
REVIEW

Which intervention design factors influence performance of community health workers in low- and middle-income countries? A systematic review

Maryse C Kok,^{1*} Marjolein Dieleman,¹ Miriam Taegtmeier,² Jacqueline EW Broerse,³ Sumit S Kane,¹ Hermen Ormel,¹ Mandy M Tijn¹ and Korrie AM de Koning¹

¹KIT Health, Royal Tropical Institute, Amsterdam, The Netherlands, ² Department of International Public Health, Liverpool School of Tropical Medicine, Liverpool, UK and ³ Athena Institute, VU University, Amsterdam, The Netherlands

*Corresponding author. Royal Tropical Institute (KIT), P.O. Box 95001, 1090 HA Amsterdam, The Netherlands. E-mail: Maryse.kok@kit.nl

Accepted 30 October 2014

Community health workers (CHWs) are increasingly recognized as an integral component of the health workforce needed to achieve public health goals in low- and middle-income countries (LMICs). Many factors influence CHW performance. A systematic review was conducted to identify intervention design related factors influencing performance of CHWs. We systematically searched six databases for quantitative and qualitative studies that included CHWs working in promotional, preventive or curative primary health services in LMICs. One hundred and forty studies met the inclusion criteria, were quality assessed and double read to extract data relevant to the design of CHW programmes. A preliminary framework containing factors influencing CHW performance and characteristics of CHW performance (such as motivation and competencies) guided the literature search and review.

A mix of financial and non-financial incentives, predictable for the CHWs, was found to be an effective strategy to enhance performance, especially of those CHWs with multiple tasks. Performance-based financial incentives sometimes resulted in neglect of unpaid tasks. Intervention designs which involved frequent supervision and continuous training led to better CHW performance in certain settings. Supervision and training were often mentioned as facilitating factors, but few studies tested which approach worked best or how these were best implemented. Embedment of CHWs in community and health systems was found to diminish workload and increase CHW credibility. Clearly defined CHW roles and introduction of clear processes for communication among different levels of the health system could strengthen CHW performance.

When designing community-based health programmes, factors that increased CHW performance in comparable settings should be taken into account. Additional intervention research to develop a better evidence base for the most effective training and supervision mechanisms and qualitative research to inform policymakers in development of CHW interventions are needed.

Keywords Community health workers, low- and middle-income countries, performance, systematic review

KEY MESSAGES

- A systematic review of 140 quantitative and qualitative studies identified factors related to the nature of tasks and time spent on delivery, human resource management, quality assurance, links with the community, links with the health system and resources and logistics having an influence on CHW performance.
- Good performance was associated with intervention designs involving a mix of incentives, frequent supervision, continuous training, community involvement and strong co-ordination and communication between CHWs and health professionals, leading to increased credibility of CHWs.
- When designing CHW programmes, policymakers should take into account factors that increased CHW performance in comparable settings, to maximize programme outcomes.

Introduction

Countries across the globe are striving to achieve universal health coverage. There is a massive shortage of 4.25 million health workers in Africa and Asia, while the distribution of existing health workers within countries is inequitable (WHO 2006). In response to the human resources for health crisis, many countries have made renewed investments in community health worker (CHW) programmes to extend the reach of inadequate health systems to hard-to-reach and underserved populations, and to expand coverage of key interventions.

A CHW has been defined as ‘any health worker carrying out functions related to health care delivery; trained in some way in the context of the intervention, and having no formal professional or paraprofessional certificate or degree in tertiary education’ (Lewin *et al.* 2010, p. 7). In addition, it is argued that CHWs ‘should be members of the communities where they work, should be selected by the communities, should be answerable to the communities for their activities, should be supported by the health system but not necessarily a part of its organization and have shorter training than professional workers’ (Lehmann and Sanders 2007, p. 1). There are many different types of CHWs and different names are used, like lay health workers (LHWs), a synonym for CHWs in this article, and traditional birth attendants (TBAs), who are focusing particularly on maternal health tasks. CHWs may operate in the public or private sectors, respond to single or multiple diseases and health issues and show differences in their levels of knowledge and training, their practice settings and remuneration and their relationship with regulatory systems (Bloom *et al.* 2001). CHWs are part of the broader group of close-to-community providers, who are health workers forming the first point of contact at community level, having up to 3 years paraprofessional training, so this group includes auxiliary staff.

Evidence shows that CHW programmes can effectively deliver key maternal and child health interventions in primary and community health care, including interventions to increase childhood immunization and breastfeeding rates (Lewin *et al.* 2010). As governments are increasingly strengthening their health systems through the use of CHWs (Earth_Institute 2012; GHWA 2012), there is a need to better understand the factors that may influence CHW performance. Policymakers and implementers need to know ‘why’ CHWs are effective or not and ‘which’ specific factors contribute to that. Existing studies show that CHW services could be enhanced by measures regarding recruitment, workload and retention policies (Prasad and Muraleedharan 2007; Campbell and Scott 2011; Jaskiewicz

and Tulenko 2012). CHWs’ motivation could be enhanced by policies on incentives, career perspectives and supervision. In addition, basic training and continuing education have been reported to have an influence on CHW performance (Lehmann and Sanders 2007; Hermann *et al.* 2009; Bhutta *et al.* 2010; ERT2 2012; Glenton *et al.* 2013; Palazuelos *et al.* 2013). Community support can also enhance CHW performance (ERT1 2012).

We conducted a systematic review on intervention design factors influencing performance of CHWs, to contribute to the evidence base needed by policymakers in the development of CHW programmes.

Methodology

This review, conducted in 2013, was undertaken using a framework approach (Dixon-Woods 2011). Based on reading of selected international literature (Chen *et al.* 2004; Haines *et al.* 2007; Bhutta *et al.* 2010; Kane *et al.* 2010; ERT1 2012; ERT2 2012; ERT3 2012; Palazuelos *et al.* 2013), factors that could potentially influence CHW performance and their (inter)relationships were identified; this resulted in a preliminary conceptual framework (Figure 1). This initial framework was used as the basis for data extraction and for the categorization of findings, and divides factors influencing CHW performance into three main categories:

- (1) Broad contextual factors, including those related to community and political contexts
- (2) Health system factors
- (3) Intervention design factors

In this review, we limit ourselves to presenting factors related to intervention design. Broad contextual factors and health system factors influencing CHW performance will be presented in a separate article.

Criteria for considering studies for this review

We included quantitative and qualitative studies that concerned CHWs working in promotional, preventive or curative primary health care in low- and middle-income countries (LMICs). The studies should have described a factor related to intervention design. The review covered studies including: CHWs, their clients and their families/carers, CHW supervisors, the wider community, policymakers, programme managers, other

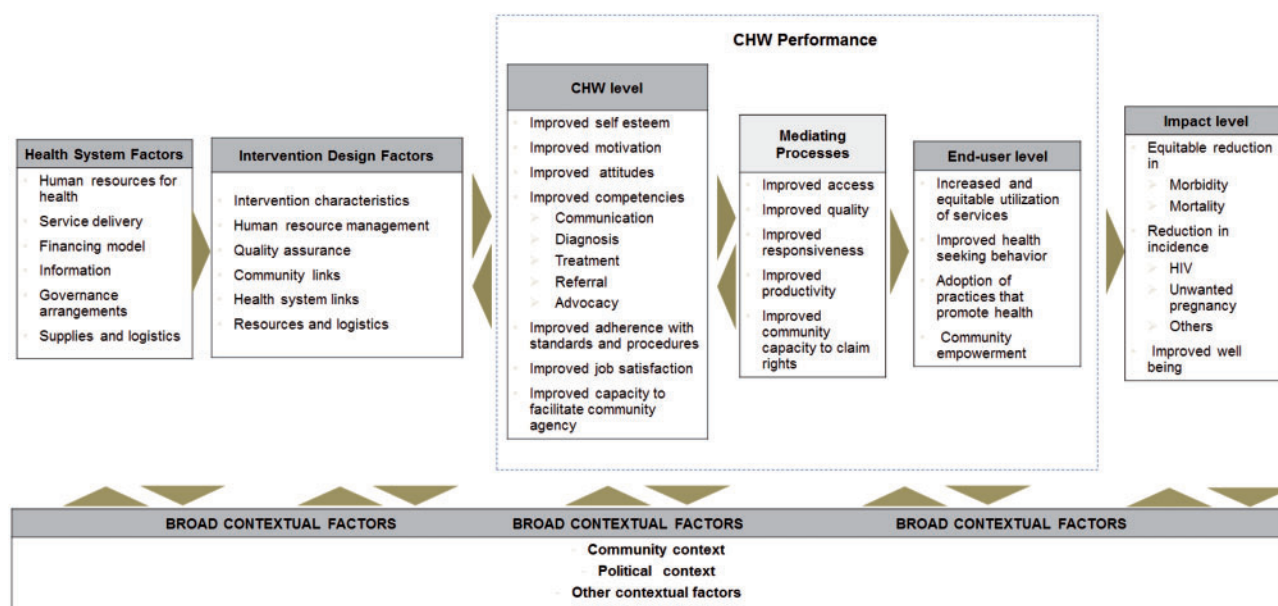


Figure 1 Preliminary conceptual framework of factors influencing CHW performance

(professional) health workers and any others directly involved in or affected by CHW service provision. We differentiated CHW performance outcome measures at three levels (Figure 1): CHW level, mediating processes and end-user level. The CHW level outcomes indicate mechanisms and characteristics of performance at the CHW level, such as self-esteem, motivation, attitudes, competencies, adherence to standards and procedures, job satisfaction and capacity to facilitate community agency. Among these mechanisms and characteristics of performance, motivation and job satisfaction are especially interrelated. Motivating factors determine the level of motivation and satisfaction. Greater job satisfaction is often associated with higher levels of motivation, but it is not a prerequisite for motivation. Motivation is a critical component of performance (Franco *et al.* 2002). Performance outcome at the CHW level was taken as the focus of the review. In our preliminary framework, CHW level outcomes contribute to end-user outcomes such as utilization of services, health-seeking behaviour, adoption of practices that promote health and community empowerment. Mediating processes, such as access, quality, responsiveness, productivity and community capacity to claim rights, all contribute to end-user outcomes. The three outcome levels that constitute CHW performance are intermediary outcomes and ultimately contribute to reduction of morbidity, mortality, incidence of disease or other conditions and to improved health status and well-being (Figure 1).

Search methods for identification of studies

We searched EMBASE, PubMed, Cochrane, CINAHL, POPLINE and NHS-EED for eligible studies. The search strategy focused on broad contextual, health system and intervention design factors influencing performance of close-to-community providers. This study was part of a research program investigating performance of close-to-community providers of which CHWs constitute an important part. For the purpose of this article, we

focus on CHWs, as the largest amount of evidence on intervention design factors influencing performance was related to CHWs. We used existing search strategies on LHWs (Lewin *et al.* 2010) and adapted these to include the broader focus of our study (Supplementary Appendix 1). We included English language studies from 2007 to July 2013. Reviews and cost-effectiveness studies were not included, but used for hand searching of reference lists. To avoid duplication, we did not include studies that had been previously included in the review of Glenton *et al.* (2013)¹ and included results of this review in the discussion.

Selection of studies

Two reviewers independently assessed titles and abstracts of identified documents to evaluate potential eligibility. An overview of inclusion criteria is provided in Box 1. In case of diverging opinions, inclusion was discussed until consensus was reached. Persisting disagreements were resolved by seeking a third reviewer's opinion. Full-text papers were assessed by two reviewers out of a team of four.

Box 1. Overview of inclusion criteria

- Quantitative and qualitative studies on CHWs
- Studies describing factors related to intervention design
- Studies conducted in LMICs
- English language studies
- Studies published 2007–July 2013

Data extraction and management

A data extraction form was developed from the preliminary conceptual framework. This was piloted through joint

assessment of several studies and adjustments were made to clarify categories and sub-categories of the intervention design factors assumed to influence CHW performance (Figure 1, second box from left). The data extraction form also contained a description of the intervention and study and the outcome measures.

Assessment of quality

Quality of included literature was assessed independently by two reviewers, using an adapted version of the Critical Appraisal Skills Programme (CASP) method (CASP 2010).

Data synthesis

Identification of themes was done by assessment of all data extraction forms. Descriptive analysis of the contents of all included papers was conducted per category (thematic coding). New (sub)categories deriving from the literature were added to the framework where needed.

Results

Search results and study types

We identified 7302 titles from 2007 to July 2013, of which 660 were selected for abstract reading. From these, a total of 348 full-text papers were read. Another set of 109 full-text papers derived from hand searching of reviews was read (Figure 2). In total, 150 papers were included in the broader literature review and for the purpose of the review we present in this article, 140 papers were included, as we excluded seven papers reporting on auxiliary staff and three papers only reporting on broad contextual factors or health system factors. A list of included studies and their basic characteristics can be found in Supplementary Appendix 2. A total of 45 studies were of

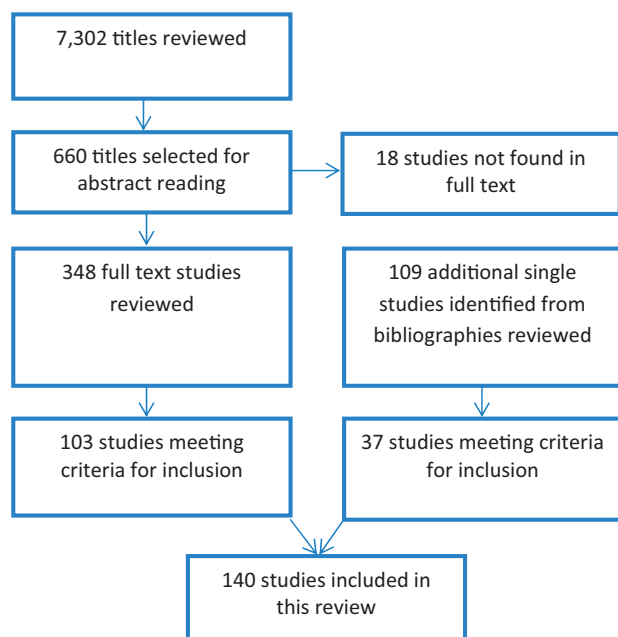


Figure 2 Flowchart search results

qualitative nature, 45 studies used mixed methods research and there were 50 quantitative studies. One hundred and six studies were intervention evaluations while 34 studies did not report on an intervention.

