main outcomes and CBP roles
HIV			
Bemel-mans	2016	NSR	In sub-Saharan Africa, lay counsellors play a critical role in scaling up HIV services and addressing gaps in the HIV testing and treatment cascade by providing HIV testing and counselling and adherence support at both the facility and community levels. Countries have taken various steps in recognizing lay counsellors, including (in Lesotho, Mozambique and Zimbabwe) well-defined harmonizing training, job descriptions, support structures for supervision and remuneration and (in Lesotho, Mozambique, Zambia and Zimbabwe) ministry of health certification for HIV testing services training. However, formal integration of this cadre into national health systems is limited, as lay counsellors are usually not included in national health workforce strategies or budgeting.
Campbell	2011	NSR	"Community embeddedness" has been overlooked in the WHO report on task sharing for HIV. Community embeddedness is required for CHWs to successfully perform socially embedded tasks such as health education and counselling, which are critical for HIV programming. The literature review identified six lessons for CHW success: i) strong management and supervision; ii) appropriate selection of CHWs; iii) suitable training; iv) adequate retention structures; v) good relationships with other health care workers; and vi) "community embeddedness".
Flynn	2017	SR	Of the 50 countries analysed, 58% either do not permit non-formal providers to perform HIV RDTs using fingerstick blood (the most common type) or do not specify if they can, while 44% do not permit or do not specify whether lay providers can perform HIV pre- and post-test counselling. In addition, fewer than half (46%) of the reports from countries to the Global AIDS Response Progress Reporting provided data that were consistent with their corresponding national HIV testing policy. Greater care must be taken when reporting Global AIDS Response Progress Reporting data to make sure they correlate with approved practice. Africa has a more supportive policy environment for CHW HIV testing services compared with other global regions. Given the low uptake of CHW use globally and their proven use in increasing HIV testing, countries should consider revising policies to support CHW testing using RDTs.
Hall	2017	SR MA	Role delegation to CHWs was generally acceptable to individuals living with HIV. Lay counsellors were able to spend more time with individuals living with HIV, provided more social and non-medical instrumental support (such as arrangement of rides to clinic). Community health worker counselling and peer health education nurtured hope and a positive attitude, which increased retention in care.
Kredo	2014	SR MA	Shifting responsibility from doctors to adequately trained and supported CHWs for managing HIV patients probably does not decrease the quality of care.
Ma	2016	SR MA	Task sharing was acceptable to persons living with HIV infection (PLHIV), and CHWs can resolve the shortage of medical professionals for HIV care, strengthen the relationship between the community and the health system, improve the psychosocial well-being of PLHIV, and empower them to achieve better adherence. Proper training and compensation for CHWs can better facilitate optimizing programmes.
Mdege	2013	SR	Role delegation from health care professional to CHW for antiretroviral therapy (ART) achieved equivalent patient outcomes in terms of mortality, viral load, CD4 cell count, adherence to treatment, loss to follow-up, health care utilization, occurrence of new AIDS-defining illnesses, incidence of opportunistic infections, toxicity of antiretroviral treatment, quality of life, and other measures of treatment failure. However, most of the identified studies in the review were underpowered. Task sharing resulted in substantial cost and physician time savings.
Mwai	2013	SR	CHWs were reported to enhance the reach, uptake and quality of HIV services, as well as the dignity, quality of life and retention in care for people living with HIV. The presence of CHWs in clinics was reported to reduce waiting times, streamline patient flow and reduce the workload of health workers. Clinical outcomes appeared not to be compromised, with no differences in virologic failure and mortality when comparing patients receiving care in the community with those receiving facility-based care.
Petersen	2014	SR	South African lay counsellors working in chronic care have poorly defined roles, inconsistent remuneration, no standardized training, as well as poor supervision and logistical support. Studies provide evidence that under controlled conditions with adequate training and supervision, CHW behaviour change counselling interventions using various adaptations of the information-motivation-behavioural skills model can reduce HIV-risk behaviours including unprotected sex, alcohol use before sex, number of sexual partners and transactional sex.
Tso	2016	SR MA	Effective interventions that link people living with HIV to care include: task sharing (four studies, high confidence rated using Confidence in the Evidence from Reviews of Qualitative research, a tool analogous to Grading of Recommendations Assessment, Development, and Evaluation for evaluating the confidence of qualitative systematic review findings); mobile outreach testing and linkage (three studies, high confidence); integration of HIV-specific and primary medical care (two studies, moderate confidence); provider initiated testing, counselling and linkage (two studies, low confidence); and cessation support for people who use illicit drugs to prepare for HIV treatment (two studies, high confidence). CHWs generally found these interventions acceptable but were hindered by insufficient administrative support and inadequate training.

Continued

Table 3.19 Infectious disease LMIC reviews (continued)

First author	Date	Review type	Main outcomes and CBP roles
Wouters	2012	SR	In role delegation to support ART, CHWs can provide psychosocial care, help trace treatment defaulters, serve as peer counsellors and adherence supporters to increase compliance with ART. Task-sharing to CHWS had a definite positive impact on a wide range of programme quality indicators, including access, coverage, adherence, virological and immunological outcomes, patient retention and patient survival.
Malaria			
Boyce	2017	SR	Rapid diagnostic tests are performed safely by CHWs when proper training is provided. These tests are executed by CHWs with high sensitivity and specificity, and CHWs display high levels of adherence to treatment guidelines. Several of the included studies showed that supplying CHWs with additional training and job aids significantly improved their performance of RDT procedures.
Kabaghe	2016	SR MA	In the three studies that assessed community-based practitioners' performance in malaria diagnosis and management, CHWs provided appropriate treatment for 98% of the cases. Those who tested positive were treated 99% of the time and those who tested negative were not treated 94% of the time. Improving health worker compliance to negative malaria RDT results will prevent the mismanagement of patients and overprescribing of antimalarial drugs. Improving diagnostic capacity for other febrile illnesses and developing local evidence-based guidelines may help improve compliance and management of negative RDT results.
Kamal-Yanni	2012	NSR	CHWs can effectively diagnose and treat malaria and other common fevers, even in remote areas. CHWs correctly used RDTs, dispensed artemisinin-based combination therapies (with substantially lower rates of over-prescription compared with health care providers in public and private facilities), counselled patients, and performed effective case management of child pneumonia. CHWs scored well in their knowledge and practices of treatment provision in most studies. CHWs increased treatment coverage in remote areas and reduced delays in care seeking. Their role should be recognized and expanded. The evidence shows that there is no short-cut to investing in training and supervision of providers and that malaria treatment must be integrated into the public health system (rather than treated through vertical programmes).
Paintain	2014	SR	CHWs can provide good-quality malaria care, including performing procedures such as RDTs. Appropriate training, clear guidelines and regular supportive supervision are important facilitating factors. Crucial to sustainable success of CHW programmes is strengthening health system capacity to support the supply of commodities used by CHWs, supervision of CHWs and appropriate treatment of cases referred by CHWs. Study findings support the notion that pre-packaged antimalarial drugs can be administered effectively by CHWs and adhered to by those receiving these medications. Appropriate treatment at the community level according to RDT result was higher than that found in numerous studies of RDT use by more highly trained health workers located at facilities, who inappropriately treated 30–80% of RDT-negative patients with antimalarial drugs. In contrast to the positive findings on quality of malaria case management, the evidence from this review suggests a more mixed performance for community-level management of pneumonia by CHWs in the context of integration with malaria diagnosis and treatment.
Ruizen-daal	2014	SR	For community case management of malaria, CHWs were able to correctly perform RDTs, although specificity levels were variable. CHWs showed high adherence to test results, but in some studies a substantial group of patients who were RDT-negative received treatment. Because of the poor quality of the studies, no effect on morbidity or mortality could be estimated. Uptake and acceptance by the community was high. However, patients with negative RDT results did not always follow up referral advice. Drug or RDT stock-outs and limited information on CHW motivation are bottlenecks for sustainable implementation.
Sunguya	2017	SR	CHWs had important preventive, case management and promotive roles in malaria interventions, including health surveillance and health promotion specific to malaria. However, CHWs faced many challenges in implementing integrated community case management for malaria. These challenges included: i) poor and unsustainable financing for integrated community case management; ii) workforce-related issues (including insufficient pre-service training duration, which reduced community confidence in CHWs); iii) lack of and unstable supply of medicines and diagnostics; iv) lack of information and research; and v) challenges related to service delivery and leadership.
Buruli ulcer			
Vouking	2013	NSR	CHW programmes can have large impacts on the control of Buruli ulcer in sub-Saharan Africa. However, larger numbers of CHWs are needed to improve the detection and management of cases. One of the major obstacles to the control of Buruli ulcer is inadequately staffed and poorly equipped health facilities in the affected areas.
Tuberculosis			
Wu	2017	NSR	Three of the 21 included studies on tuberculosis health care training programmes contained information on CHWs: one was experiential hands-on training and two were lecture-based. Data on the effectiveness of these training programmes was not presented but the authors conclude that although significant funds have been invested in tuberculosis health care provider training, publications of robust evaluations assessing the impact on quality of care and behaviour change are limited.

Continued



No studies on CHW involvement in palliative care were found that met Horey et al.'s (2015) meta-analysis inclusion criteria. The reviewers concluded that there is an absence of evidence to show how best to train or support palliative care CHWs whilst maintaining standards of care for palliative care patients and their families.

3.6 Training

In the context of CHW programmes targeting vulnerable populations with an unmet need for health care, and embedded in or closely linked to local health care services, Kane et al. (2010) conclude that training interventions in the form of knowledge- and skills-based training complemented by ongoing supervision can improve CHW performance if the following conditions are met:

- CHWs have a sense of self-efficacy and mastery of the tasks;
- CHWs have an increase in self-esteem; and
- CHWs are assured that there is a back-up support available for them.

Summary findings on training are presented in **Table 3.21**.

