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Application of Primary Health Care Principles in National Community Health Worker Programs in Low- and Middle - Income Countries: A Scoping Review

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Title of the article: Application of Primary Health Care Principles in National Community Health Worker Programs in low- and Middle -Income Countries: A Scoping Review

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Abstract

Objective: To identify which PHC principles are reflected in the implementation of national CHW programs and how they may contribute to the outcomes of these programs in the context of low-and middle-income countries (LMICs).

Design: Scoping review

Data sources: A systematic search was conducted through PubMed, CINAHL, EMBASE and Scopus databases.

Eligibility Criteria: The review only considered published primary studies on national programs, projects or initiatives utilising the services of CHWs in LMICs focused on maternal and child health. We included only English language studies. Excluded were programs operated by non-government organisations, study protocols, reviews, commentaries, opinion papers, editorials and conference proceedings.

Data extraction and Synthesis: We reviewed the application of four PHC principles (universal health coverage, community participation, intersectoral coordination and appropriateness) in the CHW program's objectives, implementation and stated outcomes. Data extraction was undertaken systematically in an excel spreadsheet while the findings were synthesised in a narrative manner. The quality appraisal of the selected studies was not performed in this scoping review.

Results: From 1,280 papers published between 1983 and 2019, 26 met the inclusion criteria. These 26 papers included 14 CHW programs from 13 LMICs. Universal health coverage and community participation were the two commonly reported PHC principles, while intersectoral coordination was generally missing. Similarly, cultural acceptability aspect of the principle of appropriateness was present in all programs as these programs select CHWs from within the communities. Other aspects, particularly effectiveness, was not evident.

Conclusion: The implementation of PHC principles across national CHW programs in LMICs is patchy. For comprehensiveness and improved health outcomes, programs need to incorporate all attributes of PHC principles. Future research may focus on how to incorporate more attributes of PHC principles while implementing national CHW programs in LMICs. Better documentation and publications of CHW program implementation is also needed.

Keywords: Primary Health Care, Community Health Worker; Community Health Program; Low-and Middle-Income Countries.

Strengths and limitations of the study

- CHW programs in developing and lower middle income countries are an essential aspect of the strategy to achieve health for all and sustainable development goals, and this scoping review can be considered as an important step towards reviewing national community health worker programs in LMICs applying the lens of primary health care principles
- Four bibliographic databases were searched using a basic search strategy that was modified as per the database requirement.
- The studies were heterogeneous in their methods and outcomes assessed and that posed a challenge in comparing primary health care principles
- The generalisability of results of this study is limited to larger national level programs in developing and lower and middle income countries only.

BACKGROUND

Primary Health Care (PHC), as an approach to reorientation of health services and provision of universal health care, has remained the benchmark for most countries' discourse on health since PHC approach was mobilized by the Alma Ata Health for All (HFA) declaration for comprehensive, evidence-based responses to local health needs with reference to the social context.[1] PHC is a whole-of-society approach to health and aims to attain the highest possible level and distribution of health and well-being by providing an accessible and wide range of services, including: health promotion; disease prevention, treatment and rehabilitation; and palliative care.[1]

'Health for All' requires that health systems respond to the challenges of a changing world and growing expectations for better performance. PHC includes the key elements needed to improve health security, through a focus on community engagement, preventative collective action, access to good quality medicines, rational prescribing, and a core set of essential public health functions, including surveillance and early response.[1] A PHC approach achieves this by strengthening community based initiatives, and building resilience.

Across a wide variety of settings in low-, middle-, and high income countries, PHC-oriented health systems have consistently produced better health outcomes, enhanced equity, and improved efficiency.[1] In Brazil, for example, enrolment in the family health strategy has been linked to a higher likelihood of regular care, better access to medication, and improved patient satisfaction. Hence, PHC has been rightly advocated as the key to achieve HFA and the 2018 Astana Declaration reiterated the importance of this approach for achieving Universal Health Coverage (UHC).[2 3]

PHC, as an approach to achieve HFA goals' was built on the principles of equity in access to health services and the right of people to participate in decisions about their own health care.[1] These principles i.e. 'equity' and 'community empowerment' underpin preventive and promotive health services, appropriate technology, and intersectoral collaboration.[4]

Evidence suggests that if countries have explicitly organised their health systems around PHC principles, it has led to improved health outcomes. Congo, Iran and Portugal when incorporated PHC principles have demonstrated significant health gains in terms of reduced maternal and child mortality and improved coverage and access to care.[5]

PHC's emphasis on community-based services is an important way to ensure access, even in rural, remote areas and for disadvantaged populations. With limited resources and geographical and epidemiological context it is a challenge for health care systems in LMICs to reach out to the whole populations. Therefore, as part of the PHC approach and with a view to its principle of community empowerment, CHW programs were envisioned as a way to reach a wider population for essential health needs and to achieve HFA and national CHW programs were implemented by many governments from 1978.[6-10] Established under the PHC principles, these programs were expected to encompass and promote them and in doing so achieve improvements in health outcomes.[11]

National CHW programs, as vehicles to incorporate PHC principles into healthcare provision, have contributed significantly in reducing under-five child mortality in Brazil[12], Indonesia[12] and Nepal[13]. In Indonesia, immunization coverage also improved many-fold with increase in community health workers. CHW programs' success is rooted in application of PHC principles, as it has been noted that where CHW programs lacked a focus on PHC principles they suffered from failure.[14 15]

These examples demonstrate the clear link and need for incorporating PHC principles when implementing CHW programs. However, there is not widespread/comprehensive evidence of the extent to which PHC principles are systematically applied across the national CHW programs. This study aims to identify the PHC principles in the implementation of these programs in the context of LMICs and to understand their contribution to the outcomes of those programs.