Study respondents

Ninety-seven studies included perspectives of people involved in the CHW programme. In 83 studies, the CHWs themselves were asked for their perspectives, client perspectives were covered in 50 studies and perspectives of others (like policymakers and health workers other than CHWs) were presented in 47 studies. The studies that did not include perspectives focused either on CHWs as the object of the study or on the effects (at the impact level) of a particular intervention (partly) delivered by CHWs. The majority of these were quantitative studies.

Setting

Eighty-three studies were conducted in Africa and 55 in Asia, one was from Oceania and two included Latin America (of which one was part of a multi-country study). The studies and interventions took place in rural (majority) and urban settings. The programmes were run by either Non-Governmental Organizations (NGOs) or governments or a collaboration of both. In 100 studies, the CHWs delivered services to people in their homes and/or in the community. In 40 studies, CHWs delivered services in health facilities; in most of these ($n=28$), facility-based services were combined with home or community-based services. CHWs solely working at the facility level were most often lay counsellors in the field of HIV.

CHW names

Many different names of CHWs were found. For an overview of the ones used in this article, see Table 1.

Health focus and CHW tasks

Seventy-six studies reported on CHWs with various promotional and preventive tasks in primary health care. These included studies on CHWs having a role in the identification of health conditions and referral to health facilities, for example, in the case of pregnancy. Fifty-one studies reported CHWs having a mix of promotional, preventive and curative tasks. For example, CHWs were involved in diagnosis and treatment of diseases, mainly in children below 5 years, at the community level. Ten studies reported on CHWs with solely curative tasks and three studies did not specify the nature of CHWs' tasks. Fifty-five studies focused on maternal, neonatal or child health or a combination of these. If there was a focus on a single disease or issue, most of the times this was HIV ($n=26$), malaria ($n=9$), promotion of family planning ($n=7$) or tuberculosis ($n=3$). Eight studies focused on other specific diseases or conditions. Twenty-nine studies reported on CHWs having tasks regarding multiple diseases or health issues. A number of studies included trained TBAs assisting deliveries at the household level.

Outcomes of CHW interventions

The majority ($n=99$) of the included studies reported outcomes at the level of the CHW. Fifty-six studies reported changes in

Table 1 Names used for CHWs

Name	Description of tasks	Country
Accredited Social Health Activists (ASHAs)	Multiple tasks	India
Adherence Support Workers (ASWs)	Supporting antiretroviral treatment (ART) adherence	Zambia
'Behvarz'	Multiple tasks	Iran
Care Facilitators (CFs)	HIV home-based care	Zimbabwe
Community Antiretroviral therapy and Tuberculosis Treatment Supporters (CATTS)	HIV and tuberculosis (TB) treatment support	Uganda
Community Based Distributors (CBDs)	Providing injectable contraceptives in the community	Madagascar
	Distribution of contraceptives	Guinea, India
Community-Based Surveillance Volunteers (CBSVs)	Multiple tasks	Ghana
Community Drug Distributors (CDDs)	Distribution of ivermectin for onchocerciasis control	Ethiopia
Community Facilitators (CFs)	Multiple tasks	Indonesia
Community Health Volunteers (CHVs)	Working in child health or reproductive health and family planning	Madagascar
Community Health Workers (CHWs)	Multiple tasks	Various countries
Community home-based care workers	HIV-related prevention and care	South Africa
Community Medicine Distributors (CMDs)	Malaria treatment	Uganda
Community Reproductive Health Workers (CRHWs)	Promotion and distribution of family planning (methods)	Uganda
Community Volunteer Workers (CVWs)	Palliative home-based AIDS/cancer care	Uganda
Health Extension Workers (HEWs)	Multiple tasks	Ethiopia
Health Surveillance Assistants (HSAs)	Multiple tasks	Malawi
Lady health workers	Multiple tasks	Pakistan
Lay counsellors	HIV counselling	Various countries
Lay Health Workers (LHWs)	TB-related tasks	South Africa
Lay Health Workers (LHWs) (as synonym of CHWs)	Multiple tasks	Various countries
'Manzaneras'	Multiple tasks	Bolivia
Maternal Health Workers (MHWs)	Promotion, prevention and curative tasks regarding maternal health	Myanmar
Peer educators	Reproductive health (promotion)	Tanzania
'Shasthya Shebikas'	Multiple tasks	Bangladesh
Traditional Birth Attendants (TBAs)	Maternal and neonatal health related tasks, sometimes including delivery	Various countries

performance through measuring competencies and knowledge levels. For example, in Nepal, a significantly higher self-efficacy and knowledge level of peer educators on HIV and AIDS was measured after training (Posner *et al.* 2009). Assessments of quality scores per community-based distributor (CBD) providing injectable contraceptives in Madagascar demonstrated that CBDs retained information taught during training (Hoke *et al.* 2008). Among children treated by CHWs in Kenya, 80% of all guideline-recommended procedures were performed correctly (Rowe *et al.* 2007a,b). Some studies measured job satisfaction or retention (which is related to performance at the CHW programme level (Willis-Shattuck *et al.* 2008) as outcome measures at the CHW level. For example, CHWs in an urban setting in China who experienced a heavy workload had a low job satisfaction (Ge *et al.* 2011).

Forty-one studies reported on changes in performance as a result of self-reported variations in motivation or self-esteem. For example, Community-based surveillance volunteers (CBSVs) in Ghana explained that respect of the community

had enhanced their motivation; they felt pride in their role as a volunteer (Dil *et al.* 2012). Improvement in self-esteem as a result of increased respect from the community was reported by community volunteer workers (CVWs) providing palliative home-based care in Uganda (Jack *et al.* 2012).

Intervention design factors

The literature reported on various factors related to the design of the CHW interventions having an effect on CHW performance. We divided these into factors related to: nature of tasks and time spent on delivery, human resource management, quality assurance, community links, health system links and resources and logistics.

Nature of tasks and time spent on delivery

Several factors influencing CHW performance were related to the nature of CHW tasks and the time spent on delivery. Only seven studies reported on this, as presented in Table 2.

Table 2 Factors related to nature of tasks and time spent on delivery

Factor	Detail on influence or association	Studies
Nature of tasks and roles	Extended tasks (curative, injections) increased CHW's self-reported motivation	Burn (2008), Callaghan-Koru <i>et al.</i> (2012), Hoke <i>et al.</i> (2008), and Sadler <i>et al.</i> (2011)
	Higher number of perceived responsibilities increased CHW performance	Smith <i>et al.</i> (2013)
	Flexibility in tasks: may lessen impact at end user or impact level but may contribute to CHW retention	Brenner <i>et al.</i> (2011)
Service delivery time	Longer service delivery time associated with higher CHW performance	Furth and Crigler (2012)
Time spend on job	More time spend on job per week associated with higher CHW performance	Smith <i>et al.</i> (2013)

Four studies reported that CHWs felt more recognized by the community, enhancing their motivation, when they provided curative tasks or administered injections. For example, health surveillance assistants (HSAs) in Malawi providing curative treatment to children below 5 years, strongly indicated that this added role changed how they viewed their own position in the health system. With the new role, the community recognized them as 'village doctors', and they viewed themselves as more equal to clinicians. They reported helping the community and increased appreciation of the community as a result of by their new curative role as motivating factors. However, a demotivating factor for some was the fact that they were not able to treat complicated cases (Callaghan-Koru *et al.* 2012). Smith *et al.* (2013) found that community health volunteers (CHVs) in Madagascar performed slightly better if they perceived that they had more responsibilities when compared to CHVs perceiving to have fewer responsibilities (Smith *et al.* 2013). Flexibility in tasks was discussed as a factor that could contribute to CHW retention in Uganda, although it could also lead to neglect of certain health issues within the programme (Brenner *et al.* 2011).

One study found a significant correlation between the time spent on each client and performance of CHWs in Zambia. The moderate to low performing CHWs corresponded to very short client contact times (Furth and Crigler 2012). Another study found a correlation between the time spent on the job and performance of CHWs working in reproductive health in Madagascar: a higher number of hours worked as a CHW per week was associated with better performance scores in relation to competencies, measured as tasks correctly undertaken for child illnesses and family planning (Smith *et al.* 2013).

In summary, having more curative tasks was found to increase CHW motivation and longer service delivery time and time spent on the job were associated with higher CHW performance.

Human resource management

The literature identified many factors related to human resource management that could influence CHW performance. We categorized them into eight broad categories: CHW characteristics, workload, clarity on CHW tasks and roles, selection and recruitment process, incentives, supervision, performance appraisal and training-related factors.

CHW characteristics

Performance of CHWs can be influenced by the characteristics of the CHWs that were recruited and implementing the

intervention. Therefore, we considered them as potential intervention design factors (although in many studies, they were not predefined as intervention design factors). Relevant characteristics identified in the literature were: gender, education level, years of experience, personal experience with the health condition, community of origin, age, household duties, marital status, social class and wealth (Table 3).

Gender of the CHWs was discussed in four studies. A study on CHWs in Kenya found that male CHWs were 1.6 times more likely to keep better records than female CHWs, while females were 58% more likely to counsel and 71% more likely to be able to convince their clients to adopt evidence-based maternal care practices than men (Crispin *et al.* 2012). A study on community antiretroviral therapy and tuberculosis treatment supporters (CATTs) in Uganda, using a regression model to identify characteristics of CATTs that influenced loss to follow up, found that male CATTs lost more patients for follow up than female CATTs (Alamo *et al.* 2012). Kebriaei and Moteghedhi (2009) measured job satisfaction of 'behvarz' (CHWs) in Iran by conducting a cross-sectional survey and found there was no difference between males and females in job satisfaction (one of the direct determinants of CHW performance, see Figure 1).

The education level of CHWs as a possible influencing factor on CHW performance was researched in five studies. For example, higher levels of education of CHWs in Kenya were associated with good record-keeping, appropriate use of job aids and appropriately counselling clients, although lower literacy CHWs were still able to satisfy and convince their clients to adopt evidence-based maternal care practices (Crispin *et al.* 2012). CHVs working in reproductive health in Madagascar were performing better in correctly executing their tasks in diagnosis and treatment of childhood illnesses, reproductive health and family planning when they had more years of education (Smith *et al.* 2013). More years of education may lead to better performance but may also lead to a higher dropout rate. 'Shasthya Shebikas' in Bangladesh who dropped out of the programme were more often higher educated (Alam *et al.* 2012b). In Iran, no difference in job satisfaction based on education level of 'behvarz' was found (Kebriaei and Moteghedhi 2009).

More years of experience as a CHW was associated with appropriate use of job aids, client satisfaction and client enablement in Kenya (Crispin *et al.* 2012). However, CATTs in Uganda who had served >6 years lost more patients than CATTs who had served < 6 years (Alamo *et al.* 2012). In Iran, no difference in job satisfaction based on years of service of 'behvarz' was found (Kebriaei and Moteghedhi 2009).

Table 3 Factors related to CHW characteristics

Factor	Detail on influence or association	Studies
Gender	Performance regarding specific types of tasks could differ between male and female CHWs No difference in job satisfaction between male – female	Alamo <i>et al.</i> (2012), Crispin <i>et al.</i> (2012), and Kebriai and Moteghedhi (2009)
Education	More years of education CHWs associated with higher performance Dropouts more often higher educated No difference in job satisfaction based on education level	Alam <i>et al.</i> (2012b), Crispin <i>et al.</i> (2012), Kebriai and Moteghedhi (2009), Rowe <i>et al.</i> (2007a), and Smith <i>et al.</i> (2013)
Experience (years)	Mixed picture regarding experience and CHW performance No difference in job satisfaction based on experience	Alamo <i>et al.</i> (2012), Crispin <i>et al.</i> (2012), and Kebriai and Moteghedhi (2009)
Experience (with the health condition)	Experience regarding health condition could improve CHW performance	Jack <i>et al.</i> (2012), Kim <i>et al.</i> (2012b), and Torpey <i>et al.</i> (2008)
Residence/ community of origin	CHWs from community of origin could have more trust of clients, enhancing performance CHWs not from community of origin might be preferred in case of HIV related programmes	Puett <i>et al.</i> (2013), Simwaka <i>et al.</i> (2012), Smith <i>et al.</i> (2007), and Alamo <i>et al.</i> (2012)
Age	Mixed picture regarding age and CHW performance No difference in job satisfaction based on age	Alam <i>et al.</i> (2012a), Counihan <i>et al.</i> (2012), Crispin <i>et al.</i> (2012) Kebriai and Moteghedhi (2009), and Olang'o <i>et al.</i> (2010)
Household duties	Fewer household duties resulted in more active CHWs and less dropouts	Alam <i>et al.</i> (2012b) and Olang'o <i>et al.</i> (2010)
Marital status	Mixed picture regarding marital status and CHW performance No difference in job satisfaction based on marital status	Alam <i>et al.</i> (2012b), Kebriai and Moteghedhi (2009), and Simba and Kakoko 2009
Social class	Mixed picture regarding social class and CHW performance	Abbott and Luke (2011) and Srivastava <i>et al.</i> (2009)
Wealth	CHWs depending on CHW income more active and poorer CHW less likely to dropout	Ahmed (2008), Alam <i>et al.</i> (2012a), and Alam <i>et al.</i> (2012b)

Three studies reported on the influence of the experience of the CHW with the health condition of their clients. For example, CVWs delivering AIDS or cancer-related palliative care in Uganda reported that having personal experience with these diseases increased compassion for the patients (Jack *et al.* 2012). A mixed methods study on adherence support workers (ASWs) in Zambia who were living with HIV reported that ASWs had stronger bonding with clients and hence increased client adherence (Torpey *et al.* 2008).

