Health Policy and Planning, 35, 2020, 1039–1052
doi: 10.1093/heapol/czaa049
Advance Access Publication Date: 4 June 2020
Review

The distinctive roles of urban community health workers in low- and middle-income countries: a scoping review of the literature

Teralynn Ludwick [1,*], Alison Morgan[2], Sumit Kane[2], Margaret Kelaher[3] and Barbara McPake[4]

[1]Nossal Institute for Global Health, Melbourne School of Population and Global Health, University of Melbourne, 333 Exhibition Street, Carlton, Melbourne, VIC, 3004, Australia, [2]Maternal Sexual and Reproductive Health Unit, Nossal Institute for Global Health, Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia, [3]Centre for Health Policy, Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia and [4]Nossal Institute for Global Health, Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia

*Corresponding author. Nossal Institute for Global Health, Melbourne School of Population and Global Health, University of Melbourne, 333 Exhibition Street, Carlton, Melbourne, VIC, Australia. E-mail: teralynn.ludwick@unimelb.edu.au

Accepted on 30 April 2020

Abstract

Addressing urban health challenges in low- and middle-income countries (LMICs) has been hampered by lack of evidence on effective mechanisms for delivering health services to the poor. The urban disadvantaged experience poor health outcomes (often worse than rural counterparts) and face service barriers. While community health workers (CHWs) have been extensively employed in rural communities to address inequities, little attention has been given to understanding the roles of CHWs in urban contexts. This study is the first to systematically examine urban CHW roles in LMICs. It aims to understand their roles vis-à-vis other health providers and raise considerations for informing future scope of practice and service delivery models. We developed a framework that presents seven key roles performed by urban CHWs and position these roles against a continuum of technical to political functions. Our scoping review included publications from four databases (MEDLINE, EMBASE, CINAHL and Social Sciences Citation Index) and two CHW resource hubs. We included all peer-reviewed, CHW studies situated in urban/peri-urban, LMIC contexts. We identify roles (un)commonly performed by urban CHWs, present the range of evidence available on CHW effectiveness in performing each role and identify considerations for informing future roles. Of 856 articles, 160 met the inclusion criteria. Programmes spanned 34 LMICs. Studies most commonly reported evidence on CHWs roles related to health education, outreach and elements of direct service provision. We found little overlap in roles between CHWs and other providers, with some exceptions. Reported roles were biased towards home visiting and individual-capacity building, and not well-oriented to reach men/youth/working women, support community empowerment or link with social services. Urban-specific adaptations to roles, such as peer outreach to high-risk, stigmatized communities, were limited. Innovation in urban CHW roles and a better understanding of the unique opportunities presented by urban settings is needed to fully capitalize on their potential.

Keywords: Urban health, community health, human resources, low- and middle-income countries, health inequalities, review

© The Author(s) 2020. Published by Oxford University Press in association with The London School of Hygiene and Tropical Medicine. All rights reserved.
For permissions, please e-mail: journals.permissions@oup.com

Key Messages

- Urbanization will be a defining feature of low- and middle-income countries (LMICs) in the next decades; however, there is a lack of evidence on effective mechanisms for delivering health services to the urban poor and marginalized in LMICs.
- Our review of 160 studies across LMICS shows that CHWs can play a role in meeting the needs of urban poor and marginalized populations in contexts of weak health systems, resource constraints, and vast inequalities.
- Urban CHWs perform important roles that other health service providers are not well-positioned to deliver, including roles related to outreach, behavioural change, psychosocial support and managing chronic diseases.
- There are significant similarities in the way CHW roles are delivered in both urban and rural contexts, with few urban-specific adaptations found in our review. Innovation in CHW roles is needed to fully capitalize on opportunities presented by urban settings and to effectively respond to the challenges of operating in an urban environment.

Introduction

Virtually all future population growth is anticipated to occur in low- and middle-income (LMIC) cities, with most of the world's fastest growing cities located in Africa and Asia (United Nations and Department of Economic and Social Affairs PD, 2018). While some health indicators show improvement in urban contexts, reviews of rural–urban and intra-urban health disparities have shown an urban health disadvantage for many health indicators (Harpham, 2009; Eckert and Kohler, 2014). The urban poor can be as vulnerable to health risks as the rural poor, though urban–rural determinants of health and health outcomes differ [African Population and Health Research Center (APHRC), 2002; Harpham, 2009; Mberu *et al.*, 2016]. However, finding solutions to address growing urban health disparities has not been prioritized by the global health community (Shawar and Crane, 2017).

Despite greater financial flows to urban health services, the poor and other disadvantaged groups face significant barriers to accessing services, including limited availability of primary care services, financial costs, low health literacy and social exclusion (Harpham, 2009; Shetty, 2011; Prasad *et al.*, 2016; Angeles *et al.*, 2019). Existing services are increasingly overwhelmed by population growth and are of low quality (Agarwal *et al.*, 2010). At the same time, urban exposures related to shelter deprivation ('slums'), lack of sanitation systems, precarious livelihoods, poor nutrition, sedentary lifestyle, environmental pollution, violence, social isolation and other factors present significant health risks (Voigtländer *et al.*, 2008; Montgomery, 2009).

Lack of evidence on effective mechanisms for delivering health services to the urban poor has been identified as a key barrier to action (Shawar and Crane, 2017). While community health workers (CHWs) have been extensively employed in rural communities in LMICs to address health inequities (Perry *et al.*, 2014), little attention has been given to understanding the roles of CHWs in urban contexts and the factors that affect their performance (Frymus *et al.*, 2013). This study is the first to systematically examine urban CHW programmes and aims to: (1) identify the roles urban CHWs are performing within the health system, (2) present the range of available evidence on CHW effectiveness in carrying out those roles and (3) identify considerations for informing future roles based on unique characteristics of the urban setting. To do so, we analyse urban CHW roles within a new framework that sets out seven key roles against a continuum of technical to political functions.

Materials and methods

We conducted a scoping review in order to (1) comprehensively map the available evidence on urban CHW roles in LMICs across study designs, settings and programme types and (2) identify gaps and areas of innovation that can inform future research and policy directions (Arksey and O'Malley, 2005; Levac *et al.*, 2010). We searched for all peer-reviewed articles of CHWs operating in urban settings in LMICs published before 1 April 2018. We defined a CHW as: 'any health worker who: performs functions related to healthcare delivery, is trained in some way in the context of the intervention, but has received no formal professional or paraprofessional certificate or tertiary education degree, and may be paid or provide voluntary care' (Glenton *et al.*, 2013). As such, we included CHWs who performed a range of in/formal and un/paid roles and had a maximum of 2 years training (which is aligned with the WHO's criterion) (World Health Organization, 2018). This broad definition allowed us to include a wide range of CHW roles, including CHWs who deliver services as part of peer-based interventions. Given the diversity of terms used to refer to CHWs, we drew on search terms that were developed by the aforementioned Cochrane and WHO review (Glenton *et al.*, 2013; World Health Organization, 2018). In the absence of a recognized definition of the term, urban (United Nations and Department of Economic and Social Affairs PD, 2018), we included all articles which self-described their setting using one of the following terms: urban, city, metropolitan, town, peri-urban, suburb, township, slum, informal settlement or shanty town. With an academic librarian, we searched four health-related databases (MEDLINE, EMBASE, CINAHL, Web of Science (social science) for peer-reviewed literature and two WHO resource hubs (CHW Central and Global Health Workforce Alliance) for additional publications. The full search strategy is presented in Supplementary File S1.

We included publications on LMICs in any region (World Bank 2017 classification), published in any year, with full-text available in English (for feasibility reasons). As this is the first study to comprehensively investigate the role of urban CHWs in LMICs, we included all study types and related outcomes in order to capture the diversity and breadth of evidence on urban CHWs—a methodological choice made in other CHW reviews (Scott *et al.*, 2018). The lead author (TL) and a research assistant conducted the abstract and full-text screening in Covidence. Authors (BM, AM, MK) were consulted when there was uncertainty about including a study. We excluded articles that did not identify the CHW role, did not provide

findings specific to the urban CHW cadre and school-based interventions led by pupils. We also excluded studies in which CHW training exceeded 2 years and those in which no information about length of training was provided (see Supplementary File S2 for full list of inclusion/exclusion criteria and Supplementary File S3 for the list of included and excluded articles).

To analyse urban CHW roles within the health system, we developed a scope of work which identifies seven typical roles performed by urban CHWs in LMICs and presents examples of key tasks and activities corresponding to these roles (Figure 1). It draws from a well-established CHW scope of practice developed by the Minnesota Community Health Worker Alliance—a leader in the field—and integrates other common CHWs roles found in LMIC settings based on Scott *et al.*'s 2017 systematic review (Minnesota Department of Health, 2016; Scott *et al.*, 2018). We note that the boundaries between the roles are not rigid, but for simplicity we have categorized each role discretely. Second, we position the seven roles in the scope of work against a continuum of technical to political functions and against existing CHW typologies (Standing and Chowdhury, 2008).

The data collection tool captured information on the intervention location, CHW roles and performance outcomes. The tool was piloted by having two individuals collect data on an initial 10 studies and compare results. Following the pilot, data were extracted for each article by one individual followed by weekly review meetings to spot-check the data. Descriptive statistics were calculated in Excel. While the heterogeneity of study methods precluded a meta-analysis, we present the range of qualitative and quantitative evidence in relation to each of the seven roles outlined in our framework. This approach fits with our scoping review objective to comprehensively map the available evidence.

Results

The search resulted in 856 articles of which 160 met our inclusion criteria (see PRISMA Tree in Figure 2). Most (123/160; 76%) were published from 2010 onwards, with 5% (8/160) published earlier than 1999. Of the publications, 63% (100/160) were quantitative, 21% (34/160) were qualitative and 16% (26/160) were mixed methods. The articles covered 114 programmes (66 of which specified the programme name) (see Table 1). Any publication which did not specify the programme name was counted as a discrete programme. Among the programmes, 20% (23/114) were implemented by governments, 28% (32/114) by non-governmental organizations (NGOs) and charitable organizations, 5% (6/114) jointly by NGOs and governments, and another 8% by other types of organizations, such as research institutes. While some publications described their interventions as part of government strategies, it was unclear whether they were implemented through government structures or through NGO implementing partners, as is the case in many LMICs. In such cases without additional information, we categorized them as government-implemented programmes. A large number (44/114; 39%) did not report the type of implementing partner.