METHODS

A systematic scoping review was conducted using a predefined protocol[16] and reported as per the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.[17] The databases searched in September 2019 were PubMed (MEDLINE), CINAHL (EBSCOhost), EMBASE (Elsevier) and Scopus (Elsevier). The review only considered published primary studies on programs, projects or initiatives utilising the services of CHWs in LMICs. We focused on the national level CHW programs defined as any CHW program that is operated or implemented by the government of a specific country, on multiple sites (jurisdictions/provinces/regions) within a country and has been functional for a minimum of three years. We considered national CHW programs with a maternal

and child health (MCH) focus as it is a national priority in the majority of LMICs.

Papers published only in English language from October 1978 to September 2019 were considered as 1978 was the year of the Alma-Ata declaration that promoted the establishment of national level CHW programs under the PHC principles. Excluded were study protocols, narrative reviews, commentaries, text and opinion papers, viewpoints, editorials, conference proceedings/abstracts, correspondences, systematic and scoping reviews and the papers on the CHW programs operated by non-government organisation (NGOs). Papers were also excluded if they involved health professionals other than CHWs such as midwives, nurses and traditional birth attendants. Papers were not excluded on the basis of unavailability of abstract.

The search strategy, including all identified keywords and index terms, was adapted for each included database (appendix I – logic grid). The search terms used included "community health worker", "Program", "Maternal and Child Health" and "Low-and Middle-Income Countries". The results of the search are presented in PRISMA-ScR flow diagram in the results section.

Following the search, all identified records were collated and uploaded into Covidence software[18] and duplicates removed. Two authors (SP and ZL) independently screened titles and abstracts and then matched the full texts selected during screening against the inclusion criteria. The reference lists of relevant papers were also searched for additional studies. Papers meeting the inclusion criteria were included in the review for data charting. In scoping reviews, the data extraction process is referred to as charting the results.[19] SP and ZL completed data charting using a pre-developed data charting form. Key attributes of the data charting form included the country of origin, study objective, design and key findings, name of the CHW program, objective, and reflection of PHC principle/s in program objective, implementation activities, and stated outcomes along with the selection process of CHWs (appendix II). The data charting form was pilot tested and modified accordingly. The operational definition of the PHC principles used as reference in this scoping review are as follows:

1. Universal Health Coverage: all people receive the health services they need, including public health services designed to promote better health, prevent illness, and to provide treatment, rehabilitation and palliative care of sufficient quality to be effective, while at the same time ensuring that the use of these services does not

expose the user to financial hardship.[2 20]

2. Community Participation: Active community involvement in defining health problem and needs, developing solutions and implementing and evaluating programs.[2]
3. Intersectoral Coordination: The linkage between health and development.[2]
4. Appropriateness: Services should be effective, culturally acceptable, affordable and manageable.[2]

We looked for all or any of the sub attribute of the above listed four PHC principles in the included studies and reported accordingly.

There was no quality assessment conducted of the included studies. The findings were synthesised in a tabular and narrative manner. The conceptual framework, including definitions of the four principles, for collating and summarizing the data is presented in the published protocol.[16]

RESULTS

Search Results

We identified 1,280 citations through database searches. After removing duplicates and screening out non-relevant abstracts, we assessed 281 full text papers for eligibility. 263 of those 281 were excluded as these did not meet the eligibility criteria. In total, 18 papers [21-38], published from 1983 to 2019 met the eligibility criteria (Figure 1). Eight[39-46] papers were further included from the reference lists of the included studies, making a total of 26 papers. The main characteristics on distribution and nature of the included studies are reported in table 1.

Of the 26 papers, two studies were conducted in western Asia[21 32], 12 studies were conducted in South Asia[23 25 27 29 34 36 37 39-43] and one study in South East Asia.[24] Seven studies were conducted in Africa ranging from the Horn of Africa[26 33 44 45], Central Africa[31], Western Africa[28] and South Africa[38]. Two studies were conducted in South America[30 46], one in Central America[35] and one study was conducted in the Caribbean.[22] Altogether, these 26 studies covered 14 CHW programs from 13 LMICs.

Fourteen of the 26 included studies were quantitative[22 24 27 28 30 32 33 35 39 41 42 44-46] and 12 studies were qualitative.[21 23 25 26 29 31 34 36-38 40 43] Table 1 provides an overview of the included studies outlining the key objective/s, methods and findings as reported by the authors.