The community of origin of the CHW is another factor that could be associated with CHW performance. CHWs that came from the community that they are serving were reported to be more trusted by that community, which could influence their performance (Puett *et al.* 2013; Simwaka *et al.* 2012; Smith *et al.* 2007). However, in Uganda, some community members preferred CATTs that lived further away and did not visit their home because of the stigma related to HIV (Alamo *et al.* 2012).

The age of CHWs was studied in five papers. The age-group of 30–40 years appeared to be the most appropriate for selection of Kenyan CHWs to obtain optimum results. Younger and much older CHWs had sub-optimal performance (Crispin *et al.* 2012). CHWs older than 50 performed less well in working with rapid diagnostic tests for malaria in Zambia (Counihan *et al.* 2012). However, Alam *et al.* (2012a) reported that older 'Shasthya Shebikas' in Bangladesh were more likely to be active than younger colleagues. Kebriai and Moteghedhi (2009) found no difference in job satisfaction based on age of 'behvarz'.

CHWs in Kenya reported fewer dropouts among CHWs above the age of 40, possibly because older people had fewer household duties (Olang'o *et al.* 2010). Alam *et al.* (2012b) confirmed this assumption: 'Shasthya Shebikas' in Bangladesh who did not face problems due to household responsibilities were more than twice as likely to stay on.

Peer educators in reproductive health in Tanzania were reported to have a higher chance of dropping out if they were married women. This was explained to be due to girls getting married and following their husbands to live somewhere else or not being allowed by their husbands to continue their work as peer supporters (Simba and Kakoko 2009). In contrast to this, Alam *et al.* (2012b) found that single 'Shasthya Shebikas' in Bangladesh had a higher dropout rate than married peers. In Iran, no difference in job satisfaction was found between married and unmarried 'behvarz' (Kebriai and Moteghedhi 2009).

In India, female CBDs from upper social classes (castes) established an easy relationship with middle and higher cast women but had real problems making services accessible for women with a significantly lower social status (Abbott and Luke 2011). However, Srivastava *et al.* (2009) reported that Accredited Social Health Activists (ASHAs) stated that they were called by all castes and religious groups.

The wealth of CHWs could also influence performance. 'Shasthya Shebikas' in Bangladesh who reported to be dependent on the income they earned through their work as CHW were more active than colleagues with other jobs (Ahmed 2008; Alam *et al.* 2012b). Moreover, richer 'Shasthya Shebikas' more often dropped out of the programme (Alam *et al.* 2012a, b).

In summary, CHWs with a higher education level, CHWs having experience with the health condition they focus on, CHWs having fewer household duties and CHWs who are depending on the income gained from the CHW work were found to perform better than others. Gender, residence, age, marital status and social class of the CHW had mixed effects on CHW performance.

Workload

In 14 studies, a high workload was reported by CHWs, and this could result in lower motivation and ultimately lower performance (Burn 2008; Kebriaei and Moteghedhi 2009; Perez *et al.* 2009; Lewis 2010; Rahman *et al.* 2010; Ge *et al.* 2011; Gusdal *et al.* 2011; Javanparast *et al.* 2011; Alamo *et al.* 2012; Callaghan-Koru *et al.* 2012; Kalyango *et al.* 2012; Medhanyie *et al.* 2012; Puchalski Ritchie *et al.* 2012; Kok and Muula 2013). The CHW-population ratio is a factor that can influence performance of CHWs. Several studies indicated that a small population to cover is preferable above a large population to cover regarding CHW performance (Edward *et al.* 2007; Suri *et al.* 2007; Burn 2008; Azad *et al.* 2010; Darmstadt *et al.* 2010; Sadler *et al.* 2011; Kalyango *et al.* 2012). A high number of patients to be supported by CATTs in Uganda was significantly associated with increased loss to follow up (Alamo *et al.* 2012).

Clarity on CHW tasks and roles

Few studies reported that the lack of clarity on roles amongst CHWs themselves or in the community affected CHW performance. A study on ASHAs in India found that ASHAs' perceptions about job responsibilities were more limited than their formal job descriptions. The majority of them were not aware about their role in changing behaviour regarding infant feeding, family planning, child marriage, girl education, hand washing and sanitation. Possibly this was related to the fact that for these particular tasks, ASHAs were not paid (Srivastava *et al.* 2009). CBSVs in Ghana reported community-related challenges of their work, because of a lack of community understanding of the duties of a CBSV (Dil *et al.* 2012). In Bolivia, a lack of community understanding of the role of 'manzaneras' was reported to cause distrust, because district health authorities and local leaders failed to advertise 'manzaneras' roles in the community (Bartos *et al.* 2009).

CHWs gained more respect in general if they were able to prescribe drugs, but sometimes this could lead to community expectations that could not be met (Table 7). For example, in Malawi, HSAs working in community case management of childhood illnesses were asked by community members to also treat adults, which was not included in the programme (Callaghan-Koru *et al.* 2012). Kalyango *et al.* (2012) also refer to a lack of community appreciation for age restrictions, which had a negative impact on performance of CHWs in Uganda. Client demands were also a challenge in Zambia, where clients still asked for anti-malarial treatment in spite of a negative test result (Chanda *et al.* 2011). CHWs in Kenya working in home-based care on HIV reported that expectations of people living with HIV about CHWs delivering them goods or money were reasons for CHW dropout (Olang'o *et al.* 2010). CHWs in South Africa reported similar expectations of the community as a demotivating factor (Suri *et al.* 2007).

In summary, we found that a lack of clarity on CHW tasks and roles, especially from the side of the community, lowered motivation and performance of CHWs.

Selection and recruitment process

Sixty-two studies clearly indicated who selected and recruited CHWs, although often the exact process and criteria were not explained. In a total of 36 studies, communities were involved in CHW selection. Nine studies referred to the positive influence of community selection on CHW's motivation or performance (Table 7). For example, CBSVs in Ghana reported that being selected by the community influenced their sense of duty as well as the pride they felt for their role and motivation (Dil *et al.* 2012). However, CHWs in Kenya, who reported to be selected by the community, did not show any difference in guideline adherence when compared to CHWs who reported no community involvement in selection (Rowe *et al.* 2007a). Selection was not always conducted as prescribed. ASHAs in India, who were supposed to be selected by the community, were often selected by auxiliary nurse midwives without community consultation, leading to ASHAs being seen as accountable to the health system and not to the community (Scott and Shanker 2010; Srivastava *et al.* 2009). The same was reported for community drug distributors (CDDs) in Ethiopia (Yirga *et al.* 2010).

Incentives

Eighty-one studies presented information on incentives given to CHWs. Factors influencing CHW performance related to incentives are presented in Table 4. There were a range of different incentives, sometimes combined in packages including: financial incentives, such as fixed salaries for those CHWs that were employees of the government or an NGO, regular and irregular allowances, performance based financial incentives, income from selling services (fees) and income from selling commodities, and non-financial incentives, such as material incentives (goods, rewards), access to training, supervision and supplies, preferential treatment and community trust and respect. (Dis)satisfaction related to incentives could lead to lower or higher motivation and influence CHW performance. In 25 studies, CHWs reported that they were dissatisfied with the incentives they received, whether financial or non-financial. Sixteen studies reported CHWs' satisfaction with incentives.

Remuneration was often reported as an important (de)motivator. However, other incentives remained important. For example, an evaluation of a CHW programme in Kenya revealed that 65% of the interviewed CHWs acknowledged that reimbursements motivated them to continue serving while others said that material incentives contributed to motivate them (38.5%) or would improve their motivation (76%). In some studies, CHWs reported to prefer financial above non-financial incentives (Rahman and Tasneem 2008; Bartos *et al.* 2009). ASHAs in India reported financial incentives (82%), being in a government job (67%), contributing to charity (44%) and improved self-esteem (37%) as motivating factors. The majority of ASHAs were satisfied and 44% reported to be willing to continue without incentives (Srivastava *et al.* 2009). HSAs in Malawi were demotivated because they had to spend

Table 4 Factors related to incentives

Factor	Detail on influence or association	Studies
Financial incentives	Financial incentives increased motivation	Bartos <i>et al.</i> (2009), Callaghan-Koru <i>et al.</i> (2012), Lewis (2010), Rahman and Tasneem (2008), and Srivastava <i>et al.</i> (2009)
	CHWs getting financial incentives performed better than CHWs receiving in-kind incentives	Furth and Crigler (2012)
	CHW perceiving they get financial incentives performed better on guideline adherence	Rowe <i>et al.</i> (2007a)
	CHWs selling commodities for income faced competition: CHWs less active but no influence on retention	Alam <i>et al.</i> (2012a, b), Rahman and Tasneem (2008), and Winch <i>et al.</i> (2008)
	Performance-based incentives led to decreased performance regarding certain tasks	Scott and Shanker (2010) and Srivastava <i>et al.</i> (2009)
	Unmet promises regarding financial incentives led to demotivation	Dil <i>et al.</i> (2012), Maes and Kalofonos (2013), and Yirga <i>et al.</i> (2010)
Non-financial incentives	Community trust, respect and recognition: enhanced motivation/self-esteem/retention/self-assessed performance/adherence to guidelines	Ahmed (2008), Alam <i>et al.</i> (2012a, b), Amare (2011), Burn (2008), Callaghan-Koru <i>et al.</i> (2012), Chibanda <i>et al.</i> (2011), Das <i>et al.</i> (2008), Dawson <i>et al.</i> (2008), Dil <i>et al.</i> (2012), Furth and Crigler (2012), Hill <i>et al.</i> (2008), Jack <i>et al.</i> (2012), Javanparast <i>et al.</i> (2011), Kalyango <i>et al.</i> (2012), Kim <i>et al.</i> (2012b), Lewis (2010), Maes and Kalofonos (2013), McPherson <i>et al.</i> (2010), Mutalemwa <i>et al.</i> (2009), Nyanzi <i>et al.</i> (2007), Osawa <i>et al.</i> (2010), Rahman and Tasneem (2008), Razee <i>et al.</i> (2012), Rowe <i>et al.</i> (2007a), Sahay and Mehendale (2011), Saleem <i>et al.</i> (2007), Saravanan <i>et al.</i> (2011), Scott and Shanker (2010), Smith <i>et al.</i> (2013), Srivastava <i>et al.</i> (2009), Takasugi and Lee (2012), Teela <i>et al.</i> (2009), and Yirga <i>et al.</i> (2010)
	Lack of community trust: led to lower CHW motivation/performance	Bartos <i>et al.</i> (2009), Dick <i>et al.</i> (2007), Moetlo <i>et al.</i> (2011), Nyanzi <i>et al.</i> (2007), and Schneider <i>et al.</i> (2008)
	Willingness to help reported as motivating factor/increasing self-esteem	Behdjat <i>et al.</i> (2009), Burn (2008), Callaghan-Koru <i>et al.</i> (2012), Dil <i>et al.</i> (2012), Elmardi <i>et al.</i> (2009), Furth and Crigler (2012), Gusdal <i>et al.</i> (2011), Jack <i>et al.</i> (2012), Javanparast <i>et al.</i> (2011), Mukherjee and Eustache (2007), Nyanzi <i>et al.</i> (2007), Rahman and Tasneem (2008), Rahman <i>et al.</i> (2010), Root and van Wyngaard (2011), Rowe <i>et al.</i> (2007a), Sanjana <i>et al.</i> (2009), Schneider <i>et al.</i> (2008), Simba and Kakoko (2009), Simwaka <i>et al.</i> (2012), Smith <i>et al.</i> (2013), Srivastava <i>et al.</i> (2009), and Takasugi and Lee (2012)
	Personal development/knowledge gain reported as incentive	Alam <i>et al.</i> (2012b), Bartos <i>et al.</i> (2009), Burn (2008), Callaghan-Koru <i>et al.</i> (2012), Dick <i>et al.</i> (2007), Dil <i>et al.</i> (2012), Lewis (2010), Peltzer <i>et al.</i> (2010), Rahman <i>et al.</i> (2010), Root and van Wyngaard (2011), Schneider <i>et al.</i> (2008), Simba and Kakoko (2009), and Takasugi and Lee (2012)
	Preferential treatment reported as incentive	Alamo <i>et al.</i> (2012), Rahman and Tasneem (2008), and Takasugi and Lee (2012)
	Hope for future employment reported as incentive	Bartos <i>et al.</i> (2009), Rahman <i>et al.</i> (2010), Schneider <i>et al.</i> (2008), and Simba and Kakoko (2009)
	Having a government job reported as incentive	Srivastava <i>et al.</i> (2009)
Career advancement	No career advancement reported as disincentive	Burn (2008) Furth and Crigler (2012), Kebriaei and Motegheddi (2009), Kok and Muula (2013), and Rahman <i>et al.</i> (2010)

their own money to run village clinics (Callaghan-Koru *et al.* 2012).

Furth and Crigler (2012) researched the correlation between incentives and performance (task completion) in Zambia. The data from this study indicated 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. CHWs in child health in Kenya were performing better in their consultations with children and had a higher adherence to guidelines when they thought that they received four to five benefits (including making money) than those that thought they received fewer than four benefits (Rowe *et al.* 2007a).

'Shasthya Shebikas' in Bangladesh earn some income with providing certain health services and selling of commodities. Those who reported competition with others (pharmacies,

village doctors, TBAs) were reported to be less likely to be active (Alam *et al.* 2012a) but competition was not an important predictor of retention (Alam *et al.* 2012b). CHWs in Mali who obtained income by selling drugs had to compete with informal vendors that sold drugs in smaller, cheaper quantities (Winch *et al.* 2008).

Two studies reported on a negative side of performance-based payments of ASHAs in India. ASHAs could earn money for bringing people to the clinic and helping with biomedical interventions. They could not earn money for encouraging village health meetings nor discussing health issues on social change more generally, although this was part of their role. This resulted in an over-focus on paid tasks (Srivastava *et al.* 2009; Scott and Shanker 2010).

In three studies, CHWs reported to be demotivated because of unmet promises regarding allowances or stipends (Yirga *et al.* 2010; Dil *et al.* 2012; Maes and Kalofonos 2013).