Geographic location of programmes included in reviewed studies

The review covered 114 urban CHW programmes, spanning 34 countries, with most in sub-Saharan Africa (68/114; 60%), Asia

Figure 1: Conceptual framework - urban CHW roles

	Typology of CHWs		CHW scope of work	
Technical functions ↕ Political functions	**Polyvalent roles**	**Generic profile:** predominantly volunteer work directed to filling gaps in health service provision in the context of health worker shortages		
	Uni-modal role	**Specialized agent:** trained to work on specific health conditions, typically within a particular health programs **"Expert patient":** people working for the same health programs they participate in as patients, that is, people with considerable knowledge and ability to manage their own condition and support other people with the same disease	**Role 1: Provide health education and build skills for behavioural change** • Promote wellness by providing culturally appropriate health information to clients and providers • Educate clients on disease prevention • Build individual capacity to achieve wellness • Facilitate groups **Role 2: Provide direct services and treatment** • Conduct health-related screenings • Assist clients in self-management of chronic illnesses and medication adherence • Administering treatment and vaccines • Distribute health commodities and medicines **Role 3: Provide psychosocial support** • Provide individual social and healthcare support •Counselling	**Role 4: Perform outreach and link community members to services** •Increase access to primary care through culturally competent outreach and linking to services •Educate community members about how to use the healthcare and social service systems • Link clients to and inform them of available community resources • Enroll clients into programs such as health insurance and public assistance • Make referrals and coordinate services • Facilitate continuity of care by providing follow-up **Role 5: Support health administration and information systems** • Perform general clerical duties • data collection • identify and report on outbreaks • monitor medicine stocks
	Community agent	**Community agents:** working as mediators and enablers, they support communities and health services to develop solutions to problems	**Role 6: Act as mediators between clients, communities, and health services** • Establish better communication processes, including clarifying cultural practices • Educate the health and social service systems about community needs and perspectives • Advocate for individual and community needs • Map communities to help locate and support needed services	**Role 7: Empower communities to address the social determinants of health** • Build community capacity to address the social determinants of health • Identify community needs • Involve participants in self and community advocacy

Figure 1 Conceptual framework—urban CHW roles.

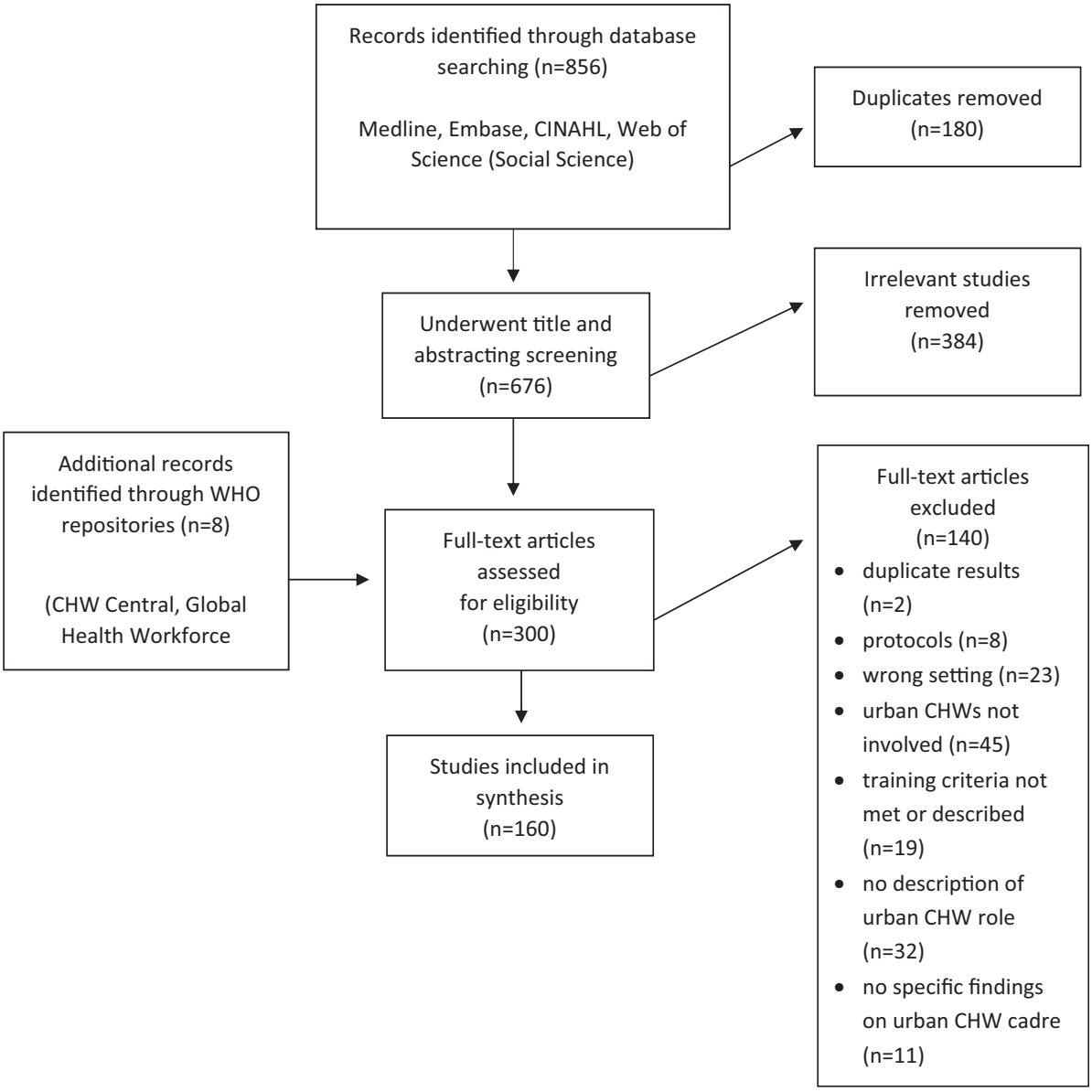


Figure 2 PRISMA tree.

(27/114; 24%) and Latin America and Caribbean (15/114; 13%). Publications were clustered on five countries (South Africa: 41 articles; Brazil: 26 articles; Bangladesh: 12 articles; Kenya: 12 articles; India: 11 articles).

Most programme sites were located in large cities with populations over 1 million (68/135; 50%) or in peri-urban communities (37/135; 27%) bordering large cities. Where programmes operated in more than one location, each distinct programme location was counted. As described by authors, nearly half (64/135; 47%) operated in slums, informal settlements or low-income neighbourhoods. Population size was not ascertained for 12 sites.

CHW scope of work

Urban CHWs addressed a wide range of health issues. Of the programmes which specified the health issue, the largest number focused on HIV/AIDS (32/108; 30%), maternal, newborn and child health (MNCH) (29/108; 27%) and non-communicable diseases (NCDs) (16/108; 15%). Sexual and reproductive health, mental health (almost exclusively maternal depression) and malaria were addressed by CHWs in less than 10% of programmes, and early childhood development in 7% of programmes (7/108). A minority of programmes addressed drug and alcohol use, oral health, occupational health, disaster preparedness and injury prevention (<5 programmes each).

The majority of CHWs carry out home visits (70/114; 61%), with almost one-third performing some tasks in clinics (35/114; 31%), and nearly a quarter performing tasks in other community venues (27/114; 24%). A minority (14/114; 13%) perform roles exclusively at clinics, mostly for tasks related to HIV/AIDS and NCDs. Few CHWs deliver services to schools (7/114; 6%).

Table 1 Countries and CHW programmes included in the review

Region	Country[a]	Implementing programme[b]
Asia	**Bangladesh (12)**	**BRAC/Manoshi (10);** Demand-Based Reproductive Health Commodity Project (DBRHCP); one unspecified programme
	China (3)	Centre for Disease Control (Jiangsu Province) and Chinese Association of STD/HIV Prevention and Control; two unspecified programmes
	India (11)	Anganwadi centres; Accredited Social Health Activists (ASHAs); Asha Community Health and Development Society (Asha); Urban Health Initiative; Freedom From Filariasis (FFF); India's DOTS-based Revised National TB Control Programme (RNTCP); the Occupational Health Programme in Mirzapur; three unspecified programmes
	Malaysia (1)	Co-HELP programme
	Pakistan (5)	Aetiology of Neonatal Infection in South Asia (ANISA); Primary Health Care Programme; Young Infant Clinical Signs Study; two unspecified programmes
	Philippines (2)	Barangay Health Workers; Barangay Pembo local government and citizen's initiative
	Sri Lanka (1)	DIABRISK-SL
	Vietnam (1)	National peer education programme for HIV prevention
Latin America and Caribbean	Argentina (1)	The Hypertension Control Programme in Argentina (HCPIA)
	Brazil (26)	**Family Health Strategy (22);** HIPERDIA Minas Programme; Projeto Princesinha; QualiDia project; one unspecified programme
	Dominican Republic (1)	Peer education-based HIV/AIDS prevention programme
	Guatemala (1)	UNICEF's Urban Basic Services Programme
	Haiti (1)	GHESKIO
	Jamaica (1)	One unspecified programme
	Mexico (3)	Meta Salud; Salud Para Su Corazón Promotores Model; Partners in Health; one unspecified programme
	Peru (2)	Peru's National TB Programme (NTP); Partners in Health
Sub-Saharan Africa	Burkina Faso (2)	Save the Children and Bill and Melinda Gates; one unspecified programme
	Cameroon (1)	One unspecified program
	Ethiopia (4)	Medhin Social Center (Ethiopia), Hiwot NGO (Ethiopia), Urban Health Extension program; one unspecified programme
	Ghana (3)	Ghana AIDS Commission; two unspecified programmes
	Kenya (12)	**Community Health Strategy, Government of Kenya (5)**; Jacaranda Health; Jhpiego young mother's club (2); Maternal Infant and Young Child Nutrition (MIYCN) (2); Programme Management Plus (PM+) Program; The Orphans and Vulnerable Children's (OVC) Project
	Malawi (7)	HitTB; National Tuberculosis Programme (NTP), Malawi; Prevention of Mother to Child Transmission (PMTCT) programme at Bwaila District Hospital, Malawi; four unspecified programmes
	Mozambique (2)	Programme modelled on the Cameroonian Baptist Convention Health Services Assisted Partner Services (APS) program; 'Together for Life'
	Nigeria (1)	One unspecified programme
	Sierra Leone (1)	One unspecified programme
	South Africa (41)	**Philani (8)**; AFrica Focus on Intervention Research for Mentalhealth, South Africa randomised controlled trial (AFFIRM-SA) (2); An adaption of the Health Visitor Preventive Intervention Programme; Diabetes Buddies; (3) Good Start Saving Newborn Lives; loveLife programme; 'health promoters' cadre, government of South Africa (3); South African Christian Leadership Assembly (2); the South African National Council on Alcoholism and Drug Dependence—(SANCA) and a local NGO; Tikking the Boxes; Ukwazana programme; Vuwani Programme; Western Cape Regional Services Council (RSC); 16 unspecified programmes
	Swaziland (1)	Siphilile
	Tanzania (1)	Urban Malaria Control Programme of Dar es Salaam
	Uganda (6)	The Uganda Newborn Study (UNEST); Village health teams (2); three unspecified programmes
	Zambia (3)	Three unspecified programmes
	Zimbabwe (3)	Red Cross community volunteers; two unspecified programmes
Middle East and North Africa	Iran (1)	Primary Health Care Network
	Turkey (2)	Two unspecified programmes
Europe	Russia (1)	Project Renewal