3.6.1 Length of training

Several reviews noted that the length of pre-service training received by CHWs varies greatly (Gogia et al., 2011; Gogia & Sachdev, 2016; Kok, Kane et al., 2015; Lewin et al., 2010; Mutamba et al., 2013), with ranges from 4 hours to 6 months. In a study of programmes that use CHWs to provide home visits to reduce neonatal mortality, training ranged from 3 to 36 days, but training duration had no consistent effect on the effectiveness of the intervention (Gogia et al., 2011). In another review to examine the effect of CHW home-visit interventions on neonatal mortality, which included only five controlled trials, training on essential newborn care ranged from 6 days in India to 6 months in Pakistan, the latter of which also included the management of sick neonates (Gogia & Sachdev, 2010). Several reviews reported that they did not find evidence on the effects of the length of training on CHW performance (Gogia et al., 2011; Kok, Kane et al., 2015); no review explicitly identified an association between length of training and outcomes. However, Sungaya et al. (2017) found, in the context of malaria control programmes, that short-term training reduces the community's confidence in CHWs and related health cadres, which affects community utilisation of the CHW services.

In a review of programmes in which CHWs provided injectable contraceptives, training ranged from 3 days in Peru to 10 days in Ethiopia and Guatemala, with the Guatemala study also including a 1.5 day refresher training after 6 months (Malarcher et al., 2011). The review did not report an association between length of training and outcomes but did report that in one study (from Peru) competencies

from the first 3-day training were below satisfactory levels so a second training was implemented. After the second training the CHWs achieved competency to provide injectable contraceptives.

CHWs in high-income settings tend to receive longer training with a narrower subject focus. Palmas et al. (2015) report that in a Texas, United States of America, intervention to improve glycaemic control among Hispanics with diabetes, CHWs had to be certified through a university, attend 27 hours of additional professional training from certified diabetes educators, registered dieticians, and an endocrinologist; and pass a written exam. Other studies (all in the United States of America) captured in the Palmas et al. (2015) review required multiple training sessions and a written test, with follow-up training provided by doctors and nurses. In a review of allied health assistants in HICs, they were found to require formal qualifications through certificate programmes (Stanhope & Pearce, 2013). Peer supporters for breastfeeding women (in HICs) attended up to 6 weeks of training, although the review noted that some partners, friends, and family members became peer supporters with just a few hours of training (Kaunonen et al., 2012).

3.6.2 Training tools

Several studies noted specific training tools that can be useful for CHWs: de Oliveira Castro & Zucki (2015) report that in addition to live classroom training, CHWs have been trained successfully through online classes, video-conferencing and CD-ROMs. Källander et al. (2013) reported that FHI360-SATELLIFE's Uganda Health Information Network project broadcasted continuing medical education regarding diagnosis, treatment and prevention of major health problems three times per week via personal digital assistants (PDAs); no information on the effectiveness of these aids was reported. Lewin et al. (2010) list the following terms used to describe CHW training in their review: courses, classes, seminars, sessions, workshops, reading, discussion groups, meetings, role play, practical training, field work, videotaped interviews, and in-class practice. Several studies note the provision of training aids such as fact sheets, resources guides, and handbooks but do not assess their effectiveness (Dale et al., 2008; Kaunonen et al., 2012)

3.6.3 Training and community health worker competency

Training should seek to impart technical competency and socially oriented skills such as communication and counselling including on the importance of confidentiality (Glenton et al., 2013 in Kok et al., 2015). Awareness of the social and political determinants of health and problem-solving skills were also identified as being important (Campbell & Scott, 2011; Pereira & Oliveira, 2013). Training curricula have often failed to adequately assess and fill the learning needs of CHWs in order to fulfil their roles (Kane et al., 2016).

Patel & Nowalk (2010) found that competency-based CHW training to promote immunization in India reflected the recommendations of Gilroy



Seventeen reviews provided information on deployment. In CHW interventions to prevent neonatal mortality through home visits, the ratio of health workers to population ranged from approximately 1:500 up to 1:4000, but there was no consistent effect of the ratio on the neonatal mortality rate. However, in trials involving only community mobilization (compared with trials involving community mobilization and home visits by the CHW), the reduction in neonatal mortality was greater when the ratio of health worker to population increased (Gogia et al., 2011). A review of studies in which CHWs provided malaria case management for children found that the size of population covered by each CHW varied, with a median of 692 persons per CHW and a range of 409–1740 (Paintain et al., 2014).

Jaskiewicz and Tulenko (2012) found that there is no formula for the optimal population size that a CHW could cover and that programmes must monitor the appropriateness of the catchment area and, when deciding on ratio of CHW to population, take into account the target group within the family (e.g. all family members, children only, women only), the geographic distribution of those households, transportation available, terrain, epidemiology and the nature of the services provided. Smaller catchment populations enable CHWs to offer more integrated and intensive services. A large or geographically dispersed catchment population can lead to extensive time spent in travel, inability to reach some groups (such as during floods) and wasted visits if the CHW arrives to find no one home (Kok, Dieleman et al., 2015; Kok, Kane et al., 2015). A high workload associated with a high population ratio or a large geographic area can reduce CHW motivation, satisfaction and efficacy (Kok, Dieleman et al., 2015) and even lead to increased attrition (Pallas et al., 2013).

3.8 Performance measurement

Summary findings on performance measurement are presented in **Table 3.23**.

In Kok, Dieleman et al.'s (2015) review of 140 studies on intervention design factors that influence performance of CHWs, 15 studies were

identified that reported on performance appraisal mechanisms. Only one study researched how appraisal influenced CHW performance. The study (Furth & Crigler, 2012), found that organizations with stronger performance appraisal systems were more likely to have more engaged CHWs, but there was no correlation between CHW engagement and performance.

CHWs functioning in immunization programmes in India were assessed through observation, the use of checklists by supervisors, record review and informal evaluation through discussions with village health committee members. The use of formal supervisory checklists increased the efficiency in identifying CHWs who were most in need of further time-intensive supervision (Patel & Nowalk, 2010). Gogia & Sachdev (2016) reviewed research on home visits by CHWs to prevent neonatal deaths in LMICs and found several descriptions of CHW performance assessment. They note an example from India (Kumar et al., 2008) involving monthly programme meetings that brought together four regional teams for discussion and problem-solving, performance assessment by feedback from community members, spot checks by supervisors, and monitoring by supervisors of whether targets for home visits and community meetings were being met.

Of the 140 studies in the Kok, Dieleman et al. (2015) review, 49 reported that a monitoring and evaluation system was in place. All focused on community oversight, such as from village health committees or individual community members (such as pregnant women). These are discussed further in section 3.12 on community embeddedness.

Separate from routine performance appraisal, many studies measured CHW performance. CHW competency in providing injectable contraceptives in the field was assessed, for example, through the use of simulated or mystery clients, expert consensus and direct observation (Malarcher et al., 2011). Kok, Dieleman et al. (2015) found that 99 of their 140 included studies reported CHW outcomes. Fifty-six studies measured competencies and knowledge

Table 3.23 Summary findings on performance measurement

Topic	Summary of findings
Routine performance appraisal	9 of 140 studies on CHW performance noted the presence of a monitoring system, sometimes through community oversight (by committees or individuals) (Kok, Dieleman et al., 2015). Only one out of 140 studies on CHW performance researched how appraisal influenced CHW performance; organizations with stronger performance appraisal systems were more likely to have more engaged (motivated and committed) CHWs, but there was no correlation between CHW engagement and performance of specific tasks (Kok, Dieleman et al., 2015). Easy to understand performance-based incentives were found capable of improving CHW performance at the community level in the context of family planning programmes (Bellows et al., 2015)
Identifying CHWs in need of support	Formal supervisory checklists increased the efficiency in identifying CHW who were most in need of further time-intensive supervision (Patel & Nowalk, 2010)



a monthly allowance of US\$ 15 or US\$ 25 in four studies. Four studies explicitly stated that no monetary motivation was provided and 17 did not report on CHW incentives or payments (Paintain et al., 2014). Bemelmans et al. (2016) reports remuneration for HIV lay counsellors in Swaziland alone ranging from US\$ 100–300, depending on the supporting partner; Baatiema et al. (2016) note that there is a lack of consensus on whether Ghanaian CHWs should be paid and how much they should receive, and that the government does not contribute, leaving remuneration extremely low and dependent on communities and NGOs.

Pallas et al. (2013) report that the most frequently identified barrier to scale up and sustainability in the literature was insufficient pay or incentives for CHWs relative to other employment opportunities (8 of 19 articles). Lack of sufficient financial remuneration was a cause of attrition among CHWs in such settings as India, Zaire, Mozambique and Nigeria. Sunguya et al. (2017) found that deployment and retention of CHWs in hard-to-reach areas was constrained by low or no remuneration and lack of incentives (as well as lack of recognition from some of the public health system and poor transport to remote areas).

Unmet promises, delayed release of payment or having to spend out of pocket to meet one’s responsibilities were identified in four studies in the Kok Dieleman et al. (2015) review as a source of demotivation of CHWs. Similarly, Zulu et al. (2014) identified a study from India in which ASHAs had to make out-of-pocket expenditures.

Kok, Dieleman et al. (2015) and others (Campbell & Scott, 2011; Paintain et al., 2014) note the importance of worker recognition through non-monetary mechanisms as well, such as uniforms, bicycles, certificates and badges. One study of the six in Mdege et al. (2013)

review on task sharing for HIV found that community recognition and support was an important motivator among CHWs who did not receive money. Two reviews on CHWs and malaria management (Paintain et al., 2014; Ruizendaal et al., 2014) found multiple reports of CHW motivation arising from CHW pride in their work, CHW satisfaction from helping others, CHW appreciation of the community’s respect, and from spiritual fulfilment. Traditional midwives in Brazil reported serving for non-financial reasons, although they occasionally received donations of food or domesticated animals (Silveira Feyer et al., 2013). Kok, Dieleman et al. (2015) identified two studies that found CHWs prefer financial over non-financial incentives. One studied from Zambia compared CHW task completion between those receiving financial and those receiving non-financial incentives. This study found that CHWs who were paid a monetary incentive performed better than volunteer CHWs who received only gifts in kind. However, the data also showed that greater monetary incentives did not necessarily correlate with better performance, especially when compared with other factors that influence performance. The authors reported that little consideration was given to incentives relative to workload or time commitment.

Bhatia’s rights-based review of CHW programmes in India identified multiple efforts by CHWs to demand reforms in their service conditions, including increasing their remuneration (Bhatia, 2014). The review highlights that performance-based payments do not provide the financial security expected by CHWs and notes that in most countries, CHWs, who are largely women, have never been integrated into the established, salaried team of formal government health workers. Bhatia suggests that the voluntary status of CHWs impedes their rights and that they ought to be integrated into the regular salary system of formal health workers.