In 34 studies, CHWs reported that trust and respect from the community was an important non-financial incentive enhancing their motivation. We present these incentives, as they are potentially related to intervention design. Social rewards included more greetings, more honor and more participation in decision making. This social prestige might be a stronger factor in rural settings, because of the existence of more stable communities with stronger social fabric (compared to more unstable urban slum communities; Alam *et al.* 2012a). In some cases, social rewards were culturally determined. An example is that the greatest social reward many TBAs in Gambia appreciated was the recognition given at the naming ceremony when they participated in shaving the baby's head and carrying it to the elders for prayers (Nyanzi *et al.* 2007). An example of how respect by the community could enhance CHW's status was reported in a study by Jack *et al.* (2012, p. 757) on CVWs involved in palliative care in Uganda, where one of the volunteers said: 'I was selected to be vice chairperson in the village'. Alam *et al.* (2012b) reported that social prestige and community approval were correlated with CHW retention. CHWs who reported to enjoy more social prestige were more than three times as likely to remain. A cross-sectional study on Care Facilitators (CFs) working in HIV home-based care in Zimbabwe found that the more the communities accepted, appreciated and supported the CFs in their activities, the more CFs were motivated to perform (Osawa *et al.* 2010). Rowe *et al.* (2007) found that CHWs working in child health in Kenya showed better guideline adherence when they reported to receive respect from the community. In Ethiopia, perceived good performance of CDDs by the population was associated with increased compliance. The authors discussed that insufficient knowledge of CDDs might hamper the acceptability of the CDD in the community (Yirga *et al.* 2010).

There were some examples in the literature of community distrust. For example, 'manzaneras' in Bolivia were reported to occasionally being afraid to conduct home visits, because community members unfairly spread rumours of 'manzaneras' eating the food instead of providing it to the little children (Bartos *et al.* 2009). LHWs working on farms in South Africa were sometimes criticized by the community because they had a better relationship with the farmer (the employer) and nurses

than community members, because of their job (Dick *et al.* 2007).

In several studies, CHWs reported their willingness to help and care for other people as an incentive that enhanced their motivation. For example, CBSVs in Ghana reported that altruism towards the community was a vital factor to take on and remain in the role as CBSV. Moreover, seeing the health and education of the community improve also emerged as a motivator (Dil *et al.* 2012). In Zambia, CHVs overwhelmingly felt happy to be able to help their communities (92% of CHVs working in child health and 95% of CHVs working in reproductive health; Smith *et al.* 2013). In Uganda, CVWs in palliative care reported that the reason for becoming a volunteer stemmed from traditional values of wanting to help other people (Jack *et al.* 2012).

In various studies, CHWs reported that personal development or knowledge gain served as an incentive. Perceived access to skills and knowledge of 'Shasthya Shebikas' was important for retention in rural areas of Bangladesh, but was not a driving factor among urban 'Shasthya Shebikas' (Alam *et al.* 2012b). CHWs in South Africa reported that although being CHW was not held in high esteem, one motivator was the development of a professional identity, especially for those working as counsellors, and they desired to advance in that role (Schneider *et al.* 2008).

Some studies referred to preferential treatment as an incentive for CHWs. For example, Alamo *et al.* (2012) reported that the non-financial benefits, like free care and treatment and school fees support that CATTs in Uganda received, contributed to the high retention of CATTs (Alamo *et al.* 2012). 'Shasthya Shebikas' in Bangladesh reported that they would prefer to get a salary, but they also expected other incentives, like preferential access to loans (Rahman and Tasneem 2008).

In four studies, CHWs reported that their CHW job would result in future other employment and this was a motivating factor. For example, ASHAs in India reported that the second most important motivating factor after gaining money (82%) was having a government job (67%; Srivastava *et al.* 2009).

In a few studies, CHWs reported to be demotivated because of a lack of career advancement. For example in Zambia, opportunities for advancement were strongly correlated with higher levels of engagement (defined as satisfaction plus motivation) of CHWs, but there was no correlation found between engagement and CHW performance (Furth and Crigler 2012). CHWs in Bangladesh reported no promotion opportunities as being a reason for leaving the project, although it was reported that CHWs had the opportunity to become a supervisor based on exemplary performance (Rahman *et al.* 2010).

In summary, many studies reported that both financial and non-financial incentives, including career advancement, increased motivation and performance of CHWs.

Supervision

In a total of 80 studies, it was stated that a supervision structure was available, but most of them were lacking information on its precise structure and its implementation. The review identified a few aspects of supervision being related to CHW performance: whether the CHW programme setup

Table 5 Factors related to supervision

Availability of supervision	Lack of supervision decreased motivation	Callaghan-Koru <i>et al.</i> (2012, 2013), Gusdal <i>et al.</i> (2011), Hill <i>et al.</i> (2008), Javanparast <i>et al.</i> (2011), Kok and Muula (2013), Moetlo <i>et al.</i> (2011), Nsabagasani <i>et al.</i> (2007), Perez <i>et al.</i> (2009), and Suri <i>et al.</i> (2007)
	Supervision increased motivation	Amare (2011), Lewis (2010), Martinez <i>et al.</i> (2008), Puett <i>et al.</i> (2013), and Simwaka <i>et al.</i> (2012)
Frequency of supervision	Frequency of supervision was not correlated with guideline adherence in one study, in another study it increased CHW performance	Rowe <i>et al.</i> (2007a) and Smith <i>et al.</i> (2013)
Location of supervision	Facility-based supervision hindered CHW's work	Chanda <i>et al.</i> (2011)

involved any form of supervision and the frequency and location of supervision (Table 5).

Community reproductive health workers (CRHWs) in Uganda found supervision increased credibility and recognition, it made them feel part of the team (Martinez *et al.* 2008). The ways in which supervision was motivating or demotivating CHWs was sometimes associated with the skills and attitude of supervisors. Community home-based care workers in South Africa reported problems with supervisors, such as lack of management skills (40%) and 'selfishness' (38%) Moetlo *et al.* 2011). CBSWs in Ghana felt demotivated by the supervision they received: 'They (current supervisors) seem to forget that the work is a voluntary one and as such we should be treated well and encouraged'. The CBSWs identified the need for good quality supervision to increase retention: 'Even if there is no money in it you would feel that you are being supervised and that would motivate you to do the work well' (Hill *et al.* 2008, p. 43).

The studies showed a variety in frequency of supervision. There were two studies that researched the effect of frequency of supervision on CHW performance. One study showed that a lower frequency of supervision resulted in lower performance of CHWs in Madagascar (Smith *et al.* 2013) while another study in Kenya found no effect of frequency of supervision on CHW guideline adherence (Rowe *et al.* 2007a).

Only one study referred to the location of supervision. In rural Zambia, supervision in the health centre was not appreciated by CHWs as they felt they missed out on providing care to their own village (Chanda *et al.* 2011).

In summary, many studies reported supervision to be important to increase CHW performance, although details of the supervision structure and its implementation contributing to success were scarce. CHWs who perceived their supervision as insufficient often reported to be demotivated.

Performance appraisal

Fifteen studies reported on performance appraisal systems. Some of them reported certification after skills assessments (Hoke *et al.* 2008; Sanjana *et al.* 2009; Shankar *et al.* 2009; Root and van Wyngaard 2011; Javanparast *et al.* 2012). Only one study researched how appraisal influenced CHW performance; Furth and Crigler (2012) found that organizations with stronger performance appraisal systems were more likely to have more engaged CHWs. However, there was no correlation between engagement and performance.

Training-related factors

A total of 113 studies reported that the CHWs had received initial training. Forty-seven studies reported on the availability of refresher trainings. However, only 18 studies investigated the association between training and CHW performance (see Table 6).

CHWs reported that training increased motivation and some studies linked training to CHW knowledge and performance. An 8-day training course for TBAs in Pakistan found that TBAs in the intervention arm showed better performance than untrained TBAs (Miller *et al.* 2012). Saravanan *et al.* (2011) found that despite training of TBAs, lifesaving practices for mothers and babies were not followed in India. 'Behvarz' in Iran reported that the pre-service training had a positive impact on their capacity to provide health care services and to build their confidence and skills in communicating with rural people. The friendly environment of the training centres, the nature of the trainer–trainee relationships and the highly qualified trainers were particularly noted as having a positive impact on the learning process and motivation. Other 'behvarz' complained about quality and timing of the training, the infrequency of courses, inadequate qualified trainers who were unfamiliar with the 'behvarz' working environment, the lack of practical sessions and lack of adaptation of training materials to the local context (Javanparast *et al.* 2012).

Training was sometimes seen as an income-generating activity by CHWs. CHWs in Malawi and Kenya reported favouritism in selecting CHWs for trainings as a demotivating factor (Olang'o *et al.* 2010; Kok and Muula 2013). In Zambia, trained TBAs were less likely than non-trained TBAs to attend a delivery without payment (40 vs 49%) and more likely to be paid in cash (55 vs 43%). Mothers were more likely to choose an intervention TBA above a control TBA and higher compensations were paid to intervention TBAs (Gill *et al.* 2011).

Several studies reported on a possible positive influence of continuous training on CHW job satisfaction and motivation (Lewis 2010; Ge *et al.* 2011). Smith *et al.* (2013) found a clear correlation between receiving refresher training and performance (the ability to assess, classify, treat, or refer appropriately as required by guidelines) of CHVs in Madagascar (Smith *et al.* 2013). No association between the frequency of refresher trainings and CHWs' guideline adherence was found in Kenya (Rowe *et al.* 2007a).

One study reported that the participatory way of developing training materials was crucial for the success of the CHW

Table 6 Factors related to training

Factor	Detail on influence or association	Studies
Training in general	Training enhancing CHW motivation	Alamo <i>et al.</i> (2012), Dil <i>et al.</i> (2012), Javanparast <i>et al.</i> (2012), and Simwaka <i>et al.</i> (2012)
	Training generally resulting in expanded CHW knowledge/performance	Gill <i>et al.</i> (2011), Hamer <i>et al.</i> (2012), Hien le <i>et al.</i> (2008), Javanparast <i>et al.</i> (2012), Miller <i>et al.</i> (2012), Puett <i>et al.</i> (2013), and Saravanan <i>et al.</i> (2011)
	Training linked to allowances and favouritism leading to demotivation	Kok and Muula (2013) and Olang'o <i>et al.</i> (2010)
Continuous training	Continuous training increasing job satisfaction/motivation	Ge <i>et al.</i> (2011) and Lewis (2010)
	Continuous training increasing CHW performance	Smith <i>et al.</i> (2013)
	Frequency refresher training no effect on guideline adherence	Rowe <i>et al.</i> (2007a)
Development of training materials	CHW participation in development training materials increased sense of ownership	Omer <i>et al.</i> (2008)

intervention (health promotion by Lady Health Workers in Pakistan; Omer *et al.* 2008).

In summary, training was found to positively influence CHW motivation, job satisfaction and performance.

Quality assurance

The literature identified factors related to quality assurance that could influence CHW performance. We have categorized them as protocols and guidelines and monitoring and evaluation.

Protocols and guidelines

Four studies reported on the use of protocols and guidelines and how their use could affect CHW performance (Rowe *et al.* 2007a; Dambisya and Matinhure 2012; Javanparast *et al.* 2012; Kalyango *et al.* 2012). For example, standard operating procedures and institutional and programmatic guidelines were reported by various stakeholders within the health system as facilitating factors for task shifting towards CHWs working in HIV in Uganda (Dambisya and Matinhure 2012).

Monitoring and evaluation

In 49 of the included studies, a monitoring and evaluation system was reported to be in place. Six studies reported on community monitoring, mainly by village health committees (VHCs). Two studies made a reference to CHW performance (Table 7). The engagement of pregnant women in the assessment of community facilitators in Indonesia provided social accountability and empowered the women to expect good quality services from the CHWs. Moreover, the authors assumed that the awareness that the community facilitators would be evaluated by the pregnant women they served provided an additional incentive to actively engage the target population and created good relationships (Shankar *et al.* 2009). Community medicine distributors (CMDs) in Uganda reported that community support in the form of feedback and rewards had a greater influence on their performance than that from the health system (Kalyango *et al.* 2012).

Community links

The role of communities in selection and community expectations, described under Human Resource Management, and the role of communities in monitoring, described under Quality Assurance, were found to influence CHW performance. In addition, community support can have a bearing on CHW performance. All factors related to community links are summarized in Table 7.

There are different ways in which communities can support the work of CHWs. Community members, including village doctors, referred cases of severe acute malnutrition to CHWs in Bangladesh (Sadler *et al.* 2011). In Ethiopia, community support for voluntary CHWs was strengthened by mobilizing various local institutions to serve as 'community anchors'. Community anchors were raising community recognition for and acceptance of voluntary CHWs, supporting their goals and activities, and sustaining their motivation levels. The local institutions that the project had mobilized as community anchors included churches, mosques, 'idirs' (burial associations) and women's associations (Amare 2011). In another study from Ethiopia, community members participated in the construction of health posts (where HEWs are working; Teklehaimanot *et al.* 2007). In Mozambique, a community-based vital registration and health information system project for routine surveillance of births, deaths and childhood illnesses was instituted using a network of 2300 volunteers. Community structures played a role in supporting volunteers (Edward *et al.* 2007). In Guinea, involvement of religious leaders in VHCs was crucial for acceptance of the work by CBDs. The VHCs acted as the health services' local liaison, informing villagers of clinic dates, seeking those lost to follow-up and encouraging men and women to attend health education activities (Diakite and Keita 2009).