204 Table 1: Key characteristics of included studies as reported by the authors

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Damari 2018 / **IRAN**[21]	To evaluate the national Iranian Women Health Volunteers program	Qualitative • Document review • One FGD • Semi-structured questionnaires filled by 44 key informants	Achievements: Increased community participation, increasing health literacy, increased coverage and utilization of health services.
Nasseri 1991 / **IRAN**[32]	To determine the impact of PHC services on immunisation activities in areas where the two services are integrated	Quantitative • Cross-sectional survey	Higher coverage in rural areas is attributed to active approach of CHWs and vaccinators.
Memon 2016 / **PAKISTAN**[29]	To explore community barriers in accessing MCH services in 10 remote and rural districts of Pakistan	Qualitative • Sixty FGDs with mothers and fathers of children under five and CHWs - 20 each group	Better awareness was seen among community caregivers for antenatal care and family planning services in the CHW-covered areas.
Hafeez 2011 / **PAKISTAN**[23]	To assess the contribution of the LHWP in enhancing coverage and access of health care services as well as towards improvement of health indicators	Qualitative • Document review • Interviews, formal and informal interactions and discussions with all the stakeholders • Performance validation exercises in the field	The LHWP has led to a development of a very well-placed cadre that links first-level care facilities to the community, thus improving the delivery of PHC services. The health indicators are significantly better than the national average in the areas served by the CHWs.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
		• Feedback from community being served by the program	
Douthwaite 2005 / **PAKISTAN**[41]	To assess the impact of the LHWP on the uptake of modern contraceptive methods	Quantitative • Secondary data analysis from the 2002 national evaluation of the LHWP	The study provides strong evidence that the LHWP has succeeded in integrating family planning into the doorstep provision of preventive health care and in increasing the use of modern reversible methods in rural areas.
Afsar 2005 / **PAKISTAN**[40]	To assess the strengths and weaknesses of the LHWP from the Lady Health Workers perspective	Qualitative • 20 key informant interviews with CHWs (n=14), CHW Supervisors (n=4) and 2 medical officers (District Coordinator and District Health Education Officer)	Major strengths: provision of services at the grassroots level, reinforcement of health messages and the community acceptability of workers. Weaknesses: contract-based job, low salaries, irregularity of payment, no career development, and poor logistical support.
Afsar 2003 / **PAKISTAN**[39]	To estimate the proportion of patients who were referred and to identify the factors associated with unsuccessful referral in Karachi, Pakistan	Quantitative • Cross-sectional survey of 347 patients	A high referral rate (55%) by CHWs was found in this study; 76.4% (n=265) were successful and 23.6% (n=82) were unsuccessful referrals. Key factors for unsuccessful referral: never referred before, never visited the referral site before, no knowledge of who to meet at the referral site, and failure of CHW to follow up.
Kohli 2015 / **INDIA**[42]	To assess the knowledge and practices for maternal health care delivery among Accredited Social Health	Quantitative • Descriptive cross-sectional study (n = 55)	CHWs' knowledge is good but practices about maternal health were not adequate due to the number of problems faced by them which need to be addressed through skill-

Author and year of publication / Country	Key objective of the study	Methods	Main findings
	Activist workers in North-East district of Delhi, India		based training in terms of good communication and problem solving. Monitoring should be made an integral part of CHW working in the field to ensure that knowledge is converted into practices as well.
Kosec 2015 / **INDIA**[27]	To understand predictors of essential health and nutrition service delivery in Bihar, India	Quantitative • Secondary data analysis of a 2012 cross-sectional survey of 6,002 households in 400 randomly selected villages in 1 district of Bihar state • Primary data collection from 382 CHWs	CHWs who maintained records of pregnant women were significantly associated with households receiving such information. Incentivizing frontline workers and helping them organize their work is associated with greater receipt of services by households.
Saprii 2015 / **INDIA**[36]	To explore stakeholders' perceptions and experiences of the CHW scheme in strengthening maternal health	Qualitative (exploratory study) • Eighteen in-depth interviews and 3 FGDs with CHWs, key stakeholders and community members	CHWs are valued for their contribution towards maternal health education and for their ability to provide basic biomedical care, but their role as social activists is much less visible as envisioned in the CHW operational guidelines

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Ved 2019 / **INDIA**[37]	To examine how the program is seeking to address gender inequalities facing CHWs, from the program's policy origins to recent adaptations	Qualitative • Document review • 12 key informant interviews	The value of community embeddedness for CHW programs is widely recognized as a mechanism to ensure program relevance to local needs and secure community ownership, support, and recognition of CHWs
Koblinsky 1989 / **BANGLADESH**[25]	To identify and examine organizational constraints to quality care and to provide a feasible strategy for program managers to overcome those barriers	Qualitative • Observations • FGDs – number not reported in the study	Only brief, interactions are possible if CHWs are to complete their rounds in the three-month period mandated by the government. The CHWs compensate for the pressure of their workload by skipping visits with some of the women in their area, by visiting even fewer during the monsoon season, and by neglecting to provide valuable information about family planning or health with some of the women they do visit
Panday 2019 / **NEPAL**[34]	To explore use of MCH care services delivered by CHWs and the reasons for the underutilisation of these services	Qualitative • Interviews and FGDs with 34 CHWs, 26 service users and 11 health workers	Perceived factors that discourage the use of healthcare services by ethnic minority groups are; 1. Lack of knowledge among service users - related to CHWs' inability to communicate health messages; 2. Lack of trust in volunteers; 3. Traditional beliefs and healthcare practices; 4. Low decision-making power of women –

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Panday 2017 / **NEPAL**[43]	To explore the role and experience of CHWs in maternal healthcare provision	Qualitative • Interviews with 20 CHWs, 26 service users and 11 health workers • Four FGDs with 18 CHWs	• All study participants acknowledged the contribution of CHWs in basic maternity care in villages • With support available to CHWs from the local health centres (regular training and access to medical supplies), CHWs were able to assist with childbirth, distribute medicines, and administer pregnancy tests. Whereas such activities were not reported in the other region where such support was not available to CHWs. • Key challenge: lack of monetary incentives
Hasegawa 2013 / **CAMBODIA**[24]	To identify determinants of caregivers' Village Malaria Workers service utilization for childhood illness and caregivers' knowledge of malaria management	Quantitative • Cross-sectional survey with CHWs and primary caregivers of children under five years	• Among the caregivers, 23% in M villages (villages with only malaria control services) and 52% in M+C villages (with both malaria and child health services) utilized CHW services for childhood illnesses.
Negussie 2017 / **ETHIOPIA**[33]	To assess the contribution made by the CHWs in MCH care service delivery in Dale district, southern Ethiopia	Quantitative • Cross-sectional survey with 613 mothers of reproductive age (15-49), having at least one under-five child	• Overall service coverage of antenatal care (four and more visits), delivery and postnatal care services were low in the district as compared to the national status; and the input from the CHWs, in this regard, was unsatisfactory. • The number of home visits was also inadequate for the necessary support of the mothers. • Mothers who listen to the radio and who had received information about the MCH