Table 3.25 Summary findings on support and supervision

Topic	Summary of findings
Supervision appears to be effective in combination with other supports	<ul style="list-style-type: none"> Supervision is critical to maintain quality and motivation (Campbell & Scott, 2011; Fulton et al., 2011; Jaskiewicz & Tulenko, 2012; Kamal-Yanni et al., 2012; Paintain et al., 2014; Pallas et al., 2013; WHO & Global Health Workforce Alliance, 2010). In integrated community case management programmes, supervision and on-site training of CHWs improved clinical practices, with providers showing increased knowledge, increased effectiveness in promoting care-seeking behaviours, or improved basic disease management (Bosch-Capblanch & Marceau, 2014). Frequent supervision and continuous training led to better CHW performance in certain settings, but the evidence is mixed (Kok, Dieleman et al., 2015).
Many unknowns and need more research	<ul style="list-style-type: none"> There is some evidence of benefit for health care performance, but evidence quality is low (Bosch-Capblanch et al., 2011) and follow up is limited (Bosch-Capblanch & Garner, 2008). Supervision and training were often mentioned as facilitating factors, but few studies have tested which approaches work best or how these were best implemented (Kok, Dieleman et al., 2015).
What might work?	<ul style="list-style-type: none"> Supervision that focuses on supportive approaches, quality assurance and problem-solving may be most effective at improving CHW performance (as opposed to more bureaucratic and punitive approaches) (Bosch-Capblanch & Garner, 2008; Hill et al., 2014; Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015). Enhanced supervision of CHWs was only superior to routine supervision in two low-quality studies, which examined the effect of regular, supportive supervision and the use of checklists on workforce performance (Bosch-Capblanch et al., 2011). Less-intensive supervision of CHWs in one study of low quality did not show any adverse effect on the quality of care or health workers attrition (Bosch-Capblanch et al., 2011). Improving supervision quality has a greater impact than increasing frequency of supervision alone (Hill et al., 2014).



requirements. The CHWs did not appreciate this requested shift to facilities as they felt they missed out on providing care to their own village.

The Bosch-Capblanch & Garner (2008) review found that supervision appears expensive from studies that have reported costs. In 12 quasi-experimental trials, supervision interventions generally showed small positive effects in some of the outcomes assessed. However, the quality of the studies was mixed, and outcomes varied greatly between studies. In Paintain et al.'s (2014) review of research on CHW management of malaria, 11 of the 43 included studies reported on training health workers to support CHWs, but the impact of these trainings was not clear from the papers. Paintain et al. (2014) note that supervision was generally described as part of the context in which the CHWs operated rather than as the focus of the intervention itself. The training that supervisory health workers received to support CHWs included: retraining health workers on malaria case management, orienting them to accept and treat referrals sent by CHWs, or training them on how to supervise CHWs, collect reporting forms and deliver drug supplies.

In a review on the capacity of CHWs to deliver vaccines and medicines to mothers and children through compact pre-filled auto-disposable devices, most health professionals working alongside or supervising CHWs were confident that CHWs could deliver the intervention with sufficient training and supervision, but some had problems delivering supervision due to time constraints or difficulty reaching the CHWs (Glenton, Khanna et al., 2013). In a review specifically of integrated community case management programmes, supervision and on-site training of CHWs was shown to improve clinical practices, with providers showing increased knowledge, increased care-seeking behaviour, or improved basic disease management (Bosch-Capblanch & Marceau, 2014).

Supervision by higher level health system staff can be difficult to carry out; the community-based nature of CHWs means they often work far from those in supervisory roles (Campbell & Scott, 2011). Reviews by Jaskiewicz and Tulenko (2012) and the WHO and Global Health Workforce Alliance (2010) both found that supervision is often one of the “weakest links” in a CHW programme and note that supervision quality is crucial. Similarly, Pallas et al. (2013) found that weak supervision of CHWs was mentioned repeatedly as a barrier to scale up and sustainability of CHW programmes. One study in the Jaskiewicz and Tulenko (2012) review found that ineffective supervision contributes to low CHW morale and poor productivity, while another found that many health professionals are not equipped to provide a supportive environment for CHWs.

Kok, Dieleman et al. (2015) report that CHWs who reported insufficient supervision were often demotivated, including because they had low legitimacy in the eyes of the community. For example, a study in their

review reported that 40% of CHWs in South Africa felt their supervisors lacked management skills and 38% felt their supervisors were selfish. Another study in the review reported CHWs in Ghana feeling demotivated by the supervision they received, with one CHW quoted saying: “They (current supervisors) seem to forget that the work is a voluntary one and as such we should be treated well and encouraged” (Hill et al., 2008, p. 43). Reasons for poor-quality supervision of CHWs from higher level staff reported by Kok, Kane et al. (2015) in their review include: high supervisory staff turnover, lack of trust of supervisory staff in CHWs, absence of supervision, a general lack of higher level staff, and a high workload of higher level staff. In their review on CHWs and malaria management, Paintain et al. (2014) found that most supervision problems related to health system weaknesses, such as health staff shortages and competing priorities, insufficient skills of health staff, or a lack of fuel for transportation to enable health staff to carry out supervisory visits. Pallas et al. (2013) found that a lack of training, low accountability, limited knowledge of the CHW's role, and poor incentives for supervisors were key causes of problematic supervision. They report an example from Botswana where the health facility staff person who supervised CHWs assigned them additional facility-based responsibilities that kept them from carrying out their work in the community. The WHO and Global Health Workforce Alliance (2010) review also noted that supervisors may not understand the CHWs or their own role properly and, furthermore, may resent the additional task of supervision.

Several papers identify models or ideas for improving CHW supervision. Jaskiewicz and Tulenko (2012) suggest that supervision should shift towards a participatory approach, focused on checking in with CHWs for their feedback as well as on problem-solving and fostering community support. Kok, Dieleman et al. (2015) also found that problem-solving supervision is the most desired model.

Several reviews discuss the use of mobile technologies, such as mobile phones and peer-to-peer support, to improve two-way communication and enable improved support and supervision. Mobile phones have been used in interventions in the United Republic of Tanzania and Uganda to support CHWs through enabling peer support and disseminating educational short message services (SMSs) and videos (Källander et al., 2013), and in Uganda mobile phones have helped field officers support CHWs supporting ART adherence (Kredo et al., 2014). Also in Uganda, although the use of SMSs to support CHWs working on antiretroviral medication adherence was not associated with improved viral loads among patients, it did result in improved patient care, logistics, CHW morale, confidence among CHWs, and CHW-patient relationships (Källander et al., 2013). The three studies in the Kok, Dieleman et al. review (2015) that mentioned the use of mobile phones in supervision did not report a clear influence on CHW performance. Agarwal et al. (2015) found that mobile health strategies for CHW supervision or coordination were discussed in six of the 42 studies included in their



One cost–effectiveness study in LMICs showed that CHW use of PDAs for collecting and reporting patient data delivered 24% savings per unit of spending over traditional manual data collection and transmission approaches (Källander et al., 2013). One study in Kaunonen et al.’s (2012) HIC review of peer support for breastfeeding included cost–effectiveness data, concluding that the intervention cost (US\$ 301 per mother) was partially offset by cost savings on formula and health care (Pugh et al., 2002).

Postma et al. (2009) identified four studies reporting the annual costs of CHW interventions for asthma among children, with costs per child ranging from US\$ 492–2000. They report preliminary evidence suggesting that the care provided by CHWs may be more cost-effective than care provided by higher level health staff.

Community case management of malaria using RDTs was found to be cost-effective for the correct treatment of malaria in areas with low-to-medium malaria prevalence (Ruizendaal et al., 2014). There was limited data on the cost–effectiveness of engaging “non-specialist health workers” in interventions for mental, neurological and substance-abuse disorders in LMICs, but the findings suggested potential cost savings (van Ginneken et al., 2013).

Three reviews (Kredo et al., 2014; Mdege et al., 2013; Mwai et al., 2013) refer to a cluster randomized trial from Uganda by Jaffar et al. (2009), which reported cost savings from task sharing ART. Jaffar et al. (2009) reported that health-service delivery cost the health system US\$ 793 per patient per year for the task shifting model and US\$ 838 for patients receiving usual care. This calculation takes account of the cost of staff, transport, drugs, laboratory, training, supervision, capital and utilities. However, the cost to the patient and his/her family for accessing care cost was on average US\$ 29 in the first year and US\$ 18 per year after the first year for the task-sharing model, and US\$ 60 in the first year and US\$ 54 per year after the first year for patients receiving the usual care.

Kredo et al. (2014) draw from a prospective cohort study in Uganda by Kipp et al. (2010), which also reported some cost–effectiveness data associated with task shifting for ART. Kipp et al. (2010) report that HIV treatment in the community was slightly more cost-effective than hospital-based care, but note that for both models the average programme cost per patient per year (US\$ 100) was between 5 and 10 times the normal Ugandan health expenditure. They also note that patients obtaining care from a CHW in the community spent half of what patients obtaining facility-based care did, when accounting for transport only.

Corluka et al. (2009) sought to determine whether immunization programmes delivered by CHWs were cost-effective. Although the authors considered the 11 studies identified in the review to be methodologically strong, none adequately addressed affordability and sustainability so no conclusions on cost–effectiveness could be drawn.

3.12 Community embeddedness

Summary findings on community embeddedness are presented in **Table 3.27**.