Puchalski Ritchi *et al.* (2012) reported that HSAs in Malawi were supported by guardians (who were relatives or friends). The task of guardians was to directly observe the patients taking their TB medication on a daily basis. Good guardians were acknowledged to improve patient adherence if they functioned as planned. However, some guardians were ineffective because they lived too far away from the patients and

Table 7 Factors related to community links

Community support	Community support: leading to increased CHW motivation/performance	Amare (2011), Bhutta <i>et al.</i> (2008), Callaghan-Koru <i>et al.</i> (2012), Edward <i>et al.</i> (2007), Elmardi <i>et al.</i> (2009), Hoy <i>et al.</i> (2008), Razeq <i>et al.</i> (2012), Sadler <i>et al.</i> (2011), Teklehaimanot <i>et al.</i> (2007), and Torpey <i>et al.</i> (2008)
	Community support: negative effect on performance	(Puchalski Ritchie <i>et al.</i> 2012)
	Lack of community support: leading to dropout	Simba and Kakoko (2009)
Community selection	Community selection improved motivation/self-esteem	Brenner <i>et al.</i> (2011), Chanda <i>et al.</i> (2011), Dil <i>et al.</i> (2012), Elmardi <i>et al.</i> (2009), Gill <i>et al.</i> (2012), Nyanzi <i>et al.</i> (2007), Scott and Shanker (2010), Srivastava <i>et al.</i> (2009), and Yirga <i>et al.</i> (2010)
Community monitoring	Community monitoring increased performance	Kalyango <i>et al.</i> (2012) and Shankar <i>et al.</i> (2009)
Community expectations	Conflicting community expectations as demotivating factor for CHWs	Callaghan-Koru <i>et al.</i> (2012), Chanda <i>et al.</i> (2011), Kalyango <i>et al.</i> (2012), Mukanga <i>et al.</i> (2010), Olang'o <i>et al.</i> (2010), Smith <i>et al.</i> (2013), and Suri <i>et al.</i> (2007)

only acted when the client was sick or because of conflicting advice in case of multiple guardians. Peer educators in reproductive health in Tanzania had stopped because of lack of support from village leaders (Simba and Kakoko 2009).

In summary, community support and its involvement in CHW selection and monitoring generally resulted in higher CHW motivation and performance.

Health system links

CHW's links or 'embedment' in the health system is an often-stated factor in the literature, which could influence CHW performance. We found evidence on relationships of CHWs with other health staff (which could in turn influence CHW's access to equipment, supplies and functional referral) and communication and co-ordination between them (Table 8).

Attitudes of other health staff had a major effect on how the CHWs felt and performed. In Malawi, clinicians were reluctant to give drugs to HSAs which hindered their performance, because of lack of drugs at the health centre or the fact that they were not aware of the program (of HSAs administering drugs; Callaghan-Koru *et al.* 2012, 2013). In Bolivia, some 'manzaneras' had conflicts with medical personnel and this led to feelings of inadequacy and inferiority. Some claimed that doctors did not value their work and would request more of them than they were able to provide (Bartos *et al.* 2009). CBSVs in Kenya were proud of their job and said they gained respect and recognition from the community, elders and district health staff, leading to motivation (Dil *et al.* 2012). CFs in Zimbabwe felt motivated by organizational characteristics like managerial support, but their performance was not influenced by organizational characteristics (Osawa *et al.* 2010).

Improved communication between CHWs and clinical staff by an m-health intervention in Uganda (Chang *et al.* 2011) and improved co-ordination between maternal health workers and other tiers of the system in Myanmar (Teela *et al.* 2009) were reported by CHWs as improving quality of care. A study on different types of CHWs in Mozambique discussed that the formation of community health teams (CHTs), in which different types of CHWs were working together, enhanced accountability towards the health system as well as the

community. Each member had to report to the team leader and the rest of the team on activities and results. CHT members discussed difficult cases together and worked with community leaders to find solutions for problems encountered. Areas previously not reached were now reached, because of improved co-ordination (Simon *et al.* 2009).

In summary, we found that recognition of formal health staff increased CHW motivation and good communication and co-ordination structures increased CHW performance.

Resources and logistics

For resources and logistics, we found some evidence on job aids, transport and supplies influencing CHW performance.

Several studies reported on the use of job aids by CHWs; these were mostly simple tools used to support in (treatment) decision making (Rowe *et al.* 2007a; Sadler *et al.* 2011; Gill *et al.* 2012; Hamer *et al.* 2012; Javanparast *et al.* 2012; Lemay *et al.* 2012). CHWs in Malawi using Short Message Service (SMS) to ask medical questions, drug adverse effects and dosage amounts reported that their participation in the SMS network resulted in recognition and improved status among their clients and communities (Lemay *et al.* 2012). Simplicity of a treatment algorithm and clarity of a treatment chart provided clear guidance to CHWs working in child health in Zambia (Hamer *et al.* 2012). Simplicity of treatment algorithms was also mentioned as a contributor to success of CHWs interventions by Gill *et al.* (2012) and Sadler *et al.* (2011). However, in Iran, some younger and higher educated 'behvarz' reported that centrally produced step-by-step guidelines were too didactic and constrained participatory learning. 'There are too many step-by-step guidelines and instructions that we have to follow, we are not given a chance to search, to think and to analyze things' (Javanparast *et al.* 2012, p. 6). Rowe *et al.* (2007a) researched the effect of the use of job aids by CHWs working in child health in Kenya and found that the use of a treatment card (reminding the CHW how to prescribe drugs) was associated with better overall guideline adherence, but the use of a flipchart job aid during consultations was not associated with better guideline adherence.

Table 8 Factors related to health system links

Embedment in health system	Lack of recognition of upper level decreases CHW motivation	Bartos <i>et al.</i> (2009), Callaghan-Koru <i>et al.</i> (2012, 2013), Javanparast <i>et al.</i> (2011), Kok and Muula (2013) Nsabagasani <i>et al.</i> (2007), Schneider <i>et al.</i> (2008), and Takasugi and Lee (2012)
	Recognition of the upper level increases CHW motivation	Dil <i>et al.</i> (2012), Osawa <i>et al.</i> (2010), and Wang <i>et al.</i> (2011)
Communication	Co-ordination/communication increased quality of care (as reported by health workers/CHWs)	Chang <i>et al.</i> (2011) and Teela <i>et al.</i> (2009)
Co-ordination	Teamwork enhanced accountability, solving problems, improved coverage	Simon <i>et al.</i> (2009)

Lack of transport for CHWs or clients was often discussed or reported by CHWs as a factor limiting their work performance. Lack of bicycles and having to pay for transport were often mentioned (Simba and Kakoko 2009; Arem *et al.* 2011; Gusdal *et al.* 2011; Moetlo *et al.* 2011; Pongvongsa *et al.* 2011; Kalyango *et al.* 2012; Takasugi and Lee 2012; Kok and Muula 2013).

Several studies reported that CHWs were less motivated because of lack of supplies, such as drugs and education materials (Suri *et al.* 2007; Perez *et al.* 2009; Simba and Kakoko 2009; Moetlo *et al.* 2011; Callaghan-Koru *et al.* 2012; Dil *et al.* 2012; Kalyango *et al.* 2012; Takasugi and Lee 2012; Callaghan-Koru *et al.* 2013; Kok and Muula 2013). In some cases, lack of supplies resulted in not being able to conduct the job (Furth and Crigler 2012; Kalyango *et al.* 2012). However, Osawa *et al.* (2010) found no correlation between supplies and motivational outcome of CFs in Zimbabwe and in Kenya, no correlation was found between adequacy of medicine supplies in the village and guideline adherence of CHWs (Rowe *et al.* 2007a).

In summary, job aids were often reported to facilitate CHW performance, while transport constraints and lack of supplies were often reported to hinder CHW performance.

Discussion

Based on the evidence found in this review, we created a more detailed conceptual framework (see Figure 3, second box from left). Besides intervention design factors, broad contextual factors and health system factors also influence CHW performance and are often either unchangeable by an intervention or preconditions for the functioning of interventions (results will be published elsewhere).

Our findings indicate that variations in the design of CHW programmes have a significant influence on CHW performance. The most prominent factors related to higher CHW performance were inclusion of curative tasks in CHWs' job description; longer service delivery times; certain characteristics of CHWs such as higher education level, experience with health conditions to be dealt with, fewer household duties and lower wealth; financial and non-financial incentives; availability of supervision; training; community support, selection and monitoring; and recognition by and co-ordination and communication with other health staff. (Perceived) absence or poor quality of these factors could lead to lower CHW performance. Other factors that were often reported as barriers to CHW performance were high workload; lack of clarity on CHW roles and lack of resources and logistics. These intervention design factors

form a complex web, influence each other and are highly context dependent.

CHW characteristics like gender, age, marital status, social status, past experience and selection of CHWs from within the community they serve may have an influence on CHW performance, although our review shows a mixed picture on the influence of these factors. Previous studies found that CHW retention rates are higher in programmes which selected CHWs based on past performance (Malarcher *et al.* 2011) and CHWs who are trusted members of the community better reflect the linguistic and cultural diversity of the population served (Bhutta *et al.* 2010; Campbell and Scott 2011; Glenton *et al.* 2013). These characteristics should be taken into account when developing selection criteria for CHW programmes and they are task and context specific. For example, one study on CHWs working in HIV care found clients to prefer CHWs from outside the community, because of stigma.

While we found community involvement in selection to be a motivating factor in some contexts, there was also a need to balance selection by the community with input from administrators, leaders or health workers (Campbell and Scott 2011) to guarantee CHWs have both the necessary skills and represent different groups (Atkinson *et al.* 2011). Selection with involvement of the health system and the community could also improve linkages of CHWs with both sides.

Multiple layers of inner and external factors contribute to individual motivation of CHWs. Clarity of roles (Nkonki *et al.* 2011), balance of curative and promotive tasks (Standing and Chowdhury 2008), recognition, workload and the ability to meet community expectations all contribute (Hermann *et al.* 2009; Nkonki *et al.* 2011; Glenton *et al.* 2013). Community trust and recognition was an often reported motivating factor for CHWs. Factors in the intervention design, like facilitation of support of traditional leaders or regular community meetings, could enhance community trust and respect towards CHWs and thereby CHW motivation.

While financial incentives increased performance of CHWs when compared with CHWs not receiving financial incentives, these should be predictable (Glenton *et al.* 2013). Non-financial incentives were also found to be important (Bhattacharyya *et al.* 2001; Lehmann and Sanders 2007; Prasad and Muraleedharan 2007; Bhutta *et al.* 2010) and mixing different types of incentives could be an effective strategy. The 1 million CHW campaign emphasizes that the optimal design of CHW programmes should involve full-time paid CHWs combined with a volunteer part-time community health workforce

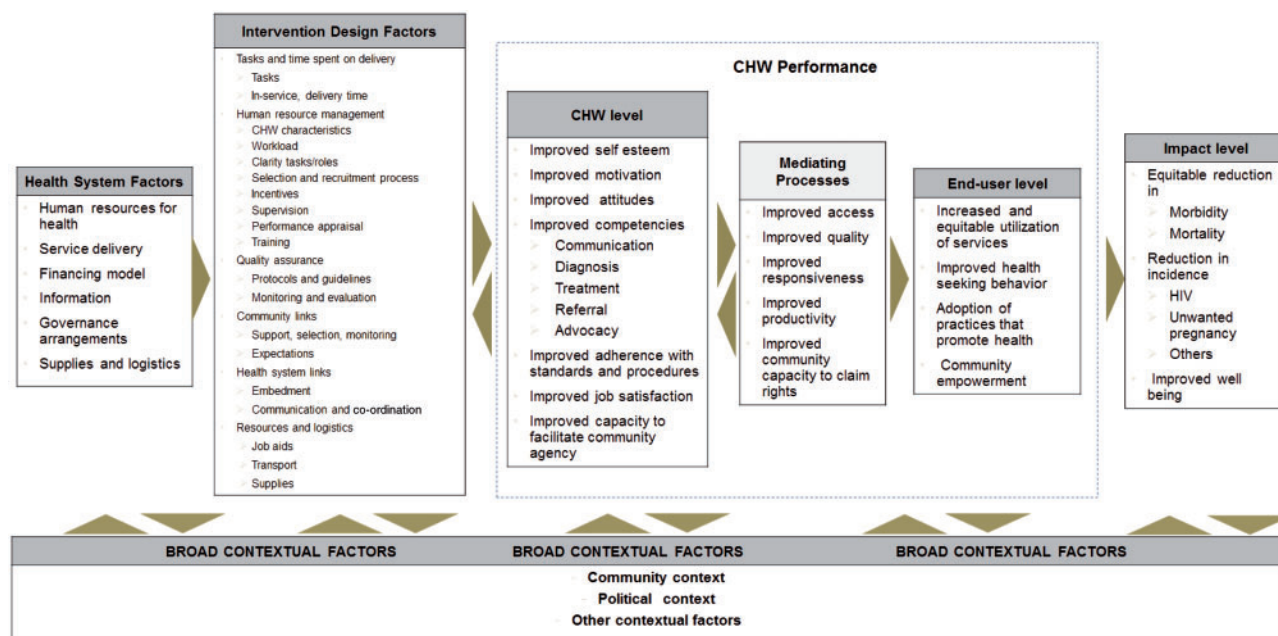


Figure 3 Adapted conceptual framework based on review findings

(Earth_Institute 2012). Our findings and those of others (Willis-Shattuck *et al.* 2008; Hermann *et al.* 2009; Wringe *et al.* 2010; Campbell and Scott 2011) support remuneration of CHWs, especially when they have multiple tasks or tasks that require a long service delivery time or time spent on the job per week and when remuneration is clearly linked to workload. This needs to be designed in a way that is sustainable and avoids conflicts between cadres (Mukherjee and Eustache 2007).

Our review points towards a positive effect of regular supervision from the health system on CHW performance, with problem-solving supervision being the most desired. In contrast, a Cochrane review concluded that it is uncertain whether supervision (of health workers in LMICs) is effective in the long term (Bosch-Capblanch *et al.* 2011). We found very little description of the exact mechanisms of supervision that contributed to success, such as type of supervisor, frequency of supervision and support to supervisors. In some studies, supervision was done in the context of the pilot intervention or research project conducted by a combination of research and NGO staff. In others, this was unclear. Some studies reported on the number of CHWs supervised per supervisor, but none measured the effects of different supervisor to CHW ratios on performance. Studies mentioning the use of mobile phones in supervision (Arem *et al.* 2011; Cornman *et al.* 2011; Jack *et al.* 2012) did not report a clear influence on CHW performance. Our review revealed that supervision has a number of indirect effects on motivation, retention, skills development and community recognition, supporting data from elsewhere that inadequate supervision may result in lack of legitimacy of CHWs in the eyes of the community (Atkinson *et al.* 2011).