Note: some publications contain data for multiple countries.

[a] Number of publications pertaining to specified country. Countries with >10 publications are bolded.

[b] Programmes with >5 publications are bolded. A number of publications did not specify the name of the programme under study.

Evidence of CHW effectiveness in performing seven key roles

The following sections: (1) identify which roles are commonly carried out by urban CHWs, and; (2) present the range of qualitative and quantitative evidence available regarding their effectiveness in carrying out those roles. Supplementary File S4 presents the outcomes reported by authors.

Role 1: Provide health education and build skills for behavioural change

Health education is the most commonly reported urban CHW role (95/114 programmes; 83%). CHWs tend to deliver health education on a one-on-one basis, often alongside individual skill-building. In a few cases, typically related to NCD prevention, CHWs, delivered group-based sessions. Included studies frequently failed to describe explicit strategies that CHWs employed to build skills and motivate clients.

Outcomes related to increased knowledge

A few studies reported only on increased knowledge as the primary study outcome. Results included increased knowledge among unmarried, female adolescents about contraceptives in Bangladesh (though knowledge remained low overall) (Kabir *et al.*, 2015); and, increased knowledge of birth plans (though with less significant gains for maternal danger signs) (Ndirangu *et al.*, 2015).

Outcomes related to behavioural change

Studies most commonly reported outcomes related to behavioural change which tended to focus on safer sexual activities, health-promoting behaviours for MNCH, and diet and exercise for NCD prevention. In some interventions, health education and skill-building were performed alongside other tasks such as distributing condoms or providing referrals, making it difficult to isolate the impact of education alone on the behavioural change documented.

CHWs provided health education contributed to safer sexual activities, including increased condom use and/or decreased number of sexual partners, namely among sex workers and clients, men who have sex with men (MSM) and drug/alcohol users (Welsh *et al.*, 2001; Benzaken *et al.*, 2007; Parry *et al.*, 2017). However, change was often seen only in select behaviours (e.g. reduction of number of sex partners but no change in condom use or drug use) (Parry *et al.*, 2017) and in one case the change was not associated with CHW-provided education (Sandøy *et al.*, 2012).

Many studies reported on improved MNCH practices, particularly related to early child development and breastfeeding. House visits by CHWs improved caregiver-child attachment (Cooper *et al.*, 2002, 2009; Bryant *et al.*, 2012) and cognitive development (Powell and Grantham-McGregor, 1989), though the latter was financially unsustainable due to the intervention intensity. Largely through home-visiting (but also through peer mentoring), CHWs helped improve breastfeeding practices (Haider *et al.*, 2000; Salud *et al.*, 2009; Le Roux *et al.*, 2013; Rotheram-Borus *et al.*, 2014; Tomlinson *et al.*, 2014; Adams *et al.*, 2015; Ijumba *et al.*, 2015; Kimani-Murage *et al.*, 2016; Goudet *et al.*, 2018). Other positive externalities included decreased burden of care from healthier babies (Goudet *et al.*, 2018) and diffusion of health messages within social networks (Adams *et al.*, 2015). A cost-effectiveness study found significant costs savings for each averted case of low birthweight, stunted growth and suboptimal breastfeeding (Wynn *et al.*, 2017). While some studies noted that despite significant improvements in breastfeeding, such as doubling rates of exclusive breastfeeding, overall rates in the intervention population remained low (Ijumba *et al.*, 2015); other programmes grappled with waning attention to messages (Coetzee *et al.*, 2018) and failure to sustain improvements (Rotheram-Borus *et al.*, 2014). Other improved MNCH-related behaviours included improved home hygiene practices and use of ORS to treat diarrhoea (Agboatwalla and Akram, 1995). Only one study reported on family planning outcomes, reporting increased use of modern contraception methods following CHW-provided information during postnatal visits (Rajan *et al.*, 2016).

Regarding NCDs, several studies noted reductions in at least one risk factor or outcome related to cardiometabolic health (Mash *et al.*, 2012; Denman *et al.*, 2014; Balcazar *et al.*, 2015; Ibrahim *et al.*, 2016; Wijesuriya *et al.*, 2017). However, a phone-based, peer support intervention for diabetes prevention was ineffective (Rotheram-Borus *et al.*, 2012). A CHW-led group diabetes education intervention was found to be cost-effective (Mash *et al.*, 2015) and including CHW home visiting as part of a multi-component hypertension programme did not increase costs over usual care (He *et al.*, 2017).

On smoking cessation, motivational interviewing by CHWs doubled sustained smoking abstinence in tuberculosis (TB) patients (Louwagie *et al.*, 2014) and modestly improved cessation rates among pregnant women, with women finding CHW assistance more helpful than midwives in the latter study (Everett-Murphy *et al.*, 2010).

CHW-provided health education also improved a number of other health-promoting areas, including oral care (Frazao and Marques, 2009; Raj *et al.*, 2013), WASH practices (Thevos *et al.*, 2000; Gebreegziabher *et al.*, 2017), disaster readiness (Ardalan *et al.*, 2013) and household safety/injury reduction measures for young children (Odendaal *et al.*, 2009).

Outcomes related to health and social service utilization

Studies found that CHW-provided information increased screening for breast and cervical cancer (Gozum *et al.*, 2010; Mbachu *et al.*, 2017), vaccination rates (Owais *et al.*, 2011a), and uptake of antenatal care (ANC) and/or delivery with a trained birth attendant (Giles *et al.*, 2015; Jolly *et al.*, 2016).

Outcomes related to improved health status

A few studies documented the contribution of CHW-provided health education and skills-building to improved health outcomes. Three studies in which 'generalist' CHWs performed home visits and provided education on a range of MNCH-related topics (Le Roux *et al.*, 2013; Rotheram-Borus *et al.*, 2014; Tomlinson *et al.*, 2016), and one in which CHW home visits were focused specifically on infant–mother attachment (Cooper *et al.*, 2002) led to decreased likelihood of stunting, and/or healthier height/weight for age compared with controls, though one study noted that effects were not sustained past 18 months (Rotheram-Borus *et al.*, 2014).

Role 2: Provide direct services and treatment

Among included programmes, CHWs provided a range of direct services, including conducting health screenings and diagnostics (37/114; 33%), supporting self-management of chronic illness and medication adherence (27/114; 24%) and supplying medicines and health commodities (22/114; 19%). CHWs supplied medicines (primarily for treatment of malaria and occasionally for control of NCDs and TB) and health commodities (namely condoms for sex workers, family planning, HIV and STI prevention). Services not commonly

provided included administering medicines (8/114; 7%), assisting in the medical consult (4/117; 4%), administering vaccines (3/114; 3%) and providing first aid/taking vital signs (2/114; 2%).

Outcomes related to CHW-conducted health screenings

Studies report good ability of CHWs to identify and screen individuals for a range of health issues, including antenatal depression (Tsai *et al.*, 2014), dementia (Ramos-Cerqueira *et al.*, 2005), distress from gender-based violence (Bryant *et al.*, 2017), mental retardation in children (Dave *et al.*, 2005), oral health issues in the elderly (that impact eating, swallowing and speaking) (Ribeiro *et al.*, 2014) and eligibility for abortion (based on gestational age) (Constant *et al.*, 2017). Diagnostic tools were often modified and simplified for ease of use.

In carrying out voluntary HIV/AIDS testing and counselling services, there were varied levels of success in providing continued support across testing, counselling, disclosure and treatment. For example, CHW-assisted partner notification helped significantly increase testing and HIV case finding among sexual partners (Myers *et al.*, 2016). In a community HIV testing campaign for youth, CHWs successfully tested 98% of all neighbourhood youth, escorted nearly 100% of positive cases to the clinic for same-day enrolment in care, and when requested, provided guardians with assistance in disclosing perinatally acquired HIV infections to their children (Reif *et al.*, 2016). However, in another programme, less than one-third of women attending an ANC clinic accepted voluntary HIV counselling and testing by CHWs (Shetty *et al.*, 2005).