A CHW programme is “embedded” in the community when community members feel a sense of ownership of the programme by having substantial control over the selection, promotion, monitoring, activities and priority-setting of CHWs (Campbell & Scott, 2011). Community embeddedness was identified as important to CHW programmes in many reviews. Community embeddedness is a reflection of: i) the extent to which community members are involved in CHW selection; ii) expectations that the community has for their CHW(s); iii) monitoring of CHWs that the community performs; and iv) support that the community provides for the CHW(s) (Kok, Dieleman et al., 2015). This support may include

Table 3.27 Summary findings on community embeddedness

Topic	Summary of findings
Of central importance	Community embeddedness is associated with CHW retention, motivation, performance, accountability, support and ultimately acceptability and uptake of CHWs’ health-related work (Baatiema et al., 2016; Brownstein et al., 2007; Campbell & Scott, 2011; Darmstadt, Lee et al., 2009; Jaskiewicz & Tulenko, 2012; Källander et al., 2013; Kane et al., 2010; Kok, Dieleman et al., 2015; Mercer et al., 2014; Miyake et al., 2017; Pallas et al., 2013; Smith et al., 2016; Vouking et al., 2013; WHO & Global Health Workforce Alliance, 2010; Wouters et al., 2012).
Mechanisms to foster community embeddedness	Community embeddedness can be fostered through (Campbell & Scott, 2011; Jaskiewicz & Tulenko, 2012; Kane et al., 2010; Kok, Dieleman et al., 2015): <ul style="list-style-type: none"> • Community member involvement in CHW selection and selecting a locally acceptable and trusted person. • Community having a clear understanding of and reasonable expectations for their CHW. • Community monitoring of CHWs. • Community ownership of the CHW programme. • Community involvement in selection of activities and priority-setting of CHW work. • Health system back-up of CHWs with supervision, supplies and support, which in turn helps to maintain community trust in CHWs.



community members pooling their resources to provide incentives and remuneration for their CHW (Baatiema et al., 2016).

3.12.1 Benefits of community embeddedness

CHWs are more effective in encouraging health behaviour change when community members trust them. For example, the design of successful of maternal and newborn health interventions requires an understanding of the local culture, the customs surrounding childbirth, and the roles played by all those involved (Darmstadt, Lee et al., 2009).

Several studies in the Kok, Dieleman et al. review (2015) reported a direct link between community respect for CHWs and increased CHW motivation, as CHWs felt pride in their role or improved self-esteem resulting from increased respect from the community. In 34 of the 140 studies in the Kok, Dieleman et al. (2015) review, CHWs reported that trust and respect from the community was an important non-financial incentive enhancing their motivation. Trusted and respected CHWs enjoyed more frequent greetings from community members, a sense of honour, and greater CHW participation in community decision-making. The authors suggest that high social prestige associated with being a CHW may be stronger in rural communities. In several studies, CHW retention was associated with CHWs reporting that they gained social prestige in the community through their role as a CHW, that they had community support for their work, and that they had greater acceptance in the community (Kok, Dieleman et al., 2015).

When community members trust and support CHWs, they can all work well together towards health goals. For example, community members can refer cases to CHWs, can mobilize resources for CHWs, can

perform outreach and community organizing to help CHWs complete their tasks (such as encouraging people to attend CHW education meetings) and can help motivate CHWs by recognizing and honouring them (Kok, Dieleman et al., 2015).

Six studies in the Kok, Dieleman et al. review (2015) reported on community monitoring, mainly by village health committees. Two studies made a reference to CHW performance: one, from Indonesia, found that engaging pregnant women in assessing community facilitators provided social accountability, empowered these pregnant women to expect good quality services from the CHWs, and may have encouraged the CHWs to more actively engage with their patients and create better relationships with their patients (Shankar et al., 2009). A second study, from Uganda, reported that community medicine distributors were more influenced by community support in the form of feedback and rewards than by support from the health system (Kalyango et al., 2012).

3.12.2 Facilitators of community embeddedness

Kok, Dieleman et al. (2015) found that community support and community involvement in CHW selection and monitoring generally resulted in higher CHW motivation and performance. Four studies in the review reported that being able to perform curative tasks or administer injections increased CHWs' sense of community recognition and enhanced CHW motivation. Although providing medicines could increase community respect for CHWs, it could also inflate community expectations and lead to frustration with CHWs if drug supplies were not continuously stocked or if illnesses could not be managed. For instance, several studies in the Kok, Dieleman et al. (2015) review found that CHWs who were trained to treat children were expected to also provide treatments to adults, and in one study community members expected

Table 3.28 Summary findings on infrastructure and supplies

Topic	Summary of findings
Regular supplies enable effectiveness	<p>Directly</p> <ul style="list-style-type: none"> Equipping CHWs with the medicines (e.g. drug kits) and supplies (e.g. RDTs, job aids such as checklists and patient forms) that they are trained to use and mandated to have enables them to perform their related roles (Bosch-Capblanch & Marceau, 2014; Jaskiewicz & Tulenko, 2012; WHO & Global Health Workforce Alliance, 2010; Zulu et al., 2014). <p>Indirectly</p> <ul style="list-style-type: none"> Community trust and respect can be eroded if CHWs experience frequent stock-outs or do not have access to the supplies needed to perform their role (Jaskiewicz & Tulenko, 2012; WHO & Global Health Workforce Alliance, 2010; Zulu et al., 2014).
Need for travel support in remote areas	<ul style="list-style-type: none"> Travel can be a barrier to effectiveness as CHWs are dependent on road infrastructure and transportation options (e.g. availability of buses). Bicycles or a transportation allowance can support CHW access in remote areas (Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015).
Exploration of mHealth tool use	<ul style="list-style-type: none"> mHealth (mobile technology: phones, PDAs) is being explored as a tool to support CHW work through assisting with diagnostics and enabling communication, reminders and reporting between the periphery with the centre (Agarwal et al., 2015; Braun et al., 2013; Källander et al., 2013; Kok, Dieleman et al., 2015).
Low-tech job aids support CHW activities	<ul style="list-style-type: none"> Counting beads can be designed to support assessment of rapid breathing (Noordam et al., 2014). Treatment cards that remind CHWs how to prescribe drugs (Kok, Dieleman et al., 2015) and pictorial instructions for RDTs for malaria (Boyce & O'Meara, 2017) can improve adherence to practice guidelines. Checklists and standard record forms are considered "best practice" for some HIV CHW programmes (Mdege et al., 2013).

CHWs to provide antimalaria drugs to patients with negative malaria test results. One study in the Kok, Dieleman et al. (2015) review (Smith et al., 2013) found that CHWs in Madagascar performed slightly better if they perceived that they had more responsibilities, compared with CHWs who perceived they had fewer responsibilities.

Selecting CHWs who come from and live in the community they serve can improve community trust and enhance CHW performance (Brownstein et al., 2007; Jaskiewicz & Tulenko, 2012; Kane et al., 2010; Kok, Dieleman et al., 2015; WHO & Global Health Workforce Alliance, 2010). In a review on collaboration between Aboriginal and non-Aboriginal health care providers in Australia, Aboriginal health workers (a category that included CHWs, as well as liaison officers and health professionals) were valued for delivering care inclusive of an Aboriginal definition of health. The authors note that an Aboriginal definition of health includes connection to culture and country. Furthermore, in collaboration with non-Aboriginal health care workers, Aboriginal workers fostered feelings of self-determinism and cultural safety among Aboriginals receiving care (Mercer et al., 2014). However, in HIV programmes, CHWs not from the community of origin might be preferred due to concern about stigma and involuntary disclosure within one's community (Kok, Dieleman et al., 2015).

Kane et al.'s realist synthesis (2010) highlights the importance of community members playing a role in selecting CHWs to facilitate the selection of people who are admired and trusted. CHWs chosen by the community can foster a greater sense of "relatedness" between the CHWs and beneficiaries as well as a greater sense of responsiveness and responsibility amongst CHWs. In these conditions, the interventions carried out by CHWs are more likely to have positive outcomes. However, when CHWs are not explicitly chosen by beneficiaries but rather are appointed by the authorities outside of the community, CHW motivation, relatedness and responsibility are compromised, undermining intervention outcomes.

Kane et al. (2010) further note that the legitimacy of CHWs in the eyes of their communities is built by community members seeing robust supervision and collaboration with local health services.

3.12.2 Barriers to community embeddedness

Community embeddedness is hindered when there is a lack of clarity on CHW tasks and roles from the side of the community, which in turn reduces CHW motivation and performance (Kok, Dieleman et al., 2015). Two studies in the Kok, Dieleman et al. (2015) review found that CHWs involved in programmes for people living with HIV faced demands for support in the form of goods or money that they were unable to meet. This led to demotivation and attrition among the CHWs. Some CHWs were discouraged and at times afraid to carry out their work because of community distrust; in the Plurinational State of Bolivia some were accused of stealing the

food they were supposed to distribute to children. Community midwifery initiatives in fragile and conflict-affected countries had to work within challenging patriarchal social structures, which necessitated male approval and buy-in for programme success (Miyake et al., 2017).

CHWs can get caught in tensions between the community and the health system and between social and biomedical issues (Bornstein & Stotz, 2008). Kok, Dieleman et al. (2015) found some research highlighting community mistrust of CHWs who were seen as more affiliated with the health system than with community members. Poor supply of medicines can also erode community trust in CHWs. A study from Pakistan identified in the Jaskiewicz and Tulenko (2012) review noted that lack of drugs caused LHWs to feel embarrassed and caused some community members to become suspicious about whether the CHWs were stealing the medicines and selling them on the market (Jaskiewicz & Tulenko, 2012).

In Rwanda, the use of mobile phones for data collection made CHWs feel more distant from the "human side of their role," turning them into "data collection robots" (Källander et al., 2013).

3.13 Infrastructure and supplies

Table 3.28 provides summary findings pertaining to infrastructure and supplies.

Numerous reviews reported that CHWs require regular supplies in order to be effective; without supplies needed for their work, productivity will decrease and CHWs can lose the respect of the community (Baatiema et al., 2016; Jaskiewicz & Tulenko, 2012; WHO & Global Health Workforce Alliance, 2010; Zulu et al., 2014), as noted in section 3.12 on community embeddedness. In the Jaskiewicz and Tulenko (2012) review, a study from Zambia identified drug shortages as one of the two most important factors behind the dysfunction of the CHW programme. Kok, Dieleman et al. (2015) also found many reports of demotivation due to lack of supplies, such as drugs and educational materials. However, one study (Osawa et al., 2010) in the Kok, Dieleman et al. (2015) review found no correlation between supplies and motivation of CHWs in Zimbabwe. Another (Rowe et al., 2007a) found no correlation between adequacy of medicine supplies in the village and CHW adherence to guidelines in Kenya. Inadequate storage conditions in the community for malaria RDTs was an issue facing CHWs and can compromise the accuracy of the RDTs (Boyce & O'Meara, 2017).