Our review showed a positive effect of regular continuous education on CHW performance, but again, aspects of training

that contributed to success were often not identified. Only one study reported that a friendly environment in training centres, a good trainer–trainee relationship and high quality trainers contributed to higher motivation of trainees. Many studies reported on trainings offering classroom theory sessions combined with practical exercises and more participatory sessions, but no study researched the influence of different training approaches on CHW performance. No evidence was found on effects of the length of training on CHW performance. Atkinson *et al.* (2011) discussed that CHWs who receive only short training may lack legitimacy from the community. Glenton *et al.* (2013) found that training should include counselling and communication skills. In addition to this, training on confidentiality is important to overcome community concerns about stigmatization. These additions to training would more closely reflect the expected but often unwritten tasks of CHWs than the often medical oriented training that is currently offered. Finally, we found no evidence on the linking of training to supervision or follow-up refresher trainings, strategies that are often used when creating a community of practice that may strengthen learning and support.

The literature clearly revealed the importance of embedment of CHWs in both their community and the health system. Community selection, monitoring and support were contributing to CHW motivation. While the importance of community involvement has been identified by other studies (Campbell and Scott 2011; ERTI 2012; Glenton *et al.* 2013), the exact mechanisms of how this can improve performance of CHWs has not been explored in depth in the literature (Green 2011); our review confirmed this. Links with the health system were reported as important by CHWs, as recognition of and communication and co-ordination with other health professionals and supervision from the health system increased credibility. Other reviews have

stressed this point as well (Rosato *et al.* 2008; Byrne and Morgan 2011; Glenton *et al.* 2013).

The unique position of CHWs in-between the community and the health system can result in a delicate balancing act, as CHWs are accountable to both. This could sometimes lead to a burden to the CHW. Clarity on the roles of CHWs, supervisors linked to the health system and committees at village level supporting the CHW and introducing clear processes for communication between these three parties in the intervention design could reduce this burden.

Many studies included in this review used motivation as an outcome measure, which could ultimately influence CHW performance, as presented in our conceptual framework. However, higher motivation and greater job satisfaction do not necessarily result in higher performance. For example, we found that performance-based incentives could be satisfactory for CHWs, but could lead to ignoring certain tasks which were not paid. Some studies investigated the influence of certain intervention design factors on other outcome measures, such as CHW competencies and adherence to guidelines. These outcome measures are important characteristics of CHW performance besides the often researched motivation, and should, therefore, be more often included in future research.

The recent trend of expanding CHW programmes in LMICs confirms the need for more research on factors having the potential to improve CHW performance. Beside the lack of evidence on mechanisms and specific aspects that could improve CHW performance related to supervision and training, we did also not find evidence on the influence of other factors associated with improving CHW performance (derived from initial reading of selected international literature), such as the use of guidelines and protocols, performance appraisal, specific aspects of monitoring and evaluation systems related to the health system, experience sharing visits, career advancement and the functionality of referral systems. Significant challenges remain for policymakers in using evidence to design programmes. Teasing out the exact impact of altering one factor over another may not be possible and no data exist on the impact of intervention bundles or the cost implications in most contexts.

Our review adds value to the current literature, as it included both qualitative and quantitative studies and was able to explore perceptions as well as measurements of characteristics of CHW performance. A limitation of our review is that factors influencing performance were often stated (to be important), but were rarely described in detail. Effectiveness trials are seldom linked with qualitative studies. The same is true for some less rigorous quantitative studies which were included in this review. Qualitative studies should be run alongside quantitative studies to generate insight into why an intervention was successful or not (Bhattacharyya *et al.* 2011; Glenton *et al.* 2013). The literature clearly shows the diversity of CHWs in LMICs. However, many studies do not clarify specific characteristics of CHWs, which hinders our understanding on how to increase CHW performance. A general vocabulary related to different types of CHWs could assist in making more nuanced recommendations. Furthermore, we might have missed relevant studies because of the delimiters of our search strategy.

Conclusion

CHWs increasingly are made a formal part of health systems in LMICs, with expanding tasks. Although their contribution towards achieving health goals has been shown in various programmes, there is little evidence on which specific factors have contributed to success. This systematic review found many factors related to intervention design that could influence CHW performance. These factors should be taken into account by policymakers during the development and adjusting of CHW programmes, taking the specific context of the situation in which programmes are implemented into account.

Supplementary Data

Supplementary data are available at *HEAPOL* online

Acknowledgements

The systematic review presented in this article is part of the REACHOUT programme, funded by the European Commission. REACHOUT is an ambitious 5-year international research consortium aiming to generate knowledge to strengthen the performance of CHWs and other close-to-community providers of promotional, preventive and curative primary health services in rural and urban areas in Africa and Asia. We would like to thank Ilse Egers, from the Royal Tropical Institute, who helped with the initial literature search. Finally we thank Olivia Tulloch from the Liverpool School of Tropical Medicine for proofreading the article.

Funding

The research leading to these results has received funding from the European Union Seventh Framework Programme ([FP7/2007-2013] [FP7/2007-2011]) under grant agreement n° 306090.

Conflict of interest

None declared.

Endnote

¹ The Glenton review took place just before we started the review and was not yet published. The team shared the studies they included so that these could be taken out of our review.

References

- Abbott L, Luke N. 2011. Local hierarchies and distributor (non) compliance: a case study of community-based distribution in rural north India. *Health Care for Women International* **32**: 225–42.
- Ahmed SM. 2008. Taking health care where the community is: the story of the Shasthya Sebikas of BRAC in Bangladesh. *BRAC University Journal* **V**: 39–45.
- Ajayi IO, Falade CO, Olley BO *et al.* 2008. A qualitative study of the feasibility and community perception on the effectiveness

- of artemether-lumefantrine use in the context of home management of malaria in south-west Nigeria. *BMC Health Services Research* **8**: 119.
- Alam K, Tasneem S, Oliveras E. 2012a. Performance of female volunteer community health workers in Dhaka urban slums. *Social Science and Medicine* **75**: 511–5.
- Alam K, Tasneem S, Oliveras E. 2012b. Retention of female volunteer community health workers in Dhaka urban slums: a case-control study. *Health Policy Plan* **27**: 477–86.
- Alamo S, Wabwire-Mangen F, Kenneth E *et al.* 2012. Task-shifting to community health workers: evaluation of the performance of a peer-led model in an antiretroviral program in Uganda. *AIDS Patient Care and STDs* **26**: 101–07.
- Amare Y. 2011. Non-financial incentives for voluntary community health workers: a qualitative study. Working Paper No. 2. The Last Ten Kilometers Project, JSI Research & Training Institute, Inc., Addis Ababa, Ethiopia.
- Arem H, Nakyanjo N, Kagaayi J *et al.* 2011. Peer health workers and AIDS care in Rakai, Uganda: a mixed methods operations research evaluation of a cluster-randomized trial. *AIDS Patient Care STDS* **25**: 719–24.
- Atkinson JA, Valley A, Fitzgerald L, Whittaker M, Tanner M. 2011. The architecture and effect of participation: a systematic review of community participation for communicable disease control and elimination. Implications for malaria elimination. *Malaria Journal* **10**: 225.
- Azad K, Barnett S, Banerjee B *et al.* 2010. Effect of scaling up women's groups on birth outcomes in three rural districts in Bangladesh: a cluster-randomised controlled trial. *Lancet* **375**: 1193–202.
- Baqi AH, Ahmed S, El Arifeen S *et al.* 2009a. Effect of timing of first postnatal care home visit on neonatal mortality in Bangladesh: a observational cohort study. *BMJ* **339**: b2826.
- Baqi AH, Arifeen SE, Rosen HE *et al.* 2009b. Community-based validation of assessment of newborn illnesses by trained community health workers in Sylhet district of Bangladesh. *Tropical Medicine and International Health* **14**: 1448–56.
- Baqi AH, Arifeen SE, Williams EK *et al.* 2009c. Effectiveness of home-based management of newborn infections by community health workers in rural Bangladesh. *The Pediatric Infectious Disease Journal* **28**: 304–10.
- Baqi AH, El-Arifeen S, Darmstadt GL, Ahmed S, Williams EK. 2008. Effect of community-based newborn-care intervention package implemented through two service-delivery strategies in Sylhet district, Bangladesh: a cluster-randomised controlled trial. *Lancet* **371**: 1936–44.
- Bartos A, Tenorio A, Saunero R *et al.* 2009. Extending the duration of exclusive breastfeeding in El Alto, Bolivia through a community-based approach and the provision of health services. Child Health and Nutrition Research Initiative (CHNRI).
- Behdjat H, Rifkin SB, Tarin E, Sheikh MR. 2009. A new role for Women Health Volunteers in urban Islamic Republic of Iran. *East Mediterranean Health Journal* **15**: 1164–73.
- Bhattacharyya K, Winch P, LeBan K, Tien M. 2001. Community health worker incentives and disincentives: how they affect motivation, retention, and sustainability. Basic Support for Institutionalizing Child Survival Project (BASICS II) for USAID.
- Bhattacharyya OK, Estey EA, Zwarenstein M. 2011. Methodologies to evaluate the effectiveness of knowledge translation interventions: a primer for researchers and health care managers. *Journal of Clinical Epidemiology* **64**: 32–40.
- Bhutta ZA, Lassi ZS, Pariyo G, Huicho L. 2010. *Global experience of community health workers for delivery of health-related Millennium Development Goals: a systematic review, country case studies and recommendations for scaling up.* Geneva, Switzerland: Global Health Workforce Alliance.
- Bhutta ZA, Memon ZA, Soofi S *et al.* 2008. Implementing community-based perinatal care: results from a pilot study in rural Pakistan. *Bulletin of the World Health Organization* **86**: 452–9.
- Bhutta ZA, Soofi S, Cousens S *et al.* 2011. Improvement of perinatal and newborn care in rural Pakistan through community-based strategies: a cluster-randomised effectiveness trial. *Lancet* **377**: 403–12.
- Bisimwa G, Mambo T, Mitangala P *et al.* 2009. Nutritional monitoring of preschool-age children by community volunteers during armed conflict in the Democratic Republic of the Congo. *Food and Nutrition Bulletin* **30**: 120–7.
- Bland RM, Little KE, Coovadia HM, Coutoudis A, Rollins NC. 2008. Intervention to promote exclusive breast-feeding for the first 6 months of life in a high HIV prevalence area. *AIDS* **22**: 883–91.
- Bloom G, Standing H. 2001. Institute of Development Studies B. 2001. Pluralism and marketisation in the health sector: meeting health needs in contexts of social change in low and middle income countries. *Institute of Development Studies-University of Sussex.* (IDS Working Papers No. 136): 15–56.
- Bosch-Capblanch X, Liaqat S, Garner P. 2011. Managerial supervision to improve primary health care in low- and middle-income countries. *Cochrane Database of Systematic Reviews* **9**: CD006413.
- Brenner JL, Kabakyenga J, Kyomuhangi T *et al.* 2011. Can volunteer community health workers decrease child morbidity and mortality in southwestern Uganda? An impact evaluation. *PLoS One* **6**: e27997.
- Burn H. 2008. Attrition of female health workers: an insight into the reasons why Lady Health Workers resign from Pakistan's National Programme for Family Planning and Primary Health Care.
- Byrne A, Morgan A. 2011. How the integration of traditional birth attendants with formal health systems can increase skilled birth attendance. *International Journal of Gynecology and Obstetrics* **115**: 127–34.
- Callaghan-Koru JA, Gilroy K, Hyder AA *et al.* 2013. Health systems supports for community case management of childhood illness: lessons from an assessment of early implementation in Malawi. *BMC Health Services Research* **13**: 55.
- Callaghan-Koru JA, Hyder AA, George A *et al.* 2012. Health workers' and managers' perceptions of the integrated community case management program for childhood illness in Malawi: the importance of expanding access to child health services. *The American Journal of Tropical Medicine and Hygiene* **87**: 61–8.
- Campbell C, Gibbs A, Maimane S, Nair Y. 2008. Hearing community voices: Grassroots perceptions of an intervention to support health volunteers in South Africa. *Sahara Journal* **5**: 162–77.
- Campbell C, Scott K. 2011. Retreat from Alma Ata? The WHO's report on Task Shifting to community health workers for AIDS care in poor countries. *Global Public Health* **6**: 125–38.
- CASP. 2010. Critical Appraisal Skills Programme. Making sense of evidence about clinical effectiveness.
- Celletti F, Wright A, Palen J *et al.* 2010. Can the deployment of community health workers for the delivery of HIV services represent an effective and sustainable response to health workforce shortages? Results of a multicountry study. *AIDS* **24**(Suppl 1): S45–57.
- Chanda P, Hamainza B, Moonga HB, Chalwe V, Pagnoni F. 2011. Community case management of malaria using ACT and RDT in two districts in Zambia: achieving high adherence to test results using community health workers. *Malaria Journal* **10**: 158.