Author and year of publication / Country	Key objective of the study	Methods	Main findings
			services by CHWs were more likely to utilize MCH services.
Kok 2015 / **ETHIOPIA**[26]	To identify facilitators of and barriers to interpersonal relationships between CHWs and actors in the community and health sector	Qualitative • Fourteen FGDs and 44 interviews in 2013 with CHWs, traditional birth attendants, health professionals and community members	• CHWs were selected by their communities, which enhanced trust and engagement between them • Program design elements facilitating relationships, support for CHWs activities from the community and health sector, monitoring and accountability structures (community and health sector), referral, supervision and training (health sector)
Medhanyie 2012 / **ETHIOPIA**[44]	To investigate the role of CHWs in improving utilization of maternal health services by rural women	Quantitative • Cross-sectional survey with 725 women with under-five children	• CHWs have contributed substantially to the improvement in women's utilization of family planning, antenatal care and HIV testing.
Admassie 2009 / **ETHIOPIA**[45]	To evaluate the short-term and intermediate-term effects of the Ethiopian HEP on MCH indicators	Quantitative • Program evaluation using a propensity score matching method and village, facility and household surveys	• HEP has significantly increased the proportion of children fully and individually vaccinated. • Women in the HEP villages appeared to make their first contact with a skilled health service provider significantly earlier during pregnancy; very little effect is detected on other prenatal and postnatal care services. • HEP has not reduced the incidence and duration of diarrhoea and respiratory diseases among under-five children
Musabyimana 2018 /	To explore perceptions of healthcare officials, providers,	Qualitative	The effectiveness of use of mobile phones to remind of the appointments for improved

Author and year of publication / Country	Key objective of the study	Methods	Main findings
RWANDA[31]	and beneficiaries on the impact of the RapidSMS program	• 10 FGDs with 93 participants • In-depth interviews with 56 beneficiaries and 36 CHWs	access to midwifery services at the health facilities was found to be limited. Indirectly, it alerts to the emerging role of contemporary technologies in community health program.
Magnani 1996 / **NIGER**[28]	To assess the impact of differential access to health services through the comparison of service use patterns and under-five mortality levels among villages provided different levels of health services	Quantitative • Secondary data analysis of National Morbidity and Mortality Survey – 1985 on 974 women of reproductive age	• Children residing in villages proximate to health dispensaries were approximately 32% less likely to have died during the study period than children living further away.
Wilford 2018 / **SOUTH AFRICA**[38]	To explore the quality of CHW household visits providing MCH services	Qualitative • 30 observations [a CHW visit to a mother or pregnant woman was observed by a field worker, followed by an in-depth interview with the participating women and CHWs] • 15 in-depth interviews with mothers/pregnant women and 15 in-depth interviews with CHWs	• Mothers receiving the services were satisfied with CHW visits and appreciated that CHWs understood their life experiences and provided relevant and accessible advice and support. • CHWs expressed concern of not having the required knowledge to undertake all activities in the household, and requested training and support from supervisors during household visits
Mues 2012 / **BRAZIL**[30]	To assess factors influencing perspectives on Brazil's national family health	Quantitative • Cross-sectional household survey of 253 households	• Most caretakers of young children were satisfied. However, less than half of the

Author and year of publication / Country	Key objective of the study	Methods	Main findings
	program and perceptions about PSF accessibility among frequent users (primary caretakers of children under 5)	with at least one child 5 years or younger and covered by the PSF	caretakers perceived the PSF unit as being accessible • about a quarter of households in the Vespasiano PSF coverage area were not receiving an agent home visit once a month

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Aquino 2009 / **BRAZIL**[46]	To evaluate the effects of the implementation of the CHW Program on infant mortality rates in Brazilian municipalities from 1996 to 2004	Quantitative – ecological and longitudinal approach • Secondary data analysis from 1991 and 2000 national census and data from Brazilian MoH of 721 municipalities	A statistically significant negative association between CHW program coverage and infant mortality rate was found after controlling for potential confounders.
Rubin 1983 / **EL SAVADOR**[35]	To evaluate the health service impact of the Rural Health Aide Program in El Salvador	Quantitative • Survey of 363 respondents in cantons served by CHWs for one year and 169 in cantons served by CHWs for two years	Compared to villagers of cantons served by CHWs for one year, those in cantons served by CHWs for 2 years were: -more likely to be visited by their CHW & to visit their CHW -more likely to visit their health centres after referral by their CHW -more likely to have their children vaccinated
Ennever 1990 / **JAMAICA**[22]	• To describe the activities of CHWs currently employed, and their perceptions about supervision and management • To describe the current employment status of CHWs who had left the service between 1982 and 1986, and use of the skills they had learned as CHWs.	Quantitative • Survey of 415 CHWs currently employed and 134 CHWs who had left the service	• Currently employed CHWs continued to perform duties in the community & in health centres with emphasis on the MCH services and the management of diabetics and hypertensives. • Previously employed CHWs unemployed though many continued to use their skills on a voluntary basis.

CHW = Community Health Worker, FGD = Focus Group Discussion, HEP = Health Extension Program (Ethiopia) LHWP = Lady Health Worker Program (Pakistan), MCH = Maternal and Child Health, PSF = Programa de Saude da Familia (Family Health Program, Brazil)

Application of PHC Principles

The PHC principles were applied to a varied extent in the objective/s, implementation and outcome of the national CHW programs reviewed in this study. The evidence found in the objective, implementation or the outcome of the included studies related to the application of the four PHC principles is organised in table 2.