CHW-performed clinical breast examinations (Kohler *et al.*, 2017) and HIV counselling during ANC clinics (Shetty *et al.*, 2005) were deemed acceptable to women. However, in a South African context, service providers were reluctant to delegate responsibility to CHWs for determining a woman's eligibility for abortion, and suggested CHWs instead focus on client referrals (Constant *et al.*, 2017). In Zambia, CHWs tasked with responsibility for reactive case detection of malaria, successfully carried out thousands of tests which informed targeting for indoor residual spraying (Larsen *et al.*, 2015). While active case finding of individuals with suspected TB in a large HIV clinic was successful in identifying additional cases, it failed to capture the majority of those who were referred for diagnosis by clinicians through passive case finding (Hermans *et al.*, 2012).

Outcomes related to CHW support to self-management of chronic illnesses and medication adherence

Evidence of CHW assistance in managing chronic diseases was strongest for TB, with mixed outcomes for HIV/AIDS and NCDs. In four studies (Zwarenstein *et al.*, 2000; Khan *et al.*, 2002; Singh *et al.*, 2004; Ferreira *et al.*, 2011), home-based, DOT treatment outcomes by CHWs were similar or better than those of professional health workers and led to significant cost savings for health systems and patients in all three cost-effectiveness studies (Zwarenstein *et al.*, 2000; Khan *et al.*, 2002; Floyd *et al.*, 2003).

The single outcome on direct medication supervision for HIV-positive individuals by CHWs showed improved treatment adherence and psychosocial outcomes (Munoz *et al.*, 2010). Two qualitative studies noted the importance of family and community support for HIV treatment adherence, though CHWs were not always knowledgeable about this factor or in a position to address family dynamics (Masquillier *et al.*, 2016; Mprah, 2016).

Outcomes in managing NCDs differed depending on the CHW role. In one intervention, CHW-led health coaching and home blood pressure monitoring, audit and feedback combined with a physician-based intervention and a text-messaging intervention led to decreased blood pressure among clients (without increasing cost of care) (He *et al.*, 2017), while CHW-provided peer support for self-management of diabetes via mobile phone helped sustain attendance at intervention sessions, but was largely ineffective at controlling diabetes (Rotheram-Borus *et al.*, 2012).

Outcomes for CHW-provided treatment of vector-borne diseases

Few studies presented outcomes for CHW-provided treatment of malaria and other vector-borne diseases. In a study of four African countries, CHWs were able to provide correct child doses for malaria treatment, covered about 40% of suspected cases, and increased use of modern medicines for self-treatment (Akweongo *et al.*, 2011). Overall, however, CHWs struggled for viability against other established providers (Akweongo *et al.*, 2011). In another study, authors concluded that community-based treatment of malaria may not be relevant in urban settings given the extremely low treatment coverage by CHWs (Druetz *et al.*, 2015). The need for greater information campaigns was also reported for CHW-led, community treatment of schistosomiasis (Odhiambo *et al.*, 2016). While CHWs increased drug distribution and compliance for lymphatic filariasis, the coverage level remained insufficient to fully interrupt transmission (Nandha *et al.*, 2007).

Outcomes related to CHW-administered immunizations

While CHWs commonly encouraged parents to vaccinate their children, only three studies reported outcomes on CHW-administered immunizations. Two older studies showed improved coverage, via home visiting (Brugha and Kevany, 1996) and through delegation of responsibility for immunization to CHWs (Espinosa and Lopez, 1994). In the third study, only a fraction of mothers obtained immunization services from CHWs at integrated child development centres (Davey *et al.*, 2008).

Outcomes related to CHW-supplied medicines and health commodities

Overall few studies documented significant outcomes related to CHW-supplied medicines and health commodities, with the exception of condoms and syringes for high-risk populations (alcohol users, drug users, sex workers and MSM) in high-risk venues. Among these high-risk groups, studies showed increased condom use in five contexts (Welsh *et al.*, 2001; Benzaken *et al.*, 2007; Sandøy *et al.*, 2012; Duan *et al.*, 2013; Morojele *et al.*, 2014), though effects were not sustained over time in the latter (Morojele *et al.*, 2014). In a context of drug-use criminalization, needle distribution and collection sites hosted by peer CHWs were more effective than fixed-site syringe exchanges (Irwin *et al.*, 2006).

Role 3: Outreach and linking community members to services

In the included programmes, CHWs performed various activities to connect populations with health services, including informing, referring and linking clients to services (38/114; 33%), following-up patients (e.g. reminders and patient tracing)(22/114; 19%) and in one case, enrolling clients in social services (1/114; 1%).

Outcomes related to CHW outreach services

CHWs, typically peers, were able to successfully reach stigmatized and hard-to-reach populations, such as, MSM (Duan *et al.*, 2013; Yan *et al.*, 2014; Hugo *et al.*, 2018), commercial sex workers/clients (Welsh *et al.*, 2001; Benzaken *et al.*, 2007) and alcohol/drug users

(Irwin *et al.*, 2006; Morojele *et al.*, 2014; Parry *et al.*, 2017). They played important roles in providing HIV and other risk-reduction services to populations who would otherwise not be reached. For example, CHW outreach accounted for the majority of MSM who were tested for HIV in a Chinese context (Yan *et al.*, 2014). CHWs often engaged clients in settings where people engage in risky activities, including bars, drug-injection sites and where transactional sex takes place.

Outcomes of CHW outreach to these hard-to-reach populations varied and are presented in the section on behavioural change outcomes. Similarly, outcomes for other outreach activities such as screening and home-visits have been previously captured under sections on health education and direct service provision.

Outcomes related to appropriate and timely referral

CHWs referral helped improve TB case finding by referring suspected cases (Islam *et al.*, 2013) and reduce time to seek emergency obstetric care (Nahar *et al.*, 2011). Compliance with referrals varied, with high compliance for newborn care referrals in South Africa (Nsibande *et al.*, 2013) versus low (<25%) acceptance of hospital referrals in Pakistan (Owais *et al.*, 011b). Proximity of health centre, access to money and skilled CHWs positively affected referral uptake in South Africa (Nsibande *et al.*, 2013) while financial difficulties and gender, religious and cultural factors had a negative effect in Pakistan (Owais *et al.*, 2011b).

Outcomes related to client follow-up by CHWs

In addition to ongoing monitoring of clients for TB, HIV and NCDs (as presented in the section on chronic disease management and medicine adherence), CHW follow-up through home visits and telephone calls improved rates of return visits for early infant detection of HIV among exposed infants (Namukwaya *et al.*, 2015) and decreased time to seek care for maternal and newborn danger signs (McConnell *et al.*, 2016). In the study on HIV-exposed infants, mothers showed greater comfort disclosing to peers compared with other lay workers or hospital staff (Namukwaya *et al.*, 2015). However, co-design and follow-up by CHWs on risk reduction plans for drug use and sexual activities did not lead to changes in many risks (Parry *et al.*, 2017).

Outcomes related to client enrolment in health and social services

Only one study reported on outcomes related to CHW support in enrolling clients in health and social programmes. It found continued low application rates following CHW-provided information on applying for child support grants from the government, suggesting barriers to enrolment beyond lack of information (Zembe-Mkabile *et al.*, 2014).

Role 4: Provide psychosocial support

CHWs provided some level of psychosocial support, such as accompaniment to services (e.g. HIV testing for MSM), emotional support and companionship, and assistance with household chores and patient care, often for people living with HIV, in about 17% (19/114) of the interventions. Counselling was provided in 13% of programmes (15/114) largely in the context of HIV testing and counselling services, with some examples of psychological treatment for depression and trauma.

Outcomes psychosocial support

Outcomes for psychosocial support by CHWs were largely related to supporting people living with HIV/AIDs. Both an HIV youth testing campaign and a MSM intervention achieved nearly universal enrolment in care by providing accompaniment to treatment services following testing (Yan *et al.*, 2014; Reif *et al.*, 2016). In the MSM intervention, support from CHWs enabled HIV-positive men to be retained successfully in case management whereas unsupported individuals were unlikely to enter treatment (Yan *et al.*, 2014). CHWs provided psychosocial and instrumental support alongside direct medicine supervision, resulting in significant improvements in stigma, self-efficacy and fewer barriers to accessing HIV/AIDS services (Munoz *et al.*, 2010).

Outcomes related to counselling

In two studies, CHWs were as or more effective than professional providers (community nurses, psychologists) in reducing psychological distress due to gender-based violence (Bryant *et al.*, 2017) and depression (Matsuzaka *et al.*, 2017). CHWs showed moderate fidelity to the training manual content in counselling women with perinatal depression, with variable rates of client drop-out documented (Munodawafa *et al.*, 2017). Several challenges were noted regarding counselling in the context of HIV testing, including lack of accredited training for CHWs, insufficient time for counselling patients due to large caseloads (Engel *et al.*, 2017) and lack of confidentiality, privacy and consent in delivering the counselling (Ngangue *et al.*, 2017). While women who were counselled by CHWs about HIV while attending an ANC clinic almost universally accepted testing, more than two-thirds of women in the ANC clinic declined to be counselled (Shetty *et al.*, 2005).

Role 5: Act as mediators between clients, communities and health/social services

While 11% (12/114) of programmes reported some level of CHW engagement in conveying community needs and perspectives to service providers, description of such tasks was often cursory. Examples included engaging in dialogue with health committees and service providers, advocacy for clients and communities, mapping communities, and translation assistance between clients and doctors.

Outcomes related to mediating between clients, communities and services

Overall, few outcomes were documented. In one study, peer CHWs conveyed women's perspectives on breastfeeding barriers, including persuasive advertising by baby formula companies, which was used to inform the development of a WHO-District Health programme (Salud *et al.*, 2009). In another context, failure to set-up local health councils and participation primarily as observers limited CHW ability to play a political role and convey community perspectives (Fausto *et al.*, 2011).

Role 6: Support health administration and information systems

About 17% (19/114) of included programmes reported on CHW tasks related to health service administration and information systems, such as collecting routine household data (e.g. household profile, immunization records), recording deaths and gathering data for research.

Outcomes related to data collection

Few programmes reported associated outcomes. While CHWs reliably collected community data using household registers in Kenya

(Otieno-Odawa and Kaseje, 2014), they recorded low percentages of births (10%) in Pakistan and noted difficulties in documenting infant deaths (Shafiq *et al.*, 2016). In Zambia, CHW-collected data from reactive case detection of malaria was used to identify persistent malaria hotspots and target neighbourhoods for indoor spraying (Larsen *et al.*, 2015).