- Chang LW, Kagaayi J, Arem H *et al.* 2011. Impact of a mHealth intervention for peer health workers on AIDS care in rural Uganda: a mixed methods evaluation of a cluster-randomized trial. *AIDS and Behavior* **15**: 1776–84.
- Chen L, Evans T, Anand S *et al.* 2004. Human resources for health: overcoming the crisis. *The Lancet* **364**: 1984–90.
- Chen SC, Wang JD, Ward AL *et al.* 2011. The effectiveness of continuing training for traditional birth attendants on their reproductive health-care knowledge and performance. *Midwifery* **27**: 648–53.
- Chibanda D, Mesu P, Kajawu L *et al.* 2011. Problem-solving therapy for depression and common mental disorders in Zimbabwe: piloting a task-shifting primary mental health care intervention in a population with a high prevalence of people living with HIV. *BMC Public Health* **11**: 828.
- Corbett E, Guenther T, Sitrin D. 2013. Facilitated referral for newborns with danger signs: the role of community health workers. Save the Children.
- Cornman DH, Christie S, Shepherd LM *et al.* 2011. Counsellor-delivered HIV risk reduction intervention addresses safer sex barriers of people living with HIV in KwaZulu-Natal, South Africa. *Psychology and Health* **26**: 1623–41.
- Counihan H, Harvey SA, Sekeseke-Chinyama M *et al.* 2012. Community health workers use malaria rapid diagnostic tests (RDTs) safely and accurately: results of a longitudinal study in Zambia. *The American Journal of Tropical Medicine and Hygiene* **87**: 57–63.
- Crispin N, Wamae A, Ndirangu M *et al.* 2012. Effects of selected socio-demographic characteristics of community health workers on performance of home visits during pregnancy: a cross-sectional study in Busia District, Kenya. *Global Journal of Health Science* **4**: 78–90.
- Dambisya YM, Matinhure S. 2012. Policy and programmatic implications of task shifting in Uganda: a case study. *BMC Health Services Research* **12**: 61.
- Darmstadt GL, El Arifeen S, Choi Y *et al.* 2010. Household surveillance of severe neonatal illness by community health workers in Mirzapur, Bangladesh: coverage and compliance with referral. *Health Policy Plan* **25**: 112–24.
- Das LK, Jambulingam P, Sadanandane C. 2008. Impact of community-based presumptive chloroquine treatment of fever cases on malaria morbidity and mortality in a tribal area in Orissa State, India. *Malaria Journal* **7**: 25.
- Dawad S, Jobson G. 2011. Community-based rehabilitation programme as a model for task-shifting. *Disability and Rehabilitation* **33**: 1997–2005.
- Dawson P, Pradhan Y, Houston R *et al.* 2008. From research to national expansion: 20 years' experience of community-based management of childhood pneumonia in Nepal. *Bulletin of the World Health Organisation* **86**: 339–43.
- Dewing S, Mathews C, Schaay N *et al.* 2012. Behaviour change counselling for ARV adherence support within primary health care facilities in the Western Cape, South Africa. *AIDS and Behavior* **16**: 1286–94.
- Diakite O, Keita DR. 2009. Village health committees drive family planning uptake communities play lead role in increased acceptability, availability. USAID.
- Dick J, Clarke M, Zyl H, Daniels K. 2007. Primary health care nurses implement and evaluate a community outreach approach to health care in the South African agricultural sector. *International Nursing Review* **54**: 383–90.
- Dil Y, Strachan D, Cairncross S, Korkor AS, Hill Z. 2012. Motivations and challenges of community-based surveillance volunteers in the northern region of Ghana. *Journal of Community Health* **37**: 1192–8.
- Dixon-Woods M. 2011. Using framework-based synthesis for conducting reviews of qualitative studies. *BMC Medicine* **9**: 39.
- Earth_Institute. 2012. One million community health workers. Technical task force report. The Earth Institute Columbia University.
- Edward A, Ernst P, Taylor C *et al.* 2007. Examining the evidence of under-five mortality reduction in a community-based programme in Gaza, Mozambique. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **101**: 814–22.
- Elmardi KA, Malik EM, Abdelgadir T *et al.* 2009. Feasibility and acceptability of home-based management of malaria strategy adapted to Sudan's conditions using artemisinin-based combination therapy and rapid diagnostic test. *Malaria Journal* **8**: 39.
- ERT1. 2012. Final report of evidence review team 1. Which community support activities improve the performance of community health workers? U.S. Government Evidence Summit: Community and Formal Health System Support for Enhanced Community Health Worker Performance.
- ERT2. 2012. Final report of evidence review team 2. Which formal health system support activities improve the performance of community health workers? U.S. Government Evidence Summit: Community and Formal Health System Support for Enhanced Community Health Worker Performance.
- ERT3. 2012. Final report of evidence review team 3. Enhancing community health worker performance through combining community and health systems approaches. U.S. Government Evidence Summit: Community and Formal Health System Support for Enhanced Community Health Worker Performance.
- Franco LM, Bennett S, Kanfer R. 2002. Health sector reform and public sector health worker motivation: a conceptual framework. *Social Science & Medicine* **54**: 1255–1266.
- Furth R, Crigler L. 2012. Improving CHW program functionality, performance, and engagement: operations research results from Zambia.
- Ge C, Fu J, Chang Y, Wang L. 2011. Factors associated with job satisfaction among Chinese community health workers: a cross-sectional study. *BMC Public Health* **11**: 884.
- GHWA. 2012. Synthesis paper. Developed out of the outcomes of four consultations on Community Health Workers and other Frontline Health Workers. Global Health Workforce Alliance.
- Gill CJ, Guerina NG, Mulenga C *et al.* 2012. Training Zambian traditional birth attendants to reduce neonatal mortality in the Lufwanyama Neonatal Survival Project (LUNESP). *International Journal of Gynaecology and Obstetrics* **118**: 77–82.
- Gill CJ, Phiri-Mazala G, Guerina NG *et al.* 2011. Effect of training traditional birth attendants on neonatal mortality (Lufwanyama Neonatal Survival Project): randomised controlled study. *BMJ*. **342**: d346. doi:10.1136/bmj.d346.
- Glenton C, Colvin CJ, Carlsen B *et al.* 2013. Barriers and facilitators to the implementation of lay health worker programmes to improve access to maternal and child health: qualitative evidence synthesis. *Cochrane Database of Systematic Reviews* **10**: CD010414.
- Green C. 2011. Community monitoring in a volunteer health worker setting: a review of the literature. inSCALE.
- Gusdal AK, Obua C, Anduaem T *et al.* 2011. Peer counselors' role in supporting patients' adherence to ART in Ethiopia and Uganda. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV* **23**: 657–62.
- Haines A, Sanders D, Lehmann U *et al.* 2007. Achieving child survival goals: potential contribution of community health workers. *Lancet* **369**: 2121–31.
- Hamer DH, Brooks ET, Semrau K *et al.* 2012. Quality and safety of integrated community case management of malaria using rapid

- diagnostic tests and pneumonia by community health workers. *Pathogens and Global Health* **106**: 32–9.
- Hermann K, Van Damme W, Pariyo GW *et al.* 2009. Community health workers for ART in sub-Saharan Africa: learning from experience—capitalizing on new opportunities. *Human Resource for Health* **7**: 31.
- Hien le TT, Takano T, Seino K, Ohnishi M, Nakamura K. 2008. Effectiveness of a capacity-building program for community leaders in a healthy living environment: a randomized community-based intervention in rural Vietnam. *Health Promotion International* **23**: 354–64.
- Hill Z, Manu A, Tawiah-Agyemang C *et al.* 2008. How did formative research inform the development of a home-based neonatal care intervention in rural Ghana? *Journal of Perinatology* **28**(Suppl 2): S38–45.
- Hoke TH, Blumenthal PD, Rasamihajamanana E, Razafindravony B. 2008. Safety, feasibility, and acceptability of community-based distribution (CBD) of Depot Medroxy Progesterone Acetate (DMPA) in Madagascar. *Family Health International*.
- Hoy D, Southavilay K, Chanlivong N *et al.* 2008. Building capacity and community resilience to HIV: A project designed, implemented, and evaluated by young Lao people. *Global Public Health* **3**: 47–61.
- Huber D, Saeedi N, Samadi AK. 2010. Achieving success with family planning in rural Afghanistan. *Bulletin of the World Health Organisation* **88**: 227–31.
- Jack BA, Kirton JA, Birakurataki J, Merriman A. 2012. The personal value of being a palliative care Community Volunteer Worker in Uganda: A qualitative study. *Palliative Medicine* **26**: 753–759.
- Jaffar S, Amuron B, Foster S *et al.* 2009. Rates of virological failure in patients treated in a home-based versus a facility-based HIV-care model in Jinja, southeast Uganda: a cluster-randomised equivalence trial. *Lancet* **374**: 2080–9.
- Jaskiewicz W, Tulenko K. 2012. Increasing community health worker productivity and effectiveness: a review of the influence of the work environment. *Human Resources for Health* **10**: 38.
- Javanparast S, Baum F, Labonte R, Sanders D. 2011. Community Health Workers' Perspectives on Their Contribution to Rural Health and Well-Being in Iran. *American Journal of Public Health* **101**: 2287–92.
- Javanparast S, Baum F, Labonte R *et al.* 2012. The experience of community health workers training in Iran: a qualitative study. *BMC Health Services Research* **12**: 291.
- Kalyango JN, Rutebemberwa E, Alfvén T *et al.* 2012. Performance of community health workers under integrated community case management of childhood illnesses in eastern Uganda. *Malaria Journal* **11**: 282.
- Kane SS, Gerretsen B, Scherpbier R, Dal Poz M, Dieleman M. 2010. A realist synthesis of randomised control trials involving use of community health workers for delivering child health interventions in low and middle income countries. *BMC Health Services Research* **10**: 286.
- Kebriaei A, Moteghedhi MS. 2009. Job satisfaction among community health workers in Zahedan District, Islamic Republic of Iran. *East Mediterranean Health Journal* **15**: 1156–63.
- Kim MH, Ahmed S, Buck WC *et al.* 2012a. The Tingathe programme: a pilot intervention using community health workers to create a continuum of care in the prevention of mother to child transmission of HIV (PMTCT) cascade of services in Malawi. *Journal of the International AIDS Society* **15**(Suppl 2):17389.
- Kim YM, Kalibala S, Neema S, Lukwago J, Weiss DC. 2012b. Meaningful involvement of people living with HIV/AIDS in Uganda through linkages between network groups and health facilities: an evaluation study. *Psychology Health Medicine* **17**: 213–22.
- Kok MC, Muula S. 2013. Motivation and job satisfaction of Health Surveillance Assistants in Mwanza, Malawi: an explorative study. *Malawi Medical Journal* **25**: 5–11.
- Kouyate B, Some F, Jahn A *et al.* 2008. Process and effects of a community intervention on malaria in rural Burkina Faso: randomized controlled trial. *Malaria Journal* **7**: 50.
- Lehmann U, Sanders D. 2007. Community health workers: What do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers. *World Health Organization*.
- Lemay NV, Sullivan T, Jumbe B, Perry CP. 2012. Reaching remote health workers in Malawi: baseline assessment of a pilot mHealth intervention. *Journal of Health Communication* **17**(Suppl 1):105–17.
- Lewin S, Munabi-Babigumira S, Glenton C *et al.* 2010. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. *Cochrane Database of Systematic Reviews (Online)* **3**: CD004015.
- Lewis J. 2010. Busia Child Survival Project. Final Evaluation Report. African Medical and Research Foundation (AMREF), United States Agency for International Development (USAID).
- Maes K, Kalofonos I. 2013. Becoming and remaining community health workers: Perspectives from Ethiopia and Mozambique. *Social Science and Medicine* **87**: 52–9.
- Malarcher S, Meirik O, Lebetkin E *et al.* 2011. Provision of DMPA by community health workers: what the evidence shows. *Contraception* **83**: 495–503.
- Mannan I, Rahman SM, Sania A *et al.* 2008. Can early postpartum home visits by trained community health workers improve breastfeeding of newborns? *Journal of Perinatology* **28**: 632–40.
- Martinez R, Vivancos R, Visschers B *et al.* 2008. Training needs, practices and barriers in the work of community reproductive health workers in Masindi district, Uganda. *Tropical Doctors* **38**: 93–5.
- McPherson RA, Tamang J, Hodgins S *et al.* 2010. Process evaluation of a community-based intervention promoting multiple maternal and neonatal care practices in rural Nepal. *BMC Pregnancy Childbirth* **10**: 31.
- Medhanyie A, Spigt M, Kifle Y *et al.* 2012. The role of health extension workers in improving utilization of maternal health services in rural areas in Ethiopia: a cross sectional study. *BMC Health Services Research* **12**: 352.
- Miller PC, Rashida G, Tasneem Z, Haque M. 2012. The effect of traditional birth attendant training on maternal and neonatal care. *International Journal of Gynaecology and Obstetrics* **117**: 148–52.
- Moetlo GJ, Pengpid S, Peltzer K. 2011. An Evaluation of the Implementation of Integrated Community Home-Based Care Services in Vhembe District, South Africa. *Indian Journal of Palliative Care* **17**: 137–42.
- Mohan P, Kishore B, Singh S *et al.* 2011. Assessment of implementation of integrated management of neonatal and childhood illness in India. *Journal of Health, Population, and Nutrition* **29**: 629–38.
- Mukanga D, Tibenderana JK, Kiguli J *et al.* 2010. Community acceptability of use of rapid diagnostic tests for malaria by community health workers in Uganda. *Malaria Journal* **9**: 203.
- Mukanga D, Tibenderana JK, Peterson S *et al.* 2012. Access, acceptability and utilization of community health workers using diagnostics for case management of fever in Ugandan children: a cross-sectional study. *Malaria Journal* **11**: 121.
- Mukherjee JS, Eustache FE. 2007. Community health workers as a cornerstone for integrating HIV and primary healthcare. *AIDS Care* **19**(Suppl 1):S73–82.