Several reviews identify challenges of travel as another important determinant of CHW effectiveness (Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015). CHWs often spoke of the need for bicycles or the difficulties they faced in having to pay for transportation (Baatiema et al., 2016; Kok, Dieleman et al., 2015).



The Källander et al. (2013) review examined the role of mobile technology (mHealth) in supporting CHWs. Most studies in their review used simple mobile phone applications for data submission, job aids to improve diagnostics, and for sending and receiving SMS messages and reminders. However, none of these projects evaluated the impact of these tools on CHW quality of care provided. Källander et al. (2013) highlight the potential use of mobile phones to improve CHW data collection from patient records as a mechanism to improve accuracy, data quality and reduce time. They found two studies (Blaschke et al., 2009; and the Millennium Villages Project, 2010) that used a mobile integrated system to improve data use and reporting, partly as a result of prompt reporting.

The Källander et al. (2013), Kok, Dieleman et al. (2015) and Agarwal et al. (2015) reviews report numerous possibilities for using mobile phones to improve patient diagnosis and consulting, including by allowing CHWs to send patient information and receive instructions on how to proceed. They suggest that these tools may motivate CHWs and improve their credibility in the community. The Patel & Nowalk (2010) review on the role of CHWs in expanding immunization coverage in India reports on a promising new software, routine immunization monitoring software (RIMS), which seeks to streamline data collection (such as information on vaccine supply) and analysis. However, they suggest that data analysis at the community level would likely be more useful for CHWs because it could help them identify local areas with low coverage and respond appropriately.

Källander et al. (2013) note, however, that technologies can shift CHW time and focus away from the community, and Kok, Dieleman

et al. (2015) found that some CHWs may find step-by-step guidelines transmitted through mobile technology overly directive and constraining.

Mdege et al. (2013) identify a number of “best practices” used by CHWs within HIV-oriented task shifting programmes, including: i) checklists of signs and symptoms of drug toxicity or disease progression (Jaffar et al., 2009); ii) standardized patient record forms (Chang et al., 2010) and iii) PDAs pre-programmed to collect specific patient data and to trigger an alert if specific parameters are met (Selke et al., 2010). In their review of CHWs in HIV programmes, Mwai et al. (2013) note that mobiles and standard forms are used to collect patient data.

Kok, Dieleman et al. (2015) identified one study that measured the value of a basic (non-digital) job aid: Rowe et al. (2007a) found that CHWs in Kenya who used a treatment card (reminding them how to prescribe drugs) had better overall guideline adherence. However, the same study reported that the use of a flipchart job aid during consultations did not produce better guideline adherence.

Noordam et al.’s (2014) review of research on the use of counting beads to improve the classification of fast breathing in low-resource settings emphasizes that the design of the beads is crucial so that CHWs can easily slide the beads while counting the child’s breathing in order to determine when breathing is too fast.

3.14 Integration into the health system

Summary findings on health system integration are presented in Table 3.29.

Table 3.29 Summary findings on health system integration

Topic	Summary of findings
Integration with the health system is essential for having strong programmes	<ul style="list-style-type: none"> Integration and cooperation with the broader health system and existing health care providers was the most frequently cited enabling factor for CHW programmes in one review (Pallas et al., 2013) and discussed as a vital enabler in many other reviews (Campbell & Scott, 2011; Jaskiewicz & Tulenko, 2012; Kane et al., 2010; Kok, Dieleman et al., 2015; Patel & Nowalk, 2010; Vouking et al., 2013; WHO & Global Health Workforce Alliance, 2010; Zulu et al., 2014). The lack of a national CHW policy has been linked to: <ul style="list-style-type: none"> inadequate support and recognition for CHWs, which limits their ability to function effectively in the community; issues around role definition (e.g. whether CHWs should treat illnesses and prescribe medications) (Kok, Kane et al., 2015).
Scaling up and integrating CHW programmes with health systems has risks and pitfalls	<ul style="list-style-type: none"> A national CHW policy by itself is insufficient; the health system needs to be equipped to supervise, support and incentivize CHWs (Kok, Kane et al., 2015). Scaled-up, integrated CHW programmes are often less effective than small, NGO CHW programmes because insufficient attention is given to maintaining the quality of the training, supervision and motivation of CHWs in scaled-up programmes (Gogia et al., 2011). Integration with a dysfunctional health system can erode CHW programmes (WHO & Global Health Workforce Alliance, 2010).
Integration with health systems should be built on collaborative, respectful, relationships	<ul style="list-style-type: none"> Integration must foster respectful collaboration and trust between CHWs and the health system, and it can be facilitated by role clarity and effective two-way communication (Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015); and potentially supported by mHealth (Källander et al., 2013). The less hierarchical and the more collaborative relationships are between CHWs and the health system, the greater is the likelihood of benefiting from the unique, practical knowledge that CHWs have (Campbell & Scott, 2011); moreover, these collaborative relationships can support CHW retention (Campbell & Scott, 2011; Kok, Kane et al., 2015; Zulu et al., 2014). Engagement with stakeholders (policy-makers, government officials, civil society and communities) fosters integration by enhancing acceptability and credibility of the CHW programme (Zulu et al., 2014).

Gogia et al. (2011) found that the impact of scaled-up CHW programmes that were operating as a health system component rather than a small trial or NGO project was lower than in small-scale studies. They suggest that scaled-up programmes need to ensure the elements that tend to get neglected when scaling up: quality of training, presence of supportive supervision and motivation of the CHWs are addressed (Gogia et al., 2011). Mutamba et al. (2013) found, in their review on CHW involvement in mental health interventions, that some effective programmes were not integrated into the health system, which, they note, raises questions about sustainability. Integration and standardization can be easier at the policy development level than at the implementation level; in their review on CHWs in Ghana, Baatiema et al. (2016) note that although the Ghanaian government attempted to develop training guides for some categories of CHWs, uptake of these training guides was limited.

Multiple reviews discussed the importance of integrating CHWs into the health system (Campbell & Scott, 2011; Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015; Kok, Kane et al., 2015; Pallas et al., 2013; WHO & Global Health Workforce Alliance, 2010; Zulu et al., 2014). Pallas et al. (2013) highlight that support and integration into the agendas of ministries of health, NGOs and international donors can strengthen CHW programmes. They also note that political upheaval, loss of external donor funding, and reduced prioritization by the ministry of health can all weaken CHW programmes.

What can foster integration? Zulu et al. (2014) suggest that CHW programmes can achieve better integration into national initiatives when policy-makers and community actors participate in some way in CHW programmes and come to see these programmes positively. Brazil's CHWs are integrated into municipal councils, and India's CHWs are overseen by a mentoring group as well as by the National Health Systems Resource Centre. This enhances acceptability and credibility of the CHW programme to government officials, to health service providers and to other community members. In the case of Brazil, it also facilitates political support for funding.

Components of CHW training have been integrated into the ministries of health in Brazil and Ethiopia, and this has facilitated national certification of CHWs. Campbell & Scott (2011) found that when regular contact of CHWs with other members of the health care system is characterized by respect the likelihood of CHW programme success increases. They suggest that these relationships can be developed if formal health staff are taught to respect the specific skills, experiences, values and potential that CHWs bring in making the health system more effective. The most frequently cited enabling factor for CHW programmes in Pallas et al.'s review (2013) was CHW integration or cooperation with the broader health system and existing health care providers. The less hierarchical and the more collaborative relationships are between

CHWs and the health system, the greater is the likelihood of benefiting from the unique, practical knowledge that CHWs have; moreover, these collaborative relationships can support CHW retention (Campbell & Scott, 2011; Kok, Kane et al., 2015; Zulu et al., 2014).

Jaskiewicz and Tulenko (2012) and Kok, Dieleman et al. (2015) highlight the importance of instilling respectful relationships between CHWs and other health workers and "embedding" CHWs within the health system in terms of communication and supplies. Jaskiewicz and Tulenko (2012) make the additional point that the health system has a fundamental role in supporting positive relationships between CHWs and the community:

- The level of respect given to CHWs by the health system influences CHW-community relationships. When CHW contributions are accepted, valued and understood by facility-based health workers – often manifested in positive responses to CHW referrals – community members are more likely to respect their CHWs and heed their advice and referrals in the future.
- By having a reliable stock of medicines and other needed supplies, CHWs will not only be productive but will retain a high standing in the eyes of the community.

By helping CHWs to become competent health workers through adequate pre-service training, monitoring and follow-up (i.e. by providing supportive supervision), health systems will make it possible for communities to have a high regard for their CHW's knowledge, skills, and capacity to help them, thereby leading the communities to respect and accept CHW services. Jaskiewicz and Tulenko (2012) refer to a multi-country study on CHW provision of HIV services (Celletti et al., 2010) that reports that CHWs were more motivated to and capable of providing HIV services when they received supportive supervision within the structures and functions of the health team.

Kane et al.'s (2010) realist review adds to this list:

- By failing to set clear CHW roles, the health system creates uncertainty among CHWs and community members about what to expect from CHWs, thereby eroding trust in the CHW and leading to confusion on all sides as well as poor performance and demotivation among CHWs.

Kane et al., (2010) describe the following context-mechanism-outcome configuration:

- In the context of CHW programmes targeting the poor with an unmet need, and embedded in or closely linked to local health care services, we can conclude that:
 - health system related interventions in the form of setting clear roles and specific responsibilities for CHWs, ensuring mentoring



for CHWs by health workers from local public health services, ensuring good referral support for CHWs from local public health services, can improve the CHW's performance when they are able to trigger the following mechanisms:

- a sense of relatedness with the local public health services, and thus accountability towards the system;
- a sense of credibility and legitimacy of being part of the local public health services;
- an anticipation of being valued by the local public health services and the community;
- a perception of improvement in social status; and
- an assurance that there is a system for back-up support.

(Kane et al., 2010, p. 5)

Jaskiewicz and Tulenko (2012) note that better outcomes were observed when CHWs were offered sustained and supportive supervision within the structure and functions of the health team. This type of supervision can motivate CHWs and can enable the timely provision of follow-up training to improve performance and solve other systemic problems. Certain tasks can be safely delegated only if supervision is provided on a constant basis. Supportive supervision requires that supervisors are motivated to adopt new behaviour, use locally appropriate tools, and invest time and resources. Supportive supervision programmes ought to be integrated into existing human resource management systems. Kok, Dieleman et al. (2015) emphasize that receiving recognition from formal health staff increased CHW motivation and that good communication and coordination structures increased CHW performance.