212 Table 2: Summary of findings – Application of primary health care principles as reflected in the national CHW programs

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
1.	**IRAN** / Women Health Volunteers Program / 1992 [21]	Principle observed: - Community Participation as the program aims to increase community involvement in health related activities in order to empower them	Principles observed: - UHC - Community Participation* • The CHWs encouraged and actively followed up on individuals to visit health centres at their required time especially those who needed special care --- thus contributing to increased service utilisation • CHWs delivering health messages to families and distributing educational materials reflect one aspect of comprehensiveness as part of universal health coverage • CHWs are selected from the local community - Community Participation and appropriateness	Principles observed: - UHC - Community Participation* - Intersectoral coordination - The active follow up by WHV increased utilization of health services – contributing to universal health coverage • The experts and stakeholders believed that CHW program increased people's participation and created self-esteem and self-reliance in people – However, the evidence on how it achieved this is not available in this study • The WHV network connects MoH, medical universities and health centers to the people – Intersectoral coordination
2.	**IRAN** / Primary Health Care Network – EPI / 1983 [32]	Principle observed: - UHC • As the program aimed to increase immunisation coverage in	Principles observed: - UHC - Community Participation* • CHWS were involved in provision of general preventive services for all the individuals in their coverage area –	Principle observed: - UHC - Appropriateness • Immunisation coverage of children improved significantly in 1987 as compared to 1984 especially for BCG (56.3%) - universal health coverage

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		Iranian children to 90% by their first birthday	Comprehensiveness, Universal health coverage • CHWs were also expected to provide basic therapeutic measures for minor illnesses and refer other cases to their immediate Rural Health Centre – universal health coverage • CHWs were selected from the same area in which they work – community participation	• Mothers in rural areas with PHC services receive much better MCH care, advice and attention in comparison to mothers in other rural and most urban areas – appropriateness
3.	**PAKISTAN** / National Program for Family Planning & Primary Health Care / 1994 [23] [29]	<u>Principle observed:</u> - UHC as the program aimed to increase utilisation of promotive, preventive and curative services at the community level particularly for women and children in poor and underserved areas –	<u>Principles observed:</u> - UHC - Community Participation* • CHWs were involved in health education and community mobilization along with provision of immunization, family planning services, basic curative care to the community at the doorstep and referral of patients to the appropriate health facility - reflecting universal health coverage	<u>Principles observed:</u> - UHC - Community Participation* • Increased utilisation of antenatal care and family planning - universal health coverage • Improved infant mortality rate, maternal mortality ratio and contraceptive prevalence rate in CHW covered areas as compared to national average - universal health coverage • Cultural acceptability of CHWs, unlimited access to households and free interaction with local women – community participation and appropriateness

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		comprehensiveness & equity		
4.	**INDIA** / Accredited Social Health Activist (ASHA) Program / 2005 [27 36 37]	Principles observed: - UHC through accessible care to rural population especially vulnerable groups - Appropriateness via provision of affordable and quality health care	Principles observed: - UHC via CHWs as 'service extension and link workers' - Community Participation as CHWs are selected from the local communities	Principles observed: - UHC as CHWs were motivating women for antenatal care and hospital delivery through home visits • Women empowerment – as CHWs have reported an increased sense of empowerment and personal growth, in part through their belief in the social value of their work. • Additionally, becoming a CHW enabled rural women to gain knowledge, status as a role model, and exposure beyond the village, as well as to access a limited amount of remuneration
5.	**BANGLADESH /** National MCH and Family Planning Program / 1976 [25]	Not reported	Principles observed: - UHC - Community Participation* • CHWs were utilised for health education and extending immunisation and family planning services at the household level. They also provided referral for antenatal, perinatal, and postnatal care. – comprehensiveness as part of universal health coverage	Not reported

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
6.	**NEPAL /** Female Community Health Volunteer Program / 1988 [34]	Principles observed: - UHC via low cost health service provision in remote areas - Community Participation via increase in local women's participation in health promotion	Principles observed: - Community Participation* - UHC via provision of MCH care by CHWs in rural communities	Not reported
7.	**CAMBODIA /** Village Malaria Worker Project as part of National Malaria Control Program / 2001 [24]	Not reported	Principles observed: - UHC - Community Participation* • Malaria prevention, diagnosis and treatment services to remote villages by CHWs – universal health coverage - Management of minor childhood illness, prescribing and providing basic medications, referral and health promotion – comprehensiveness as part of universal health coverage	Principle observed: - UHC • 15,898 children received child health services from village Malaria Workers in 2011
8.	**ETHIOPIA /** Health	Principles observed:	Principles observed: - UHC	Principles observed: - UHC

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
	Extension Program / 2003 [26 33]	- UHC - Community Participation • To improve access and utilization of health care particularly for children and mothers in rural communities – Universal Health Coverage • To improve the health status of families with their full participation, using local technologies & the community's skill & knowledge - Community Participation	- Community Participation • CHWs providing antenatal and postnatal care, family planning and immunization services and conducting clean and safe deliveries - Universal Health Coverage • Quarterly evaluation of health centers performance by the community during facility or public forums. Monitoring of CHWs by the *kebele* (lowest administrative unit) administration at the health post level. Need based adjustment of maternal health education – Community Participation	- Community Participation • Increased use of health post for antenatal care, family planning, delivery and other illnesses such as diarrhoea - reflecting universal health coverage • Statistically significant increase in the proportion of children fully and individually vaccinated against tuberculosis, polio, diphtheria–pertussis–tetanus, and measles in the program villages. • Mothers reported that CHWs were available at health posts during their last visit for MCH services • Mothers also indicated that they had gotten a complete explanation of their own/child's health condition from the CHWs • Moreover, CHWs were understanding, friendly and helpful thus assured a "natural link" between them and the community - appropriateness • Community members reported that HEWs being female was important to them, as they prefer to discuss maternal health issues amongst women - appropriateness