- Mutalemwa P, Kisinza WN, Kisoka WJ *et al.* 2009. Community directed approach beyond ivermectin in Tanzania: a promising mechanism for the delivery of complex health interventions. *Tanzania Journal of Health Research* **11**: 116–25.
- Nasreen HE, Nahar S, Al Mamun M, Afsana K, Byass P. 2011. Oral misoprostol for preventing postpartum haemorrhage in home births in rural Bangladesh: how effective is it? *Global Health Action* **4**: 7017. DOI: 10.3402/gha.v4i0.7017.
- Nelson BD, Ahn R, Fehling M *et al.* 2012. Evaluation of a novel training package among frontline maternal, newborn, and child health workers in South Sudan. *International Journal of Gynaecology and Obstetrics* **119**: 130–5.
- Nkonki L, Cliff J, Sanders D. 2011. Lay health worker attrition: important but often ignored. *Bulletin of the World Health Organization* **89**: 919–23.
- Nsabagasani X, Jesca Nsungwa S, Kallander K *et al.* 2007. Home-based management of fever in rural Uganda: community perceptions and provider opinions. *Malaria Journal* **6**: 11.
- Nyanzi S, Manneh H, Walraven G. 2007. Traditional birth attendants in rural Gambia: beyond health to social cohesion. *African Journal of Reproductive Health* **11**: 43–56.
- Olang'o CO, Nyamongo IK, Aagaard-Hansen J. 2010. Staff attrition among community health workers in home-based care programmes for people living with HIV and AIDS in western Kenya. *Health Policy* **97**: 232–7.
- Omer K, Mhatre S, Ansari N, Laucirica J, Andersson N. 2008. Evidence-based training of frontline health workers for door-to-door health promotion: a pilot randomized controlled cluster trial with Lady Health Workers in Sindh Province, Pakistan. *Patient Education and Counseling* **72**: 178–85.
- Osawa E, Kodama T, Kundishora E. 2010. Motivation and sustainability of care facilitators engaged in a community home-based HIV/AIDS program in Masvingo Province, Zimbabwe. *AIDS Care* **22**: 895–902.
- Palazuelos D, Ellis K, Im DD *et al.* 2013. 5-SPICE: the application of an original framework for community health worker program design, quality improvement and research agenda setting. *Glob Health Action* **6**: 19658.
- Peltzer K, Tabane C, Matseke G, Simbayi L. 2010. Lay counsellor-based risk reduction intervention with HIV positive diagnosed patients at public HIV counselling and testing sites in Mpumalanga, South Africa. *Evaluation and Program Planning* **33**: 379–85.
- Perez F, Ba H, Dastagire SG, Altmann M. 2009. The role of community health workers in improving child health programmes in Mali. *BMC International Health and Human Rights* **9**: 28. doi:10.1186/1472-698X-9-28.
- Pongvongsa T, Nonaka D, Kobayashi J *et al.* 2011. Determinants of monthly reporting by village health volunteers in a poor rural district of Lao PDR. *The Southeast Asian Journal of Tropical Medicine and Public Health* **42**: 1269–81.
- Posner J, Kayastha P, Davis D *et al.* 2009. Development of leadership self-efficacy and collective efficacy: adolescent girls across castes as peer educators in Nepal. *Global Public Health* **4**: 284–302.
- Prasad B, Muraleedharan V. 2007. Community Health Workers: a review of concepts, practice and policy concerns. *A review as part of ongoing research of International Consortium for Research on Equitable Health Systems (CREHS)*.
- Prata N, Ejembi C, Fraser A, Shittu O, Minkler M. 2012a. Community mobilization to reduce postpartum hemorrhage in home births in northern Nigeria. *Social Science and Medicine* **74**: 1288–96.
- Prata N, Gessesew A, Abraha AK, Holston M, Potts M. 2009. Prevention of postpartum hemorrhage: options for home births in rural Ethiopia. *African Journal of Reproductive Health* **13**: 87–95.
- Prata N, Quaiyum MA, Passano P *et al.* 2012b. Training traditional birth attendants to use misoprostol and an absorbent delivery mat in home births. *Social Science and Medicine* **75**: 2021–7.
- Puchalski Ritchie LM, Van Lettow M, Barnsley J *et al.* 2012. Evaluation of lay health workers' needs to effectively support anti-tuberculosis treatment adherence in Malawi. *International Journal of Tuberculosis and Lung Disease* **16**: 1492–1497.
- Puett C, Coates J, Alderman H, Sadler K. 2013. Quality of care for severe acute malnutrition delivered by community health workers in southern Bangladesh. *Maternal and Child Nutrition* **9**: 130–42.
- Rahman A, Malik A, Sikander S, Roberts C, Creed F. 2008. Cognitive behaviour therapy-based intervention by community health workers for mothers with depression and their infants in rural Pakistan: a cluster-randomised controlled trial. *Lancet* **372**: 902–9.
- Rahman M, Tasneem S. 2008. Determinants of income of the Shasthya Shebikas: evidences from a pilot MNCH initiative in the Nilphamari district of Bangladesh. BRAC Research & Evaluation Division.
- Rahman SM, Ali NA, Jennings L *et al.* 2010. Factors affecting recruitment and retention of community health workers in a newborn care intervention in Bangladesh. *Human Resources for Health* **8**: 12.
- Razee H, Whittaker M, Jayasuriya R, Yap L, Brentnall L. 2012. Listening to the rural health workers in Papua New Guinea - The social factors that influence their motivation to work. *Social Science and Medicine* **75**: 828–35.
- Root R, van Wyngaard A. 2011. Free love: a case study of church-run home-based caregivers in a high vulnerability setting. *Global Public Health* **6(Suppl 2)**:S174–91.
- Rosato M, Laverack G, Grabman LH *et al.* 2008. Community participation: lessons for maternal, newborn, and child health. *Lancet* **372**: 962–71.
- Rowe SY, Kelly JM, Olewe MA *et al.* 2007a. Effect of multiple interventions on community health workers' adherence to clinical guidelines in Siaya district, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **101**: 188–202.
- Rowe SY, Olewe MA, Kleinbaum DG *et al.* 2007b. Longitudinal analysis of community health workers' adherence to treatment guidelines, Siaya, Kenya, 1997-2002. *Tropical Medicine and International Health* **12**: 651–63.
- Sadler K, Puett C, Mothabbir G, Myatt M. 2011. *Community case management of severe acute malnutrition in southern Bangladesh*. Boston: Tufts University.
- Sahay S, Mehendale S. 2011. Engaging community to support hiv prevention research. *Eastern Journal of Medicine* **16**: 168–77.
- Saleem S, Rouse DJ, McClure EM *et al.* 2007. Chlorhexidine vaginal and infant wipes to reduce perinatal mortality and morbidity: a randomized controlled trial. *Obstetrics and Gynecology* **115**: 1225–32.
- Sanghvi H, Ansari N, Prata NJ *et al.* 2010. Prevention of postpartum hemorrhage at home birth in Afghanistan. *International Journal of Gynaecology and Obstetrics* **108**: 276–81.
- Sanjana P, Torpey K, Schwarzwalder A *et al.* 2009. Task-shifting HIV counselling and testing services in Zambia: the role of lay counsellors. *Human Resources for Health* **7**: 44.
- Saravanan S, Turrell G, Johnson H, Fraser J, Patterson C. 2011. Traditional birth attendant training and local birthing practices in India. *Evaluation Program for Planning* **34**: 254–65.
- Saravanan S, Turrell G, Johnson H, Fraser J, Patterson CM. 2012. Re-examining authoritative knowledge in the design and content of a TBA training in India. *Midwifery* **28**: 120–30.

- Satti H, Motsamai S, Chetane P *et al.* 2012. Scaling up a comprehensive approach to improving maternal health in the mountains of lesotho. *International Journal of Gynecology and Obstetrics* **119**: S472–3.
- Schneider H, Hlophe H, van Rensburg D. 2008. Community health workers and the response to HIV/AIDS in South Africa: tensions and prospects. *Health Policy Plan* **23**: 179–87.
- Scott K, Shanker S. 2010. Tying their hands? Institutional obstacles to the success of the ASHA community health worker programme in rural north India. *AIDS Care* **22**(Suppl 2):1606–12.
- Shah R, Munos MK, Winch PJ *et al.* 2010. Community-based health workers achieve high coverage in neonatal intervention trials: a case study from Sylhet, Bangladesh. *Journal of Health, Population and Nutrition* **28**: 610–8.
- Shah SA, Kristensen S, Memon MA, White HL, Vermund SH. 2007. Syndromic management training for non-formal care providers in Pakistan improves quality of care for sexually transmitted diseases STD care: a randomized clinical trial. *Southeast Asian Journal of Tropical Medicine and Public Health* **38**: 737–48.
- Shankar AV, Asrilla Z, Kadha JK *et al.* 2009. Programmatic effects of a large-scale multiple-micronutrient supplementation trial in Indonesia: using community facilitators as intermediaries for behavior change. *Food and Nutrition Bulletin* **30**: S207–14.
- Simba DO, Kakoko DC. 2009. Volunteerism among out-of-school adolescent reproductive health peer educators: is it a sustainable strategy in resource constrained countries? *African Journal of Reproductive Health* **13**: 99–110.
- Simon S, Chu K, Frieden M *et al.* 2009. An integrated approach of community health worker support for HIV/AIDS and TB care in Angonia district, Mozambique. *BMC International Health and Human Rights* **9**: 13. doi:10.1186/1472-698X-9-13.
- Simwaka BN, Theobald S, Willets A *et al.* 2012. Acceptability and effectiveness of the storekeeper-based TB referral system for TB suspects in sub-districts of Lilongwe in Malawi. *PLoS One* **7**: e39746.
- Smith S, Agarwal A, Crigler L *et al.* 2013. Community Health Volunteer Program Functionality and Performance in Madagascar: A Synthesis of Qualitative and Quantitative Assessments. Research and Evaluation Report. University Research Co., LLC (URC).
- Smith S, Kelly A, Randhawa G. 2007. The provision of primary care interventions by community health support workers in Pakistan. *Community Practice* **80**: 18–22.
- Soofi S, Ahmed S, Fox MP *et al.* 2012. Effectiveness of community case management of severe pneumonia with oral amoxicillin in children aged 2–59 months in Matiari district, rural Pakistan: a cluster-randomised controlled trial. *Lancet* **379**: 729–37.
- Sranacharoengpong K, Hanning RM. 2011. Developing a diabetes prevention education programme for community health-care workers in Thailand: formative findings. *Primary Health Care Research & Development* **12**: 357–69.
- Srivastava DK, Prakash S, Adhish V *et al.* 2009. A study of interface of ASHA with the community and the service providers in Eastern Uttar Pradesh. *Indian Journal of Public Health* **53**: 133–6.
- Stanback J, Mbonye AK, Bekiita M. 2007. Contraceptive injections by community health workers in Uganda: a nonrandomized community trial. *Bulletin of the World Health Organisation* **85**: 768–73.
- Standing H, Chowdhury AM. 2008. Producing effective knowledge agents in a pluralistic environment: what future for community health workers? *Social Science and Medicine* **66**: 2096–107.
- Suri A, Gan K, Carpenter S. 2007. Voices from the field: perspectives from community health workers on health care delivery in rural KwaZulu-Natal, South Africa. *Journal of Infectious Disease* **196**(Suppl 3): S505–11.
- Takasugi T, Lee AC. 2012. Why do community health workers volunteer? A qualitative study in Kenya. *Public Health* **126**: 839–45.
- Teela KC, Mullany LC, Lee CI *et al.* 2009. Community-based delivery of maternal care in conflict-affected areas of eastern Burma: perspectives from lay maternal health workers. *Social Science and Medicine* **68**: 1332–40.
- Teklehaimanot A, Kitaw Y, Girma S *et al.* 2007. Study of the working conditions of health extension workers in Ethiopia. *Ethiopian Journal of Health Development* **21**(3):246–259.
- Tenthani L, Cataldo F, Chan AK *et al.* 2012. Involving expert patients in antiretroviral treatment provision in a tertiary referral hospital HIV clinic in Malawi. *BMC Health Services Research* **12**: 140.
- Torpey KE, Kabaso ME, Mutale LN *et al.* 2008. Adherence support workers: a way to address human resource constraints in antiretroviral treatment programs in the public health setting in Zambia. *PLoS One* **3**: e2204.
- Uzochukwu BS, Onwujekwe OE, Ezeilo EA *et al.* 2008. Integrated management of childhood illness in Nigeria: does short-term training of health workers improve their performance? *Public Health* **122**: 367–70.
- Vichayanrat T, Steckler A, Tanasugarn C, Lexomboon D. 2012. The evaluation of a multi-level oral health intervention to improve oral health practices among caregivers of preschool children. *Southeast Asian Journal of Tropical Medicine and Public Health* **43**: 526–39.
- Viswanathan K, Hansen PM, Hafizur Rahman M *et al.* 2012. Can community health workers increase coverage of reproductive health services? *Journal of Epidemiology and Community Health* **66**: 894–900.
- Wang JW, Wei CN, Harada K *et al.* 2011. Applying the social cognitive perspective to volunteer intention in China: the mediating roles of self-efficacy and motivation. *Health Promotion International* **26**: 177–87.
- WHO. 2006. Working together for health: the World Health Report 2006. World Health Organization.
- Willis-Shattuck M, Bidwell P, Thomas S *et al.* 2008. Motivation and retention of health workers in developing countries: a systematic review. *BMC Health Services Research* **8**: 247.
- Winch PJ, Gilroy KE, Doumbia S *et al.* 2008. Operational issues and trends associated with the pilot introduction of zinc for childhood diarrhoea in Bougouni district, Mali. *Journal of Health, Population and Nutrition* **26**: 151–62.
- Wools-Kaloustian KK, Sidle JE, Selke HM *et al.* 2009. A model for extending antiretroviral care beyond the rural health centre. *Journal of International AIDS Society* **12**: 22.
- Wringe A, Cataldo F, Stevenson N, Fakoya A. 2010. Delivering comprehensive home-based care programmes for HIV: a review of lessons learned and challenges ahead in the era of antiretroviral therapy. *Health Policy Plan* **25**: 352–62.
- Yasuoka J, Poudel KC, Ly P *et al.* 2012. Scale-up of community-based malaria control can be achieved without degrading community health workers' service quality: the Village Malaria Worker project in Cambodia. *Malaria Journal* **11**: 4.
- Yeboah-Antwi K, Pilingana P, Macleod WB *et al.* 2010. Community case management of fever due to malaria and pneumonia in children under five in Zambia: a cluster randomized controlled trial. *PLoS Medicine* **7**: e1000340.
- Yirga D, Deribe K, Woldemichael K, Wondafrash M, Kassahun W. 2010. Factors associated with compliance with community directed treatment with ivermectin for onchocerciasis control in Southwestern Ethiopia. *Parasites and Vectors* **3**: 48.
- Zachariah R, Teck R, Buhendwa L *et al.* 2007. Community support is associated with better antiretroviral treatment outcomes in a resource-limited rural district in Malawi. *Transaction of the Royal Society of Tropical Medicine and Hygiene* **101**: 79–84.