Two reviews discuss how TBAs (Byrne & Morgan, 2011) and CHWs (Darmstadt, Lee et al., 2009) must operate in partnership with health systems to ensure referral linkages for emergency obstetric care. Jaskiewicz and Tulenko (2012) found evidence that CHW productivity can be improved through improving the integration of CHW-provided services with the broader health service needs of the community. Kok, Kane et al. (2015) also note the importance of CHW service delivery being embedded within a continuum of services, including a functioning referral and feedback loop.

Källander and Tulenko's (2013) mHealth review reports on the capacity for mobile technology to improve CHW integration. Two-way mobile communication systems can enable CHWs to call ahead to health facilities when making a referral, allow CHWs to receive updated information on drug stocks, and facilitate the transfer of attendance records and other relevant information from CHWs to the health system. One study in their review notes that mobile phone messages could also be used by health facility workers and CHWs to keep each other informed of recent developments and upcoming events, including sending an SMS to CHWs on their birthday for motivation.

Four of the 140 studies in the Kok, Dieleman et al. (2015) review reported that the use of protocols and guidelines could improve CHW performance because they help facilitate and coordinate CHW-related programmes such as role delegation. Kok, Kane et al. (2015) found that many countries had a national CHW policy. Not having a national CHW policy was linked to inadequate support for CHWs (e.g. lack of payment or academic credit for attending trainings (Sranacharoenpong & Hanning, 2011) and to CHWs not being recognized by health authorities (Baatiema et al., 2016), which limited their ability to function effectively in the community. Bemelmans et al. (2016) examined the health system integration of lay HIV counsellors in eight sub-Saharan African countries. They found that although some countries had taken steps in recognizing lay counsellors, including harmonizing training, job descriptions and support structures, formal integration of this team into national health systems was limited. Kok, Kane et al. (2015) note, however, that the "recognition and integration of CHWs in the health system seem to be more important for CHW performance than the existence of a CHW policy per se."

However, a CHW policy by itself is not sufficient. Kok, Kane et al. (2015) state that CHWs require well-functioning health services to perform optimally, including the provision of logistics support, equipment and supplies to CHWs. Kok, Kane et al. (2015) describe a study in Zambia that showed how, despite the presence of a government policy on CHWs, the health system was still not equipped to supervise, support and incentivize the full range of CHWs that were present in the country at that time. Patel & Nowalk's (2010) review identified points of breakdown at all levels of the Indian health system, which jeopardize the success of CHW interventions to improve immunization coverage. The identified "fundamental inadequacies" in cold chain equipment, coordination, supervision, data analysis, funding, and recruitment of CHWs to fill vacancies, left CHWs unsupported and less able to perform their role. Vouking et al.'s (2013) review on the impact of CHWs on Buruli ulcer in sub-Saharan Africa had very similar findings. They state that "one of the major obstacles to the control of Buruli ulcer is inadequate and poorly equipped health facilities in the affected areas."

Community health workers' rights are often not covered within a country's pre-existing human resources policies, meaning that CHWs lack basic entitlements such as leave and complaint mechanisms (Kok, Kane et al., 2015). In some countries (such as Uganda, Ethiopia and Mozambique), Kok, Kane et al. (2015) report that the lack of regulations regarding CHWs led to fragmented CHW remuneration, lack of career opportunities and ultimately demotivation. A lack of legislation can also create problems, especially on role definition: in Malawi, policy-makers in the Medical Council disagreed about whether CHWs should be able to treat illnesses. Kok, Kane et al. (2015) report that in Bangladesh, Zambia, Nepal and Nigeria, policy-makers enabled CHWs to take up key roles (such as prescribing antibiotics or distributing misoprostol).

In Bangladesh, they report evidence that CHW permission to prescribe medicine supported the programme.

Health system decentralization, i.e. the level at which decisions are made, and the implementation capacity at these levels, has an impact on CHW performance. Kok, Kane et al. (2015) identified one study from the Lao People's Democratic Republic that found that increased decentralization led to a greater recognition of the value

of community engagement and of locally designed solutions, but it also resulted in poor programme management because of low local capacity.

Rahman et al.'s (2013) review on peripartum mental health found that health workers, including CHWs, who integrated mental health care into other roles in the health system, were less stigmatizing for women, compared with mental health-focused workers.



- **Tasks:** Tasks should be clearly defined and should require a daily or weekly time commitment that is appropriate given the incentives/remuneration and support provided.
- **Catchment population:** The size of a CHW's catchment population should be determined in response to the local reality (expected workload based on epidemiology and anticipated demand for services, frequency of contact required, nature and time requirements of services provided and local geography). The service delivery profile of a specific programme should be used to determine predicted workloads and corresponding number of CHWs needed. The size of a CHW's catchment population will like change over time as the programme matures and as CHW roles evolve.
- **Incentives/remuneration:** Programmes must develop appropriate financial packages commensurate with the job demands, complexity, number of hours, training and roles undertaken, as well as the health system's resource availability. CHW needs and expectations should be considered; there is evidence that many CHWs are dissatisfied with their incentives/remuneration.
 - Clarity on financial incentives is vital for CHWs, community members and health system actors.
 - Non-financial incentives must be considered carefully because they can be easily undermined by the health system. For example, community trust and respect is an important incentive. Drug stock-outs and other health system failures can undermine CHW status in the community. If career pathways and anticipation of future employment are important incentives for CHWs, policy-makers must ensure that these incentives are genuine.
- **Community embeddedness:** Community embeddedness is associated with CHW retention, motivation, performance, accountability and support – and the level of community embeddedness ultimately affects the acceptability and uptake of CHWs' health-related work (Campbell & Scott, 2011; Darmstadt, Baqui et al., 2009; Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015; Pallas et al., 2013; Vouking et al., 2013; Zulu et al., 2014). Locally trusted CHWs can serve as a link between health facilities, formal health workers and communities (Mwai et al., 2013), and locally embedded CHWs can provide services to difficult-to-reach populations (Patel & Nowalk, 2010).
- **Training:** Training should seek to impart both technical competency and socially oriented skills such as communication and counselling skills. Training should also emphasize the importance of ensuring confidentiality of personal information about clients (Glenton et al., 2011; Kok, Dieleman et al., 2015). Training may be more effective in imparting competencies by integrating hands-on practical

components rather than just providing classroom learning. Raising awareness of the social and political determinants of health during the training and enhancing problem-solving skills were also identified as important (Campbell & Scott, 2011).

- **Linkages and referral:** Linking CHWs to a supportive and functioning referral facility is often vital to CHW programme effectiveness. An ineffective referral system not only denies community members with needed health care services; it also erodes the reputation of CHWs in the community and leaves CHWs without support they need.
- **Supplies:** Regular provision of supplies is essential for maintaining CHW programme effectiveness, CHW productivity, and respect for CHWs by the community. Lack of supplies, such as drugs and educational materials, are major sources of demotivation for CHWs (Jaskiewicz & Tulenko, 2012; Kok, Dieleman et al., 2015; WHO & Global Health Workforce Alliance, 2010; Zulu et al., 2014).
- **Relationships between health system actors:** Integration that fosters respectful communication and collaboration between CHWs and the health system can enable the broader health system to benefit from the unique, practical knowledge that CHWs have; respectful communication and collaboration also can support CHW retention, and it can enhance the acceptability and credibility of CHW programmes from the perspective of the community and higher level health care providers (Campbell & Scott, 2011; Jaskiewicz & Tulenko, 2012; Källander et al., 2013; Kok, Dieleman et al., 2015; Kok, Kane et al., 2015; Zulu et al., 2014).
- **CHW programmes are highly context specific:** There are no standard blueprints that can be used to design and implement a CHW programme. When developing programmes, decisions must be made based on national, subnational, district and local realities. However, these can be informed by strategies used in other settings as well as by the successes, challenges and pitfalls encountered there.

4.3 Gaps in the evidence

The importance of CHWs for improving health system performance on a global basis is reflected by the substantial volume of research on this topic, with 122 reviews ultimately selected for inclusion in our study. Despite this, the evidence presents notable gaps across several areas. Relatively more (and higher quality) evidence is available on the effectiveness of CHWs in delivering specific health interventions than on effective approaches and cross-cutting strategies to integrate and support CHWs in health systems and optimize their performance (Maher & Cometto, 2016). In particular, our review has highlighted the need to deepen research on:



- **The voices of CHWs themselves:** There is only modest attention in the systematic review literature given to studies of CHW views and opinions about their training, work responsibilities, supervision and support (or lack thereof) from both the health system and the community, incentives/remuneration, retention, satisfaction with the role or career opportunities/goals.
- **Issues of social justice, gender and CHW rights:** Very little attention is present in the systematic review literature concerning the vulnerability and potential exploitation of CHWs, particularly for female CHWs. There is also little attention to gender issues that CHW programmes face. The opportunities presented by CHW programmes to empower and support CHWs as an end in itself is discussed in two reviews (Bhatia, 2014; Kane et al., 2016). Bhatia (2014) highlights that costing and salary considerations do not adequately consider the needs and right of CHWs while Kane et al. (2016) note that the empowering aspects of CHW work are frustrated by CHWs' lack of control over their work environment, and their feelings of being unsupported, unappreciated and undervalued.
- **Measurement of performance of CHWs individually and of CHW programmes:** The research reviewed presents very limited evidence on the quality of care provided by CHWs or the overall performance of CHW programmes, especially large-scale ones. Evidence on strategies to enhance CHW performance and responsiveness is fragmented.
- **Management and remuneration:** Alternative models of management systems, integration in and support by primary health care teams, and remuneration are described in the research reviewed. The piecemeal evidence, with its highly context-specific nature, does not lend itself to generalization.
- **Optimization of training and supervisory approaches:** Testing alternative and innovative approaches to training and supervising CHWs has received little attention among the research reviewed in our study. The benefits, costs and trade-offs between intensity, frequency of contact and other aspects of training and supervision, on the one hand, and quality of CHW performance on the other hand are important considerations. Scarce evidence is available on the effectiveness and optimal design of accreditation of CHW training programmes and certification of individual CHWs, as well as other aspects of regulation of service provision by CHWs.
- **Exploration of the potential benefits of CHWs as community change agents:** We found little evidence in the research reviewed in our study of the ways in which CHWs have in the past or might in the future strengthen linkages between communities and health systems or how CHWs might help to mobilize communities to engage in activities that would improve health system governance and oversight.
- **The influence of health system decentralization, social accountability and governance on CHW programmes:** CHW programmes are heavily dependent on broader influences that affect health systems. It will be important to summarize the current evidence on how health system decentralization affects CHW programmes, as well as how the introduction of social accountability and governance mechanisms into health systems' influence CHW programmes.