Role 7: Empowering communities to address the social determinants of health

CHW roles related to community-level capacity building were generally not well-described, with 9% (10/114) of programmes reporting some degree of CHW assistance in addressing social determinants of health (beyond individual-level ones), and very few supporting community advocacy.

Outcomes related to empowering communities to address the social determinants of health

In HIV-related interventions, CHWs helped break down barriers between local government staff and commercial sex workers (Shrestha *et al.*, 2002), build critical consciousness among MSM to collectively break the link between homophobia, isolation and sexual risk-taking (Tucker *et al.*, 2013), secure municipal budgets for HIV/AIDS prevention (Benzaken *et al.*, 2007) and turned the project headquarters into a community centre, allowing transvestite MSM to organize and assert their rights as citizens (Benzaken *et al.*, 2007). Challenges remained including continued police harassment (Benzaken *et al.*, 2007) and limitations to individual-level action in contexts of pervasive homophobia (Tucker *et al.*, 2013). CHWs also organized clean-up campaigns which reduced indiscriminate solid waste disposal (Musoke *et al.*, 2018) and initiated walking clubs for NCD prevention (Bradley and Puoane, 2006). A comprehensive slum development model (in which CHWs are one component) documented declines in child and infant mortality that were attributed to the intervention (Morrow *et al.*, 2016). The intervention provided residents with training on human rights and equity and built women's leadership and skills for advocacy, enabling slum residents to lobby for infrastructure improvements that resulted in changes to community norms and living conditions (Morrow *et al.*, 2016). In an intervention from the 1980s, CHWs provided training on early child development to women who established local day cares and successfully lobbied the government to provide food to the childcare centres (Espinosa and Lopez, 1994). In another intervention, CHWs and community women organized into a registered, grassroots NGO to manage the CHW programme and provide soft loans to women entrepreneurs (Agboatwalla and Akram, 1995).

Discussion

Addressing urban health challenges in LMICs has been hampered by a lack of evidence on effective mechanisms for delivering health services to the poor (Shawar and Crane, 2017). This is the first study to systematically examine the roles CHWs perform in relation to health system functions in urban contexts in LMICs. In this section, we outline potential misconceptions regarding urban CHWs' effectiveness and redundancies in relation to other service providers; highlight biases and gaps in existing approaches; and raise considerations for informing future scope of practice and service delivery models.

Overall, we find that there is a breadth of experience with urban CHWs across 34 LMICs; however, the literature within countries is generally sparse; furthermore, the literature is predominantly from South Africa, Brazil, Bangladesh, Kenya and India. Our review brings together the existing evidence to provide a comprehensive overview from which countries with limited experience may draw. Our review shows that urban CHWs are able to play a range of roles that are suitable for addressing a wide range of health issues.

Our review illuminates some biases in the nature of the roles assigned to CHWs and availability of supporting evidence for those roles. While we find that urban CHWs are covering the breadth of roles and functions outlined in our framework, studies most commonly reported on tasks and intervention outcomes related to providing health education, followed by outreach and linking clients to services, and elements of direct services and treatment. They least commonly reported on CHW roles or outcomes related to mediating between clients, communities and health services or engaging in community-level capacity building—the more politically oriented roles. We observe that this distribution of evidence seems to reflect a valuation of certain tasks over others and certain types of evidence by the global health community. Overall, the distribution of evidence is highly skewed towards home-visiting models for behavioural change (traditionally used in rural programmes) which may reflect limited experimentation by the global health community in testing innovative models designed specifically for urban settings.

Overall, we find little overlap in the roles played by urban CHWs with other service providers. Though there is often greater availability of health services and health workers in urban LMIC settings, service provision tends to focus on tertiary care (Harpham, 2009) and is not well-positioned to focus on roles related to outreach, behavioural change, psychosocial support, medication adherence and management of chronic diseases, among other roles performed by urban CHWs. Given the ability of urban CHWs to offer continuing contact, emotional and social support, and personalized approaches, we foresee much scope for urban CHWs to be part of the response to the WHO's call to build new service delivery models to manage the rise of chronic diseases in LMICs (World Health Organization, 2003). However, as only a minority of the programmes reviewed indicated that the CHWs performed their roles as part of government-provided health services, it will be important for governments and future research to look at ways of re-orienting and strengthening the capacity of urban health systems (which are often set up differently from rural ones) to support CHW cadres - if CHWs are to become an effective part of urban outreach, health promotion and chronic care service models.

Like their counterparts working in rural areas, urban CHWs also step into provide services in the context of health worker shortages (World Health Organization, 2008). For example, while HIV counselling and testing, screening, and psychological treatment can be carried out by other professional cadres, many LMICs simply do not have sufficient human resources to achieve wide coverage in the absence of CHWs who can be more rapidly trained and employed at lower costs (Haines *et al.*, 2007; Patel *et al.*, 2011). Nevertheless, our analysis suggests that certain CHW roles related to commodity distribution and service provision may be redundant in urban settings given the greater availability and diversity of healthcare providers compared with rural settings. Urban CHWs in our review struggled with low uptake of community-based treatment of malaria in the presence of other providers (Akweongo *et al.*, 2011; Druetz *et al.*, 2015) and infrequently administered vaccinations. Assignment of these roles to urban CHWs may be a vestige of the rural origins and orientation of CHW programmes. Performing these roles may not represent good investments for health systems or represent fulfilling roles for CHWs. Identifying how CHWs may add

value or conversely compete with other informal and formal providers needs to be strategically considered in programme design.

Overall, we find significant similarities in the way CHW roles are delivered in both urban and rural contexts. Perhaps most striking is the strong focus on health education delivered via household visits (typically to mothers). Similarities seen in urban and rural CHW roles may reflect common barriers to accessing health services experienced by both rural and urban disadvantaged populations (e.g. lack of access to informed health information, limited access to primary care services, financial barriers) and common underlying determinants of poor health (e.g. precarious livelihoods, food insecurity, poor sanitation, gender and cultural practices, limited voice in allocation of government resources) (Harpham, 2009). However, extending from Shawar and Crane's (2017) view, our analysis suggests that the similarities in urban and rural CHW roles also results from the failure to pay sufficient attention to the different realities of urban settings, resulting in a simplistic transplantation of rural models to urban contexts (Shawar and Crane, 2017). Notably, we found few adaptations to urban CHW roles, a surprising finding, given the considerable differences in the nature of community, work and home life, and available services in urban compared with rural areas. There is a need to inject new thinking into urban CHW programme approaches to provide strategic and meaningful CHW roles.

Despite significant similarities, we identified two useful urban adaptations. In contrast to rural areas where CHWs often support population-wide household coverage in the context of generalized poverty and extremely limited health services, urban CHWs primarily targeted low-income neighbourhoods and informal settlements where health inequalities are significant. In slums, not only do slum dwellers face barriers to accessing services but service providers face barriers to provision (Van De Vijver *et al.*, 2015; Pierce, 2017). We propose that urban CHWs provide a mechanism for bridging access into these communities. A second adaptation is the strategic use of peer CHWs to reach stigmatized communities involved in high-risk health activities who would likely otherwise self-exclude from health service use (e.g. MSM, sex workers/clients, drug users) due to fear of rejection and discrimination. Unlike the typical home visiting model which relies on geographically defined neighbourhoods, CHWs engaged peers in settings where risky activities took place, helping to diffuse messages through peer networks. We anticipate that government-supported CHWs may be inappropriate and ineffective in reaching these populations and that reliance on NGO-implemented programming may be necessary.

Our conceptual framework is novel in that it situates urban CHW roles against a spectrum of technical to political roles. This is important if we understand community empowerment to be a legitimate goal of health interventions (Labonte and Laverack, 2008; Laverack and Keshavarz Mohammadi, 2011). Our review finds limited evidence for community development, political and empowerment-oriented CHW roles in urban LMIC settings. We find few examples where CHWs played strong roles in building community capacity and empowerment, particularly in terms of advocacy, or acting as communicators and mediators between clients, communities and health services. This may be partly due to reporting bias as community empowerment outcomes are harder to measure and consequently less likely to be reported (Koelen *et al.*, 2001; Laverack and Wallerstein, 2001). Beyond this, however, our findings suggest that the limited political role may be due to programme designs which are oriented towards individual-level behavioural change rather than social action. This issue is not limited to urban programmes alone, but is part of a broader debate on the positioning of CHWs as health promotion practitioners (Kane *et al.*, 2016). Health-and-development interventions in this review, and CHW roles within these programmes, looked quite different from individual behavioural change interventions and were characterized by different impact pathways. For example, health-and-development models in this review included training on human rights and equity, women's leadership, advocacy and literacy programmes—elements which did not appear strongly in the other types of interventions. Specific attention is needed to understand the levers of community change in urban disadvantaged communities (e.g. the role of lobbying for resources) as distinct from rural development paradigms and to build innovative mechanisms for integrating these levers into health interventions. Without a better understanding of what is needed for them to act as empowering agents and what can be realistically expected from them, urban CHW roles are likely to be sidelined from social action.

We find that our typology of roles comprehensively covers the range of CHW roles found among the articles reviewed. However, it does not include roles such as team member or case manager which are present in high-income country contexts (Brooks *et al.*, 2014; Minnesota Department of Health, 2016), but which we found little evidence for in our review of LMICs. Innovative approaches are needed to support the evolution of urban CHW roles that are oriented towards the kinds of urban challenges and opportunities articulated by Elsey *et al.* (2019), and move away from simplistic transplantation of rural-based roles and practices to urban settings. To this end, we believe that evolving CHW roles should consider the changing nature of urban work and home life, the increased need for long term, chronic care strategies, and opportunities to link with social services (a role seldom observed in the review). Different sets of CHWs who work in different spaces may help reach working women, men and youth—groups who were largely not targeted by urban CHWs in our review. If urban CHWs are to become a key component of new chronic care service models, there is a need to for LMIC governments and collaborating partners to explore how to build closer linkages between CHWs and clinical teams for enhanced continuity of care from clinic to home (Garfield and Kangovi, 2019).