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
9.	**RWANDA** / RapidSMS program / 2013 [31]	Principles observed: - UHC - Appropriateness • To improve access to antenatal, PNC, institutional delivery and emergency obstetric care • To facilitate communication between CHWs and the broader health system, including the ambulance system, health facilities, and MoH officials	Principles observed: - UHC - Community Participation* - Appropriateness – use of technology • The RapidSMS system sent automatic reminders to CHWs for clinical appointments, delivery, and post-natal care visits, with the intent of increasing timely access and utilization • Provision of a quick link to emergency obstetric care through so-called Red Alerts and creation of a database of clinical records on maternal care delivery – use of technology for increasing access to health care	Principles observed: - Appropriateness (use of technology, acceptability) RapidSMS was well accepted by most CHWs and community members – acceptability aspect of appropriateness principle • mHealth appeared to have helped improve communication and potentially service use • Claims that mHealth has contributed to maternal mortality reduction are not substantiated considering the difficulties that were highlighted by the respondents
10.	**NIGER /** Rural Health Improvement Program / 1970s [28]	Principle observed: - UHC – as the program aimed to extend the coverage of PHC services	Principle observed: - UHC – By upgrading existing health dispensaries and deploying trained village health teams to unserved villages to deliver PHC services	Not reported

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		throughout rural Niger		
11.	**SOUTH AFRICA /** ward-based outreach teams (WBOT) - national CHW program / 2011 [38]	Principle observed: - UHC – via improving health outcomes by providing home and community-based health services	Principle observed: - UHC - Community Participation* • Universal health coverage via CHWs providing treatment support and home-based care in underserved rural areas. Core MCH activities include visiting all mothers during pregnancy, antenatal education and support. Moreover, CHWs are linked in with local PHC clinics	Principle observed: - Appropriateness as CHWs were trusted, accessible and able to understand the mother's situation
12.	**BRAZIL /** Family Health Program (Programa de Saude da Familia, PSF) / 1994 [30]	Principle observed: - UHC – as the organizational principles include universality and equity	Principle observed: - UHC - Community Participation* - Universal health coverage via provision of promotive, preventive and basic curative services by CHWs to mothers and children	Principle observed: - UHC – as the growth of the CHW program was associated with a decrease in infant and child mortality rates • Caretakers who reported that their agent made at least one home visit per month were significantly more likely to have received care for child diarrhoea from an agent
13.	**EL SAVADOR /** Rural Health Aide Program / 1976 [35]	Principle observed: - UHC – via provision of PHC and family	Principle observed: - UHC - Community Participation*	Principle observed: - UHC • Appropriately trained PHC workers promote contact between rural

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		planning services	• Health education by CHWs for rural families • Provision of family planning supplies to women • Provision of systematic treatment of minor illnesses; administration of prescribed intramuscular injections; dispensing of antiparasitic medication; and performance of simple first-aid measures • Promotion of registration of births and deaths	populations and the health care system • To the extent that this improves the health status of the population, particularly in the area of MCH, we might expect to see better health indices in rural populations served by these workers than in populations without them
14.	**JAMAICA /** Community Health Aide program / 1978 [22]	Principle observed: - UHC as the program aimed to train local women to provide basic health care and health education to families.	Principles observed: - UHC – CHWs encouraging for immunization and family planning, weighing babies and testing urine - Community Participation*	Principle observed: - UHC • CHWs have been functioning in both health centre and community, encouraging people to utilize the services and assisting in some of the less technical duties such as weighing babies and testing urine

213 UHC = Universal Health Coverage

'Universal health coverage' and 'community participation' were the two commonly reflected PHC principles in the national CHW programs across their objective/s, implementation and outcomes. 'Intersectoral coordination' was only mentioned in the outcome of Iran's Women Health Volunteers (WHV) program.[21] The objective of two CHW programs were not reported in the papers reviewed.[24 25] In addition, studies from Nepal[34 43], Bangladesh[25] and Niger[28] did not report on the outcomes of the CHW programs.

Universal Health Coverage (UHC)

We reviewed the national CHW programs for the application of this fundamental PHC principle in terms of coverage and access, equity and comprehensiveness. UHC was reflected in the objective of 11 CHW programs[22 23 28 30-36 38] and in the implementation of 14[21-25 28 30-36 38] programs through the service provision by CHWs in the MCH and family planning domain. These 14 programs reported improvements in the scope [population coverage] and range [comprehensiveness] of health services provided. For example, an outcome of the CHW program in Iran was increased utilisation of MCH care services as a result of the active follow up by CHWs.[21] The increase in immunisation coverage of children in the rural areas was also attributed to the 'active' approach and vigilance of CHWs and vaccinators serving the PHC network of Iran.[32] In Pakistan the CHW program was claimed to be contributing to the increasing utilisation of antenatal care and family planning.[23] In Rwanda, mHealth was reported as improving communication between CHWs and community members leading to better use of the health services.[31]

The concept of 'care according to need' was reflected in the objective of Pakistan's CHW program that focuses on provision of care in underserved areas.[23] Service provision to ethnic minorities was one of the focus areas of Nepal's CHW program.[34]

Community Participation

Only three[21 33 34] of the 14 CHW programs included in this review incorporated community participation in their program objective. In terms of implementation, 10 programs[21 23-27 31 32 34 35] reflected community participation as they engaged CHWs from within the local communities to provide care to the local population. Moreover, the selection of CHWs from the local community they serve facilitated their access to households, development of good relationships and high acceptability in the community.[23 26 28] Three programs[28 30 38] did not mention the selection process of