Finally, on many of the aspects that were examined in this study, the research reviewed was often inconclusive, and of poor or very poor quality.

5. Conclusions

The summary of the existing evidence regarding CHW programme effectiveness and approaches to integrating CHWs into health systems provided here is useful at this critical juncture as many countries are in the process of implementing new national CHW programmes and/or strengthening current ones. Our systematic review of reviews of CHW effectiveness is a modest first step in this direction, representing a preliminary mapping of the synthesized evidence that will feed into the development of the WHO guideline on health policy and system support to optimize CHW programmes. It is widely recognized that supervision, logistical support, incentives, community engagement are essential to support CHWs. These ensure that CHWs are contributing to locally identified health needs. The forthcoming WHO guideline explores in greater depth specific policy questions on what strategies are most effective for achieving these essential CHW programme functions, as well as the extent to which these are context specific or can be generalized.

The application of the findings of this review need to be adapted to the national context and to each country's CHW programme goals. Developing and strengthening CHW programmes will involve recognizing existing evidence of CHW programme effectiveness, weighing options, making informed decisions involving all stakeholders, designing and implementing the best programme possible, and then over time adjusting course on the basis of experience and implementation research. The research reviewed indicates that CHW programmes have strong potential to deliver a wide range of cost-effective primary health care services in a variety of contexts. In order to be successful, however, the programmes need to be better integrated into public policies, including those related to national planning, governance, legal issues and financing. The requisite human and financial resource inputs should be factored in at the planning and budgeting stages, and reflected in national health workforce and health sector strategies. Similarly, the CHW workforce should be included in national systems for managing and tracking the health workforce (such as health workforce registries to track their availability, distribution, employment status and performance over time).

As the *WHO Global strategy on human resources for health: workforce 2030* (WHO, 2016a) notes, addressing population needs for universal

health coverage, as called for by the Sustainable Development Goals, requires harnessing opportunities from the education and deployment of CHWs as part of interprofessional primary care teams for a more sustainable and responsive skills mix. Countries should develop policies and mechanisms to integrate CHWs, where they exist, with the health system to enable these cadres to benefit from adequate system support.

Finally, in the policy dialogue on and the design of CHW programmes, it is important to reflect not just on their potential to improve health outcomes, but also on the employment and economic growth implications of the creation of CHW jobs, and the value choices that policy-makers are called upon to make (WHO, 2016b). In this context, and in line with existing International Labour Organization conventions on employment (ILO, 1977) as well as the Sustainable Development Goal on decent work and economic growth, it is important that CHWs are also provided with a living wage and adequate conditions of employment more broadly.

Future progress in improving CHW programme effectiveness will depend not only on synthesizing existing evidence but also on embarking on an expanded and vigorous research agenda to continually advance the contextualized evidence on CHW programme effectiveness. Adopting a health systems lens to CHW research entails examining, beyond the effectiveness question (what works?), the enablers and contextual factors and enablers (how? for whom? under what circumstances?) (de Savigny & Adam, 2009). This may be better addressed through mixed methods research approaches. The involvement of decision-makers in the research priority-setting process will be critical to generate support for and buy-in of the research findings.

Adequate institutional and financial support for advancing the evidence base for CHW programme effectiveness and for expanding the scope, quality and coverage of CHW programmes will be crucial to accelerate progress in ending preventable child and maternal deaths, achieving universal health coverage and accelerating progress toward achieving Health for All.



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Annex 1: PubMed search strategy

Concept 1: PubMed systematic review vilter

(available at: https://www.nlm.nih.gov.ezp.welch.jhmi.edu/bsd/pubmed_subsets/sysreviews_strategy.html)

(review[ti] OR systematic review [ti] OR meta-analysis [pt] OR meta analysis [ti] OR metaanalysis [ti] OR metanalysis [ti] OR systematic literature review [ti] OR this systematic review [tw] OR (systematic review [tiab] AND review [pt]) OR meta synthesis [ti] OR meta synthesis [ti] OR integrative review [tw] OR integrative research review [tw] OR rapid review [tw] OR consensus development conference [pt] OR practice guideline [pt] OR cochrane database syst rev [ta] OR acp journal club [ta] OR health technol assess [ta] OR evid rep technol assess summ [ta] OR drug class reviews [ti] OR (clinical guideline [tw] AND management [tw]) OR ((evidence based[ti] OR evidence-based medicine [mh] OR best practice* [ti] OR evidence synthesis [tiab]) AND(review [pt] OR diseases category[mh] OR behavior and behavior mechanisms [mh] OR therapeutics [mh] OR evaluation studies[pt] OR validation studies[pt] OR guideline [pt] OR pmcbook))OR ((systematic [tw] OR systematically [tw] OR critical [tiab] OR (study selection [tw]) OR (predetermined [tw] OR inclusion [tw] AND criteri* [tw]) OR exclusion criteri* [tw] OR main outcome measures [tw] OR standard of care [tw] OR standards of care [tw]) AND (survey [tiab] OR surveys [tiab] OR overview* [tw] OR review [tiab] OR reviews [tiab] OR search* [tw] OR handsearch [tw] OR analysis [ti] OR critique [tiab] OR appraisal [tw] OR (reduction [tw] AND (risk [mh] OR risk [tw]) AND (death OR recurrence))) AND (literature [tiab] OR articles [tiab] OR publications [tiab] OR publication [tiab] OR bibliography [tiab] OR bibliographies [tiab] OR published [tiab] OR unpublished [tw] OR citation [tw] OR citations [tw] OR database [tiab] OR internet [tiab] OR textbooks [tiab] OR references [tw] OR scales [tw] OR papers [tw] OR datasets [tw] OR trials [tiab] OR meta-analy* [tw] OR (clinical [tiab] AND studies [tiab]) OR treatment outcome [mh] OR treatment outcome [tw] OR pmcbook)) NOT (letter [pt] OR newspaper article [pt])

Concept 2: Community-based practitioners

"health auxiliary"[tw] OR "frontline health workers"[tw] OR "frontline health worker"[tw] OR "midwife"[tw] OR "Midwifery"[tiab] OR "midwives"[tw] OR "Birth Attendant"[tw] OR "Midwives"[tw] OR "outreach worker"[tw] OR "outreach workers"[tw] OR "lay health worker"[tw] OR "lay health workers"[tw] OR "promotora"[tw] OR "promotoras"[tw] OR "village health worker" OR "village health workers"[tw] OR

"volunteer health worker"[tw] OR "volunteer health workers"[tw] OR "voluntary health workers"[tw] OR "voluntary health worker"[tw] OR "community health agent"[tw] OR "community health agents"[tw] OR "health promoter"[tw] OR "health promoters"[tw] OR "Community Health Workers"[Mesh] OR "community health worker"[tw] OR "community health workers"[tw] OR "community health aide"[tw] OR "community health aides"[tw] OR "community health nursing"[tw] OR "community health nurses"[tw] OR "community health nurse"[tw] OR "community health officers"[tw] OR "community health officer"[tw] OR "community health volunteer"[tw] OR "community health volunteers"[tw] OR "community health distributors"[tw] OR "community health distributor"[tw] OR "community health surveyors"[tw] OR "community health surveyor"[tw] OR "community health assistants"[tw] OR "community health assistant"[tw] OR "community health promoters"[tw] OR "community health promoters"[tw] OR "community IMCI"[tw] OR "community volunteer"[tw] OR "community volunteers"[tw] OR "health extension workers"[tw] OR "health extension worker"[tw] OR "village health volunteer"[tw] OR "village health volunteers"[tw] OR "Community Health Nursing"[Mesh] OR "close-to-community provider"[tw] OR "close-to-community providers"[tw] OR "community-based practitioner"[tw] OR "community-based practitioners"[tw] OR "lady Health worker"[tw] OR "lady Health workers"[tw] OR "barefoot doctor"[tw] OR "Community Practitioners"[tw] OR "Community Practitioner"[tw] OR "community-based practitioners"[tw] OR "community-based practitioner"[tw] OR "promotoras de salud"[tw] OR "agentes de saúde"[tw] OR "rural health auxiliaries"[tw] OR "traditional birth attendants"[tw] OR "traditional birth attendant"[tw] OR "Activista"[tw] OR "Agente comunitario de salud"[tw] OR "Agente comunitário de saúde"[tw] OR "Anganwadi"[tw] OR "Animatrice"[tw] OR "Barangay health worker"[tw] OR "Barangay health workers"[tw] OR "Basic health worker"[tw] OR "Basic health workers"[tw] OR "Brigadista"[tw] OR "Colaborador voluntario"[tw] OR "Community drug distributor"[tw] OR "Community drug distributors"[tw] OR "Community health agent"[tw] OR "Community health agents"[tw] OR "Community health promoter"[tw] OR "Community health promoters"[tw] OR "Community health representative"[tw] OR "Community health representatives"[tw] OR "Community health volunteer"[tw] OR "Community health volunteers"[tw] OR "Community resource person"[tw] OR "Female multipurpose health worker"[tw] OR "Female multipurpose health worker"[tw] OR "Health promoter"[tw] OR "Health promoters"[tw] OR "Kader"[tw] OR "Monitora"[tw] OR "Mother coordinator"[tw] OR "Outreach educator"[tw] OR "Outreach educators"[tw] OR