Limitations

Our scoping review extensively maps the various roles undertaken by urban CHWs in LMICs and presents the range of available evidence for those roles. Our framework, which was built from existing tools and literature, allowed us to effectively categorize urban CHW roles. While we recognize that it is possible to configure the categories differently, all configurations are likely to encounter conceptual overlap between the respective categories. While a meta-analysis was not possible given the diversity of study types and range of outcomes, we believe it was not necessary to achieve our mapping objectives. Further it is debatable whether the absence of quality assessment impacts the relevance of scoping review findings (Levac *et al.*, 2010). Our study is further limited by what is reported in peer-reviewed articles which may underreport negative findings and certain CHW roles. While we believe we have captured a significant breadth of the urban CHW literature, our review may have missed: important evidence not available in English; articles that described their setting without using one of our synonyms for 'urban'; and programmes which do not have the capacity to publish findings.

Conclusions

Urbanization will be a defining feature of LMICs in the next decades and is a key challenge for the Sustainable Development Goals. What part CHWs can play in meeting the needs of urban poor and marginalized populations in contexts of weak health systems, resource constraints and vast inequalities, requires further examination. Such research will be particularly relevant in middle-income countries with mushrooming urban populations where large numbers of poor live in deprivation in or on the periphery of large, expanding cities. A better understanding of the unique opportunities presented by urban settings can help inform innovations in urban CHW roles and can enable policymakers to fully capitalize on the potential of urban CHWs in LMICs.

Supplementary data

Supplementary data are available at *Health Policy and Planning* online.

Acknowledgements

I would like to thank Ebony Verbunt who played an important role in data collection and whose contribution supported the realization of this study. This research was supported by the Canadian Institutes of Health Research (FRN: 164268) and the University of Melbourne (Melbourne Research Scholarship). This work has not been previously published.

Conflict of interest statement. None declared.
Ethical approval. No ethical approval was required for this study.

References

Adams AM, Nababan HY, Manzoor A, Hanifi SM. 2015. Building social networks for maternal and newborn health in poor urban settlements: a cross-sectional study in Bangladesh Dalal K (ed). *PLoS One* **10**: e0123817.

African Population and Health Research Center (APHRC). 2002. *Population and Health Dynamics in Nairobi's Informal Settlements: Report of the Nairobi Cross-Sectional Slums Survey (NCSS) 2000*. Nairobi: African Population and Health Research Center (APHRC).

Agarwal S, Srivastava A, Kumar S. 2010. Urban health in developing countries. In: Agarwal S, Srivastava A, Kumar S (eds). *Perspectives of Knowledge Management in Urban Health*. New York, NY: Springer New York, 61–94.

Agboatwalla M, Akram DS. 1995. An experiment in primary health care in Karachi, Pakistan. *Community Development Journal* **30**: 384–91.

Akweongo P, Agyei-Baffour P, Sudhakar M *et al*. 2011. Feasibility and acceptability of ACT for the community case management of malaria in urban settings in five African sites. *Malaria Journal* **10**: 240.

Angeles G, Ahsan KZ, Streatfield PK, El Arifeen S, Jamil K. 2019. Reducing inequity in urban health: have the intra-urban differentials in reproductive health service utilization and child nutritional outcomes narrowed in Bangladesh? *Journal of Urban Health* **96**: 193–207.

Ardalan A, Mowafi H, Ardakani HM *et al*. 2013. Effectiveness of a primary health care program on urban and rural community disaster preparedness, Islamic Republic of Iran: a community intervention trial. *Disaster Medicine and Public Health Preparedness* **7**: 481–90.

Arksey H, O'Malley L. 2005. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology 8: 19–32*.

Balcázar H, Fernández-Gaxiola AC, Pérez-Lizaur AB, Peyron RA, Ayala C. 2015. Improving heart healthy lifestyles among participants in a salud para su corazón promotores model: the Mexican pilot study, 2009-2012. *Preventing Chronic Disease* **12**:140292.

Benzaken AS, Garcia EG, Sardinha JCG, Pedrosa VL, Paiva V. 2007. Community-based intervention to control STD/AIDS in the Amazon region, Brazil. *Revista De Saude Publica* 41 Suppl 2: 118–26.

Bradley HA, Puoane T. 2006. Prevention of hypertension and diabetes in an urban setting in South Africa: participatory action research with community health workers. *Ethnicity & Disease* **16**: 49–54.

Brooks BA, Davis S, Frank-Lightfoot L *et al*. 2014. *Building a Community Health Worker Program: The Key to Better Care, Better Outcomes, and Lower Costs*. Chicago: Community Health Works.

Brugha RF, Kevany JP. 1996. Maximizing immunization coverage through home visits: a controlled trial in an urban area of Ghana. *Bulletin of the World Health Organization* **74**: 517–24.

Bryant JH, Bryant NH, Williams S, Paul RNN, Erwin C. 2012. Addressing social determinants of health by integrating assessment of caregiver-child attachment into community based primary health care in urban Kenya. *International Journal of Environmental Research and Public Health* **9**: 3588–98.

Bryant RA, Schafer A, Dawson KS *et al*. 2017. Effectiveness of a brief behavioural intervention on psychological distress among women with a history of gender-based violence in urban Kenya: a randomised clinical trial. *PLoS Medicine* **14**: e1002371.

Coetzee B, Kohrman H, Tomlinson M *et al*. 2018. Community health workers' experiences of using video teaching tools during home visits: a pilot study. *Health & Social Care in the Community* **26**: 167–75.

Constant D, Harries J, Moodley J, Myer L. 2017. Accuracy of gestational age estimation from last menstrual period among women seeking abortion in South Africa, with a view to task sharing: a mixed methods study. *Reproductive Health* **14**: 8.

Cooper PJ, Landman M, Tomlinson M *et al*. 2002. Impact of a mother-infant intervention in an indigent peri-urban South African context: pilot study. *British Journal of Psychiatry* **180**: 76–81.

Cooper PJ, Tomlinson M, Swartz L *et al*. 2009. Improving quality of mother-infant relationship and infant attachment in socioeconomically deprived community in South Africa: randomised controlled trial. *BMJ* **338**: b974.

Dave U, Shetty N, Mehta L. 2005. A community genetics approach to population screening in India for mental retardation—a model for developing countries. *Annals of Human Biology* **32**: 195–203.

Davey A, Davey S, Datta U. 2008. Perception regarding quality of services in urban ICDS blocks in Delhi. *Indian Journal of Public Health* **52**: 156–8.

Denman CA, Rosales C, Cornejo E *et al*. 2014. Evaluation of the community-based chronic disease prevention program Meta Salud in northern Mexico, 2011-2012. *Preventing Chronic Disease* **11**:140218.

Druetz T, Ridde V, Kouanda S *et al*. 2015. Utilization of community health workers for malaria treatment: results from a three-year panel study in the districts of Kaya and Zorgho, Burkina Faso. *Malaria Journal* **14**:71.

Duan Y, Zhang H, Wang J *et al*. 2013. Community-based peer intervention to reduce HIV risk among men who have sex with men in Sichuan province. *Aids Education and Prevention* **25**: 38–48.

Eckert S, Kohler S. 2014. Urbanization and health in developing countries: a systematic review. *World Health & Population* **15**: 7–20.

Elsey H, Agyepong I, Huque R *et al*. 2019. Rethinking health systems in the context of urbanisation: challenges from four rapidly urbanising low-income and middle-income countries. *BMJ Global Health* **4**: e001501.

Engel N, Davids M, Blankvoort N *et al*. 2017. Making HIV testing work at the point of care in South Africa: a qualitative study of diagnostic practices. *BMC Health Services Research* **17**: 11.

Espinosa L, Lopez OA. 1994. Unicef's Urban Basic Services Program in illegal settlements in Guatemala City. *Environment and Urbanization* **6**: 9–29.

Everett-Murphy K, Steyn K, Mathews C *et al*. 2010. The effectiveness of adapted, best practice guidelines for smoking cessation counseling with disadvantaged, pregnant smokers attending public sector antenatal clinics in Cape Town, South Africa. *Acta Obstetricia et Gynecologica Scandinavica* **89**: 478–89.

Fausto MCR, Giovanella L, de Mendonca MHM *et al*. 2011. The work of community health workers in major cities in Brazil: mediation, community action, and health care. *The Journal of Ambulatory Care Management* **34**: 339–53.

Ferreira V, Brito C, Portela M, Escosteguy C, Lima S. 2011. DOTS in primary care units in the city of Rio de Janeiro, Southeastern Brazil. *Revista De Saúde Pública* **45**: 40–8.

Floyd K, Skeva J, Nyirenda T, Gausi F, Salaniponi F. 2003. Cost and cost-effectiveness of increased community and primary care facility

involvement in tuberculosis care in Lilongwe District, Malawi. *International Journal of Tuberculosis and Lung Disease* **7**: 29–37.

Frazao P, Marques D. 2009. Effectiveness of a community health worker program on oral health promotion. *Revista De Saude Publica* **43**: 463–71.

Frymus D, Kok M, De Koning K, Quain E. 2013. *Community Health Workers and Universal Coverage: Knowledge Gaps and a Need Based Global Research Agenda by 2015*. Geneva: Global Health Workforce Alliance.

Garfield C, Kangovi S. 2019. Integrating community health workers into health care teams without coopting them. *Health Affairs*. https://www-healthaffairs-org.ezp.lib.unimelb.edu.au/do/10.1377/hblog20190507.746358/full/.

Gebreegziabher EA, Astawesegn FH, Anjulo AA, Kerie MW. 2017. Urban health extension services utilization in Bishoftu Town. *BMC Health Services Research* **17**: 195.

Giles EL, Holmes M, McColl E, Sniehotta FF, Adams JM. 2015. Acceptability of financial incentives for breastfeeding: thematic analysis of readers' comments to UK online news reports. *BMC Pregnancy and Childbirth* **15**: 116.