CHWs while in Jamaica it was not mandatory to select CHWs from within the local community.[22]

Examples of other activities reflecting the process of community participation as defined by Byrant (Table 1).[2] and beyond the use of CHWs were reported only in Ethiopia's Health Extension Program.[26] In this program the performance of health centres was evaluated by the community on a quarterly basis and the CHWs were monitored by the community volunteers.[26]

Intersectoral Coordination

PHC ought to involve the health sector and all related sectors and aspects of national and community development that have an impact on health.[2 47] Intersectoral coordination was not reflected in the objective/s or implementation of any CHW program and only in the outcome of one[21] program. The WHV Program of Iran explicitly described the intersectoral link between health and education sectors for transmitting health messages to the people.[21] The Accredited Social Health Activist (ASHA) program from India, while not reporting intersectoral collaboration directly, did report actions to enhance the role of women by creating opportunities by working with other sectors to empower women.[37]

Appropriateness

The final PHC principle assessed in this review was appropriateness: i.e. services that are effective, culturally acceptable and financially affordable. The included studies reflected one or another of these attributes but none reported all three attributes of the appropriateness. For example, the concept of appropriateness was reflected explicitly in the objective of India's ASHA program (to provide affordable and quality health care), but did not mention cultural appropriatenesnes.[27] The RapidSMS program of Rwanda reported cultural acceptability of technology (phone messaging services) and its affordability considering that almost all population had access to a mobile phone.[31]

DISCUSSION

This study has provided insights into the application of PHC principles in the implementation of national CHW programs. PHC principles do not appear to be applied with the rigor and regularity as one would expect considering the emphasis

laid on these during conceptualisation of this significant public health movement called 'PHC'.

Our results show that 'UHC' and 'community participation' were the most common PHC principles reflected in the national CHW programs. In contrast, intersectoral coordination was stated in the outcome of only one of the 14 CHW programs[21] while none of the studies described the programs with reference to all three attributes of appropriateness (effective, culturally acceptable and financially affordable).

'Enhanced coverage' attribute of UHC was most commonly reflected by the national CHW programs. There is limited evidence in the reviewed 26 papers on the implementation of other two attributes, i.e., coverage on the basis of need (equity) and comprehensiveness. This finding complements the fact that soon after Alma-Ata, selective PHC was proposed as an interim strategy for disease control in LMICs.[48 49] Many vertical programs utilised CHWs under different names and with different roles[50] resulting in a fragmented and disease-specific approach operating within the context of fragile health systems of LMICs. CHWs however, are not a "panacea for weak health systems." They require well-structured support from the formal health systems with which national CHW programs are linked. Therefore, achieving UHC requires strengthening of health systems with effective integration of comprehensive CHW programs in LMICs as PHC can only work when a country has the structures, skills and data to ensure that all people are covered.[14]

This review found that the implementation of community participation was patchy, and when it was employed it mainly reflected in the selection of CHWs from the local community. This is not surprising as after the Alma-Ata declaration several governments started CHW programs as a means for people's participation with local lay people trained to administer basic first-line healthcare in their communities.[7 14] While CHWs' position as community members themselves may provide a 'natural link' between them and the community, it may also appear to safeguard trust in[26 28] and respect for them from the community side and enhanced self-esteem from the CHW side.[26] A higher level of community participation where community is given a stake in the evaluation and redefining of services was evident only in the Ethiopian CHW program.[26] A successful CHW program requires the support and ownership of the community through their active involvement in the entire process of defining health

problems and needs, developing solutions, implementing and evaluating the program, as well as establishing a supportive social and policy environment for community participation at national, district, and local levels.[51] CHW programs often struggle to be successful when not part of a broader community engagement process which requires explicit methods for involving individuals and communities, clearly defined roles and responsibilities, training of policymakers and adequate funding.[51] Recent WHO guidelines have explicitly recommended ways to select CHWs, engage and mobilize community and this can be achieved if there is a supportive social and policy environment.[52] With little or no evidence as noted by this scoping review on community involvement in needs assessment, the design of programs and evaluation may indicate that invoking community participation is a challenge for these programs.[14] Community participation is a context-dependant, gradual process which is less controllable and less measurable, thereby making it harder to track.[53] There is need for robust program evaluations of community participation activities that measure long-term outcomes and provide support for the CHW programs to broaden their scope of community participation.

The operational problems related to partnerships working (intersectoral, interinstitutional, interdisciplinary and professional/lay partnerships) were highlighted in the early implementation years 0of these programs in LMICs.[54] Our review informs that this is still the case.[21] This finding corresponds with the fact that working relationships between partners have often proved difficult,[53 54] as each sector has its own priorities.[53] The PHC literature reports that community participation and intersectoral coordination are the two most weakly implemented principles.[14 53] Our review findings also support this evidence. National CHW programs ought to view these principles as two pillars that help achieve the universal health coverage of services that are appropriate for the community and their context.

By its nature, the provision of MCH services to women by female CHWs who are also selected from within the local community tend to make it culturally acceptable and meet the principle of appropriateness. However, CHW programs need to incorporate 'appropriateness' more explicitly in their objectives and then diligently pursue this in program implementation and outcomes, which may contribute to address the current lack of evidence on effectiveness of these programs.[55]

The review has a number of limitations. Firstly, it relied solely on the information reported in the papers to assess the application of PHC principles within the programs. Many papers did not clearly articulate these principles or provide sufficient description of the program to allow an assessment to be made. As such the reviewers needed to interpret the evidence about principles in how the program was implemented. These principles may be delineated elsewhere, for example program reports or funding agreements. Therefore, it is likely that we underestimated the application of PHC principles in these programs. However, the very fact that the research papers that we reviewed failed to document implementation of those principles, illustrates less than adequate emphasis on the application of these principles in national CHW programs.