“Promotora”[tw] OR “Shastho shebika”[tw] OR “Shastho karmis”[tw]
 OR “Sevika”[tw] OR “Village health helper”[tw] OR “Village drug-kit
 manager”[tw] OR “Accompagnateur”[tw] OR “Accredited Social Health
 Activist”[tw] OR “Animator”[tw] OR “ASHA”[tw] OR “Auxiliary Nurse”[tw]
 OR “Auxiliary Nurse-midwife”[tw] OR “Bridge-to-Health Team”[tw] OR
 “Behvarz”[tw] OR “Care Group”[tw] OR “Care Groups”[tw] OR “Care
 Group Volunteer”[tw] OR “Care Group Volunteers”[tw] OR “Community
 Case Management Worker”[tw] OR “Community Case Management
 Workers”[tw] OR “Community Health Agent”[tw] OR “Community Health
 Agents”[tw] OR “Community Health Care Provider”[tw] OR “Community
 Health Care Providers”[tw] OR “Community HealthCare Provider”[tw]
 OR “Community HealthCare Providers”[tw] OR “Community Health
 Extension Worker”[tw] OR “Community Health Extension Workers”[tw]
 OR “Community Health Officer”[tw] OR “Community Health Officers”[tw]
 OR “Community Surveillance Volunteer”[tw] OR “Community Surveillance

Volunteers”[tw] OR “Family Health Worker”[tw] OR “Family Health
 Workers”[tw] OR “Family Planning Agent”[tw] OR “Family Planning
 Agents”[tw] OR “Family Welfare Assistant”[tw] OR “Family Welfare
 Assistants”[tw] OR “Female Community Health Volunteer”[tw] OR
 “Female Community Health Volunteers”[tw] OR “Health Agent”[tw] OR
 “Health Agents”[tw] OR “Health Assistant”[tw] OR “Health Assistants”[tw]
 OR “Health Extension Worker”[tw] OR “Health Extension Workers”[tw]
 OR “Health Surveillance Assistant”[tw] OR “Health Surveillance
 Assistants”[tw] OR “Kader”[tw] OR “Lead Mother”[tw] OR “Malaria
 Agent”[tw] OR “Malaria Agents”[tw] OR “Maternal and Child Health
 Worker”[tw] OR “Maternal and Child Health Workers”[tw] OR “Mobile
 Clinic Team”[tw] OR “Mobile Clinic Teams”[tw] OR “Nutrition Agent”[tw]
 OR “Nutrition Agents”[tw] OR “Nutrition Counselor”[tw] OR “Nutrition
 Counselors”[tw] OR “Peer Educator”[tw] OR “Peer Educators”[tw] OR
 “Shasthya Shebika”[tw] OR “Socorrista”[tw]

Annex 2: Included and excluded articles

Included articles (n=122)

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Excluded articles (n=32)

These article titles and abstracts were retained from title and abstract review stage to full text review stage, at which point they were excluded. The reasons for exclusion were:

- No full text available: Austin, 2012; Borda-Olivas et al., 2012; Ehiri et al., 2016; Macuacua et al., 2015; Musa et al., 2014; Potter, 2011.
- Not a review: Kaur, 2016; Kiarie & Festin, 2015; Lassi et al., 2016; Spencer et al., 2010; Trivedi, 2016; Wagoner et al, 2015.
- Not focused on community-based practitioners: Abrahams et al., 2017; Awor et al., 2014; Bailey et al., 2016; Banda et al., 2016; Colvin et al., 2013; Cowley et al., 2015; Glenton et al, 2011; Kluthcovsky & Takayanagui, 2006; Leech et al., 2007; Leeman et al., 2015; Legg et al., 2011; Machado et al., 2016; Munn et al., 2013; Ngidi et al., 2017; Renfrew et al., 2014; Renner et al., 2013; Shaban & Leap, 2012; Wahedi, 2016 West et al., 2016; Zhang et al., 2016)

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Annex 3: AMSTAR assessments (n=122)

First author, year	1	2	3	4	5a	5b	6	7	8	9	10a	10b	11
	A priori	Duplicate	Comprehensive	Grey literature	Included (relaxed)	Included (strict)	Characteristics	Quality assessment	Quality conclusion	Meta-analysis	Bias (relaxed)	Bias (strict)	Conflict/funding
Abbott 2017	Y	N	Y	N	N	N	Y	N	NA	NA	N	N	Y
Agarwal 2015	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Amouzou 2014	Y	N	Y	Y	Y	N	N	Y	N	NA	N	N	Y
Baatiema 2016	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Bellows 2015	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Bemelmans 2016	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Bhatia 2014	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Bornstein 2008	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Bosch-Capblanch 2008	Y	N	Y	Y	Y	N	Y	Y	Y	NA	N	N	Y
Bosch-Capblanch 2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	N	Y
Bosch-Capblanch 2014	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Boyce 2017	Y	N	N	N	Y	Y	Y	N	NA	NA	N	N	Y
Braun 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Brownstein 2007	Y	N	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Byrne 2011	Y	N	Y	Y	Y	N	Y	Y	Y	NA	N	N	Y
Campbell 2011	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Chapman 2010	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Cherrington 2008	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Christopher 2011	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Corley 2016	Y	N	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Corluka 2009	Y	N	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Costa 2015	Y	Y	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Dale 2008	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Darmstadt 2009	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y
Dawson, Brodie 2014	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Dawson, Buchan 2014	Y	N	Y	N	Y	N	Y	Y	N	NA	Y	N	Y

First author, year	1	2	3	4	5a	5b	6	7	8	9	10a	10b	11
	A priori	Duplicate	Comprehensive	Grey literature	Included (relaxed)	Included (strict)	Characteristics	Quality assessment	Quality conclusion	Meta-analysis	Bias (relaxed)	Bias (strict)	Conflict/funding
de Oliveira Castro 2015	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Ehiri 2014	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Flynn 2017	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Fulton 2011	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Gibbons 2007	Y	N	Y	N	Y	N	Y	Y	N	NA	N	N	N
Gilmore 2013	Y	N	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Giugliani 2011	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Glenton, Colvin 2013	Y	N	Y	N	Y	Y	Y	Y	Y	Y	NA	NA	Y
Glenton, Khanna 2013	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	N	Y
Glenton 2011	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y
Gogia 2011	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Gogia 2010	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Gogia 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hall 2017	Y	Y	Y	N	Y	N	Y	Y	Y	Y	NA	NA	Y
Henriques Camelo 2012	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Hill 2014	Y	N	Y	N	Y	N	N	Y	Y	NA	N	N	Y
Hoelt 2017	Y	N	N	Y	Y	N	N	N	NA	NA	N	N	Y
Horey 2015	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Hou 2015	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Hunt 2011	Y	N	Y	N	Y	N	Y	Y	Y	NA	N	N	N
Islam 2015	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Jaskiewicz 2012	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Jones 2014	Y	N	Y	N	Y	N	Y	Y	Y	Y	N	N	Y
Kabaghe 2016	Y	Y	Y	N	Y	N	Y	N	NA	Y	N	N	Y
Källander 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Kamal-Yanni 2012	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Kane 2010	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Kane 2016	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Kaunonen 2012	Y	Y	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Kew 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Kok, Dieleman 2015	Y	Y	Y	N	Y	N	Y	Y	N	NA	N	N	Y
Kok, Kane 2015	Y	Y	Y	N	Y	N	Y	Y	N	NA	N	N	Y
Koon 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Kredo 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Lassi, 2015	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lee 2014	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y



First author, year	1	2	3	4	5a	5b	6	7	8	9	10a	10b	11
	A priori	Duplicate	Comprehensive	Grey literature	Included (relaxed)	Included (strict)	Characteristics	Quality assessment	Quality conclusion	Meta-analysis	Bias (relaxed)	Bias (strict)	Conflict/funding
Lewin 2010	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y
Little 2014	Y	Y	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Lizarondo 2010	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Loures 2010	Y	N	Y	Y	N	N	N	N	NA	NA	N	N	N
Ma 2016	Y	Y	Y	N	Y	N	Y	Y	Y	Y	NA	NA	Y
Malarcher 2011	Y	N	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Maravilla 2016	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Martínez-Donate 2009	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
McCullum 2016	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Mdege 2013	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Mercer 2014	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Miyake 2017	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Mutamba 2013	Y	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y
Mwai 2013	Y	N	Y	N	Y	N	Y	Y	Y	NA	Y	N	Y
Noordam 2014	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Norris 2006	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Oyo-lta 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Paintain 2014	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Pallas 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Palmas 2015	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y
Patel 2010	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Pereira 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Peterson 2014	Y	Y	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Postma 2009	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Prost 2013	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y
Rahman 2013	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y
Raphael 2013	Y	Y	Y	N	Y	N	Y	Y	Y	NA	Y	N	Y
Reisman 2016	Y	N	Y	Y	Y	N	Y	N	NA	NA	Y	N	Y
Rhodes 2007	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Ribeiro Sarmento 2014	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Ruizendaal 2014	Y	Y	Y	N	Y	N	Y	Y	Y	NA	N	N	Y
Sazawal 2003	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Schneider 2016	Y	Y	Y	N	N	N	Y	N	NA	NA	Y	N	Y
Scott 2015	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Shommu 2016	Y	N	Y	Y	Y	N	Y	N	NA	NA	N	N	Y
Sibley 2006	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Sibley 2012	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y

First author, year	1	2	3	4	5a	5b	6	7	8	9	10a	10b	11
	A priori	Duplicate	Comprehensive	Grey literature	Included (relaxed)	Included (strict)	Characteristics	Quality assessment	Quality conclusion	Meta-analysis	Bias (relaxed)	Bias (strict)	Conflict/funding
Silveira Feyer 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Singla 2017	Y	N	Y	N	Y	N	Y	N	NA	Y	N	N	Y
Small 2013	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y
Smith 2016	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
South 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Stacciarini 2012	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Stanhope 2013	Y	N	Y	N	N	N	N	Y	Y	NA	N	N	N
Sunguya 2017	Y	N	Y	Y	Y	N	Y	N	NA	NA	N	N	Y
Tso 2016	Y	Y	Y	N	Y	N	Y	Y	Y	Y	NA	NA	Y
Van Ginneken 2013	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vaughan 2015	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Viswanathan 2009	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y
Vouking 2013	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Wadler 2011	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Wahlbeck 2017	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Wells 2011	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y
WHO/GHWA 2010	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Wilson 2011	Y	Y	Y	N	Y	N	Y	Y	Y	Y	N	N	Y
Winch 2005	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Wouters 2012	Y	Y	Y	Y	Y	N	Y	Y	Y	NA	Y	N	Y
Wu 2017	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR
Zhou 2016	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y
Zulu 2014	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR



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