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. In: Glenton C (ed). *Cochrane Database of Systematic Reviews*. Chichester, UK: John Wiley & Sons, Ltd, 1–67 .

Goudet S, Griffiths PL, Wainaina CW *et al*. 2018. Social value of a nutritional counselling and support program for breastfeeding in urban poor settings, Nairobi. *BMC Public Health* **18**: 424.

Gozum S, Karayurt O, Kav S, Platin N. 2010. Effectiveness of peer education for breast cancer screening and health beliefs in Eastern Turkey. *Cancer Nursing* **33**: 213–20.

Haider R, Ashworth A, Kabir I, Huttly SR. 2000. Effect of community-based peer counsellors on exclusive breastfeeding practices in Dhaka, Bangladesh: a randomised controlled trial. *Lancet (London, England)* **356**: 1643–7.

Haines A, Sanders D, Lehmann U *et al*. 2007. Achieving child survival goals: potential contribution of community health workers. *The Lancet* **369**: 2121–52.

Harpham T. 2009. Urban health in developing countries: what do we know and where do we go? *Health & Place* **15**: 107–16.

He J, Irazola V, Mills KT *et al*. 2017. Effect of a community health worker-led multicomponent intervention on blood pressure control in low-income patients in Argentina: a randomized clinical trial. *JAMA* **318**: 1016–25.

Hermans S, Nasuuna E, van Leth F *et al*. 2012. Implementation and effect of intensified case finding on diagnosis of tuberculosis in a large urban HIV clinic in Uganda: a retrospective cohort study. *BMC Public Health* **12**: 674.

Hugo JM, Rebe KB, Tsouroulis E *et al*. 2018. ANOVA Health Institute's harm reduction initiatives for people who use drugs. *Sexual Health* **15**: 176–8.

Ibrahim N, Moy FM, Awalludin IAN, Ali ZM, Ismail IS. 2016. Effects of a community-based healthy lifestyle intervention program (Co-HELP) among adults with prediabetes in a developing country: a quasi-experimental study. *PLoS One* **11**: e0167123.

Ijumba P, Doherty T, Jackson D *et al*. 2015. Effect of an integrated community-based package for maternal and newborn care on feeding patterns during the first 12 weeks of life: a cluster-randomized trial in a South African township. *Public Health Nutrition* **18**: 2660–8.

Irwin K, Karchevsky E, Heimer R, Badrieva L. 2006. Secondary syringe exchange as a model for HIV prevention programs in the Russian Federation. *Substance Use & Misuse* **41**: 979–99.

Islam S, Harries AD, Malhotra S *et al*. 2013. Training of community healthcare providers and TB case detection in Bangladesh. *International Health* **5**: 223–7.

Jolly SP, Rahman M, Afsana K, Yunus FM, Chowdhury A. 2016. Evaluation of maternal health service indicators in urban slum of Bangladesh Räisänen SH (ed). *PLoS One* **11**: e0162825.

Kabir H, Saha NC, Gazi R. 2015. Female unmarried adolescents' knowledge on selected reproductive health issues in two low performing areas of Bangladesh: an evaluation study. *BMC Public Health* **15**: 9.

Kane S, Kok M, Ormel H *et al*. 2016. Limits and opportunities to community health worker empowerment: a multi-country comparative study. *Social Science & Medicine* **164**: 27–34.

Khan MA, Walley JD, Witter SN, Imran A, Safdar N. 2002. Costs and cost-effectiveness of different DOT strategies for the treatment of tuberculosis in Pakistan. Directly Observed Treatment. *Health Policy and Planning* **17**: 178–86.

Kimani-Murage EW, Norris SA, Mutua MK *et al*. 2016. Potential effectiveness of Community Health Strategy to promote exclusive breastfeeding in urban poor settings in Nairobi, Kenya: a quasi-experimental study. *Journal of Developmental Origins of Health and Disease* **7**: 172–84.

Koelen MA, Vaandrager L, Colomér C. 2001. Health promotion research: dilemmas and challenges. *Journal of Epidemiology & Community Health* **55**: 257–62.

Kohler RE, Miller AR, Gutnik L, Lee CN, Gopal S. 2017. Experiences and perceptions regarding clinical breast exam screening by trained laywomen in Malawi. *Cancer Causes & Control* **28**: 137–43.

Labonte RN, Laverack G. 2008. *Health Promotion in Action: From Local to Global Empowerment*. Basingstoke: Palgrave Macmillan.

Larsen DA, Chisha Z, Winters B *et al*. 2015. Malaria surveillance in low-transmission areas of Zambia using reactive case detection. *Malaria Journal* **14**: 465.

Laverack G, Keshavarz Mohammadi N. 2011. What remains for the future: strengthening community actions to become an integral part of health promotion practice. *Health Promotion International* **26**: ii258–62.

Laverack G, Wallerstein N. 2001. Measuring community empowerment: a fresh look at organizational domains. *Health Promotion International* **16**: 179–85.

Le Roux IM, Tomlinson M, Harwood JM *et al*. 2013. Outcomes of home visits for pregnant mothers and their infants: a cluster randomized controlled trial. *AIDS* **27**: 1461–71.

Levac D, Colquhoun H, O'Brien KK. 2010. Scoping studies: advancing the methodology. *Implementation Science* **5**:69.

Louwagie GMC, Okuyemi KS, Ayo-Yusuf OA. 2014. Efficacy of brief motivational interviewing on smoking cessation at tuberculosis clinics in Tshwane, South Africa: a randomized controlled trial. *Addiction* **109**: 1942–52.

Mash B, Levitt N, Steyn K, Zwarenstein M, Rollnick S. 2012. Effectiveness of a group diabetes education programme in underserved communities in South Africa: pragmatic cluster randomized control trial. *BMC Family Practice* **13**: 126–32.

Mash R, Kroukamp R, Gaziano T, Levitt N. 2015. Cost-effectiveness of a diabetes group education program delivered by health promoters with a guiding style in underserved communities in Cape Town. *Patient Education and Counseling* **98**: 622–6.

Masquillier C, Wouters E, Mortelmans D *et al*. 2016. HIV/AIDS competent households: interaction between a health-enabling environment and community-based treatment adherence support for people living with HIV/AIDS in South Africa. *PLoS One* **11**: e0151379. doi:10.1371/journal.pone.0151379.

Matsuzaka CT, Wainberg M, Pala AN *et al*. 2017. Task shifting interpersonal counseling for depression: a pragmatic randomized controlled trial in primary care. *BMC Psychiatry* **17**:225.

Mbachu C, Dim C, Ezeoke U. 2017. Effects of peer health education on perception and practice of screening for cervical cancer among urban residential women in south-east Nigeria: a before and after study. *BMC Women's Health* **17**: 41.

Mberu BU, Haregu TN, Kyobutungi C, Ezeh AC. 2016. Health and health-related indicators in slum, rural, and urban communities: a comparative analysis. *Global Health Action* **9**:33163.

McConnell M, Ettenger A, Rothschild CW, Muigai F, Cohen J. 2016. Can a community health worker administered postnatal checklist increase health-seeking behaviors and knowledge?: evidence from a randomized trial with a private maternity facility in Kiambu County. *BMC Pregnancy and Childbirth* **16**: 136.

Minnesota Department of Health. 2016. *Community Health Worker (CHW) Toolkit: A Guide for Employers*. Saint Paul, MN: World Health Organization.

Montgomery MR. 2009. Urban health in low- and middle-income countries. In: *Oxford Textbook of Public Health*. Oxford 6th edition. 2015, 1297–1315.

Morojele NK, Kitleli N, Ngako K *et al*. 2014. Feasibility and acceptability of a bar-based sexual risk reduction intervention for bar patrons in Tshwane, South Africa. *SAHARA J: Journal of Social Aspects of HIV/AIDS* **11**: 1–9.

Morrow M, Armstrong G, Dayal P, Kermode M. 2016. Documenting a long-term development model in the slums of Delhi. *BMC International Health and Human Rights* **16**: 14.

Mprah A. 2016. Knowledge, opinions, and experiences of stigma as a barrier to antiretroviral therapy adherence among HIV community volunteers and health care givers in an urban slum, in Uganda. *Annals of Tropical Medicine and Public Health* **9**: 331–9.

Munodawafa M, Lund C, Schneider M. 2017. A process evaluation exploring the lay counsellor experience of delivering a task shared psycho-social intervention for perinatal depression in Khayelitsha, South Africa. *BMC Psychiatry* **17**:236.

Munoz M, Finnegan K, Zeladita J *et al*. 2010. Community-based DOT-HAART accompaniment in an urban resource-poor setting. *AIDS and Behavior* **14**: 721–30.

Musoke D, Ndejjo R, Halage AA *et al*. 2018. Drinking water supply, sanitation, and hygiene promotion interventions in two slum communities in central Uganda. *Journal of Environmental and Public Health* **2018**: 1–9.

Myers RS, Feldacker C, Cesar F *et al*. 2016. Acceptability and effectiveness of assisted human immunodeficiency virus partner services in Mozambique: results from a pilot program in a public, urban clinic. *Sexually Transmitted Diseases* **43**: 690–5.

Nahar S, Banu M, Nasreen HE. 2011. Women-focused development intervention reduces delays in accessing emergency obstetric care in urban slums in Bangladesh: a cross-sectional study. *BMC Pregnancy and Childbirth* **11**: 11.

Namukwaya Z, Barlow-Mosha L, Mudiope P *et al*. 2015. Use of peers, community lay persons and Village Health Team (VHT) members improves six-week postnatal clinic (PNC) follow-up and Early Infant HIV Diagnosis (EID) in urban and rural health units in Uganda: a one-year implementation study. *BMC Health Services Research* **15**: 555.

Nandha B, Sadanandane C, Jambulingam P, Das P. 2007. Delivery strategy of mass annual single dose DEC administration to eliminate lymphatic filariasis in the urban areas of Pondicherry, South India: 5 years of experience. *Filaria Journal* **6**: 7.

Ndirangu G, Gichangi A, Kanyuuru L *et al*. 2015. Using young mothers' clubs to improve knowledge of postpartum hemorrhage and family planning in informal settlements in Nairobi, Kenya. *Journal of Community Health* **40**: 692–8.

Ngangue P, Gagnon M-P, Bedard E. 2017. Challenges in the delivery of public HIV testing and counselling (HTC) in Douala, Cameroon: providers perspectives and implications on quality of HTC services. *BMC International Health and Human Rights* **17**: 9.

Nsibande D, Doherty T, Ijumba P *et al*. 2013. Assessment of the uptake of neonatal and young infant referrals by community health workers to public health facilities in an urban informal settlement, KwaZulu-Natal, South Africa. *BMC Health Services Research* **13**, https://doi.org/10.1186/1472-6963-13-47.

Odendaal W, Van Niekerk A, Jordaan E, Seedat M. 2009. The impact of a home visitation programme on household hazards associated with unintentional childhood injuries: a randomised controlled trial. *Accident Analysis & Prevention* **41**: 183–90.

Odhiambo GO, Musuva RM, Odiere MR, Mwinzi PN. 2016. Experiences and perspectives of community health workers from implementing treatment for schistosomiasis using the community directed intervention strategy in an informal settlement in Kisumu City, western Kenya. *BMC Public Health* **16**: 986.

Otieno-Odawa C, Kaseje D. 2014. Validity and reliability of data collected by community health workers in rural and peri-urban contexts in Kenya. *BMC Health Services Research* **14**: S5.

Owais A, Hanif B, Siddiqui AR, Agha A, Zaidi A. 2011a. Does improving maternal knowledge of vaccines impact infant immunization rates? A community-based randomized-controlled trial in Karachi. *BMC Public Health* **11**: 239.

Owais A, Sultana S, Stein AD *et al*. 2011b. Why do families of sick newborns accept hospital care? A community-based cohort study in Karachi. *Journal of Perinatology* **31**: 586–92.

Parry CDH, Carney T, Williams PP. 2017. Reducing substance use and risky sexual behaviour among drug users in Durban, South Africa: assessing the impact of community-level risk-reduction interventions. *SAHARA-J: Journal of Social Aspects of HIV/AIDS* **14**: 110–7.

Patel V, Chowdhary N, Rahman A, Verdeli H. 2011. Improving access to psychological treatments: lessons from developing countries. *Behaviour Research and Therapy* **49**: 523.

Perry HB, Zulliger R, Rogers MM. 2014. Community health workers in low-, middle-, and high-income countries: an overview of their history, recent evolution, and current effectiveness. *Annual Review of Public Health* **35**: 399–421.

Pierce G. 2017. Why is basic service access worse in slums? A synthesis of obstacles. *Development in Practice* **27**: 288–300.

Powell C, Grantham-McGregor S. 1989. Home visiting of varying frequency and child development. *Pediatrics* **84**: 157–64.

Prasad A, Gray CB, Ross A, Kano M. 2016. Metrics in urban health: current developments and future prospects. *Annual Review of Public Health* **37**: 113–33.

Raj S, Goel S, Sharma VL, Goel NK. 2013. Short-term impact of oral hygiene training package to Anganwadi workers on improving oral hygiene of preschool children in North Indian City. *BMC Oral Health* **13**: 67.

Rajan S, Speizer IS, Calhoun LM, Nanda P. 2016. Counseling during maternal and infant health visits and postpartum contraceptive use in Uttar Pradesh, India. *International Perspectives on Sexual and Reproductive Health* **42**: 167.

Ramos-Cerqueira ATA, Torres AR, Crepaldi AL *et al*. 2005. Identification of dementia cases in the community: a Brazilian experience. *Journal of the American Geriatrics Society* **53**: 1738–42.

Reif LK, Rivera V, Louis B *et al*. 2016. Community-based HIV and health testing for high-risk adolescents and youth. *AIDS Patient Care and STDS* **30**: 371–8.

Ribeiro MTF, Ferreira RC, Vargas AMD, Ferreira E. 2014. Validity and reproducibility of the revised oral assessment guide applied by community health workers. *Gerodontology* **31**: 101–10.

Rotheram-Borus MJ, Tomlinson M, Gwegwe M *et al*. 2012. Diabetes buddies: peer support through a mobile phone buddy system. *The Diabetes Educator* **38**: 357–65.

Rotheram-Borus MJ, Tomlinson M, Le Roux IM *et al*. 2014. A cluster randomised controlled effectiveness trial evaluating perinatal home visiting among South African mothers/infants Helleringer S (ed). *PLoS One* **9**: e105934.

Salud M, Gallardo JI, Dineros JA *et al*. 2009. People's initiative to counteract misinformation and marketing practices: the Pembo, Philippines breastfeeding experience, 2006. *Journal of Human Lactation* **25**: 341–9.

Sandøy IF, Zyaambo C, Michelo C, Fylkesnes K. 2012. Targeting condom distribution at high risk places increases condom utilization-evidence from an intervention study in Livingstone, Zambia. *BMC Public Health* **12**: 10.

Scott K, Beckham SW, Gross M *et al*. 2018. What do we know about community-based health worker programs? A systematic review of existing reviews on community health workers. *Human Resources for Health* **16**: 39.

Shafiq Y, Nisar MI, Kazi AM *et al*. 2016. Implementation of the ANISA study in Karachi, Pakistan: challenges and solutions. *The Pediatric Infectious Disease Journal* **35**: S60–4.

Shawar YR, Crane LG. 2017. Generating global political priority for urban health: the role of the urban health epistemic community. *Health Policy and Planning* **32**: 1161–73.

Shetty AK, Mhazo M, Moyo S *et al*. 2005. The feasibility of voluntary counselling and HIV testing for pregnant women using community volunteers in Zimbabwe. *International Journal of STD & AIDS* **16**: 755–9.

Shetty P. 2011. Health care for urban poor falls through the gap. *The Lancet* **377**: 627–8.

Shrestha R, Osei A, Kamphuis M. 2002. Evaluation of HIV/AIDS prevention through peer education, counselling, health care, training and urban refuges in Ghana. *Evaluation and Program Planning* **25**: 409–20.

Singh AA, Parasher D, Shekhavat GS *et al*. 2004. Effectiveness of urban community volunteers in directly observed treatment of tuberculosis patients: a field report from Haryana, North India. *The International Journal of Tuberculosis and Lung Disease* **8**: 800–2.

Standing H, Chowdhury A. 2008. Producing effective knowledge agents in a pluralistic environment: what future for community health workers? *Social Science & Medicine* **66**: 2096–107.

Thevos AK, Kaona FA, Siajunza MT, Quick RE. 2000. Adoption of safe water behaviors in Zambia: comparing educational and motivational approaches. *Education for Health (Abingdon, England)* **13**: 366–76.

Tomlinson M, Doherty T, Ijumba P *et al*. 2014. Goodstart: a cluster randomised effectiveness trial of an integrated, community-based package for maternal and newborn care, with prevention of mother-to-child transmission

of HIV in a South African township. *Tropical Medicine & International Health* **19**: 256–66.

Tomlinson M, Rotheram-Borus MJ, Le Roux IM *et al*. 2016. Thirty-six-month outcomes of a generalist paraprofessional perinatal home visiting intervention in South Africa on maternal health and Child Health and Development. *Prevention Science* **17**: 937–48.

Tsai AC, Tomlinson M, Dewing S *et al*. 2014. Antenatal depression case finding by community health workers in South Africa: feasibility of a mobile phone application. *Archives of Women's Mental Health* **17**: 423–31.

Tucker A, de Swardt G, Struthers H, McIntyre J. 2013. Understanding the needs of township men who have sex with men (MSM) health outreach workers: exploring the interplay between volunteer training, social capital and critical consciousness. *AIDS and Behavior* **17**: S33–42.

United Nations, Department of Economic and Social Affairs PD. 2018. *The World's Cities in 2018—Data Booklet*. Geneva: United Nations.

Van De Vijver S, Oti S, Oduor C *et al*. 2015. Challenges of health programmes in slums. *The Lancet* **386**: 2114–6.

Voigtländer S, Breckenkamp J, Razum O. 2008. Urbanization in developing countries: trends, health consequences and challenges. *Journal of Health & Development* **4**: 135–63.

Welsh MJ, Puello E, Meade M, Kome S, Nutley T. 2001. Evidence of diffusion from a targeted HIV/AIDS intervention in the Dominican Republic. *Journal of Biosocial Science* **33**: 107–19.

Wijesuriya M, Fountoulakis N, Guess N *et al*. 2017. A pragmatic lifestyle modification programme reduces the incidence of predictors of cardio-metabolic disease and dysglycaemia in a young healthy urban South Asian population: a randomised controlled trial. *BMC Medicine* **15**: 146.

World Health Organization. 2003. *Adherence to Long-Term Therapies: Evidence for Action*. Geneva: World Health Organization.

World Health Organization. 2008. *Task Shifting: Rational Redistribution of Tasks among Health Workforce Teams: Global Recommendations and Guidelines*. Geneva: World Health Organization.

World Health Organization. 2018. *WHO Guideline on Health Policy and System Support to Optimize Community Health Worker Programmes*. Geneva: World Health Organization.

Wynn A, Rotheram-Borus MJ, Leibowitz AA *et al*. 2017. Mentor mothers program improved child health outcomes at a relatively low cost in South Africa. *Health Affairs* **36**: 1947–55.

Yan HJ, Zhang RJ, Wei CY *et al*. 2014. A peer-led, community-based rapid HIV testing intervention among untested men who have sex with men in China: an operational model for expansion of HIV testing and linkage to care. *Sexually Transmitted Infections* **90**: 388–93.

Zembe-Mkabile W, Doherty T, Sanders D, Jackson D. 2014. Child Support Grant access and receipt among 12-week-old infants in an urban township setting in South Africa. *Global Health Action* **7**: 1–4.

Zwarenstein M, Schoeman JH, Vundule C, Lombard CJ, Tatley M. 2000. A randomised controlled trial of lay health workers as direct observers for treatment of tuberculosis. *The International Journal of Tuberculosis and Lung Disease* **4**: 550–4.