Secondly, we reviewed the CHW programs identified only through the search of peer-reviewed published journal articles and there may be CHW programs that apply the PHC principles but are not published in peer-reviewed journals in a way to be captured in our search. This scoping review can be considered as a first step towards reviewing national CHW programs in LMICs applying the lens of PHC principles. Future studies on the analysis of non-peer-reviewed publications or 'grey' literature may produce further evidence on this phenomenon.

CONCLUSION

This scoping review informs that the application of PHC principles across national CHW programs in LMICs is patchy. For comprehensiveness and improved health outcomes, programs need to incorporate all attributes of PHC principles. The findings also point to the limited research and published studies on this important topic. Better documentation and publications of program implementation with reference to PHC principles is needed. Further research is needed to identify reasons to this inadequate emphasis on historic PHC principles, and to find out what other principles are adhered to by the current CHW programs. Future research may also focus on how to incorporate more attributes of the PHC principles while implementing national CHW programs in LMICs.

Figure 1: PRISMA flowchart for study selection and inclusion process

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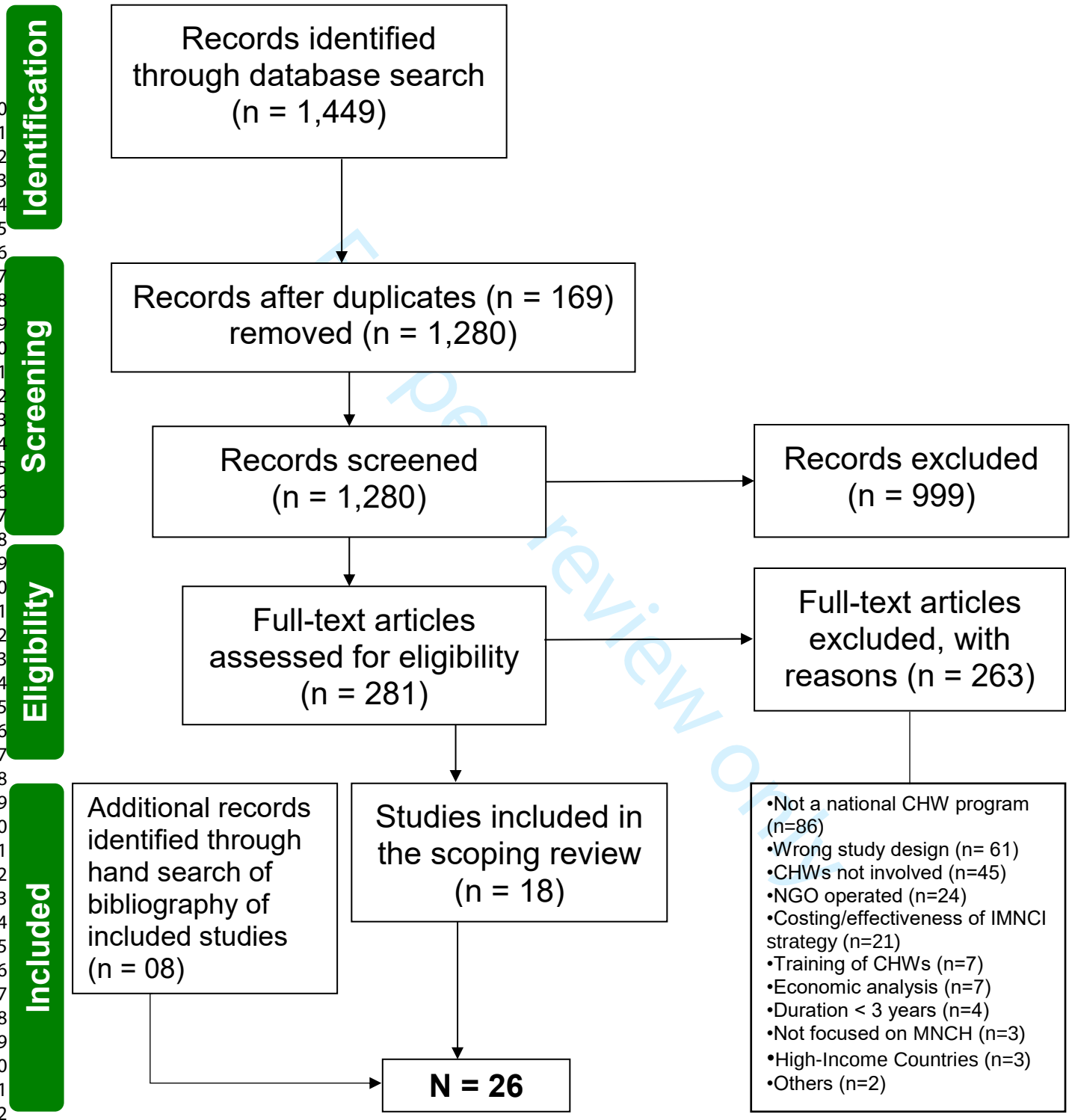

Figure 1: PRISMA flowchart for study selection and inclusion process

Appendix I: Logic grids for information sources

PubMed

Search	Query	Records retrieved
#1	"community health workers"[mh] OR community health worker*[tiab] OR community health aide*[tiab] OR village health worker*[tiab] OR barefoot doctor*[tiab] OR family planning personnel*[tiab] OR health extension worker*[tiab] OR lady health worker*[tiab] OR community health agent*[tiab] OR Shasthyo Sebika*[tiab] OR community nutrition worker*[tiab] OR maternal health worker*[tiab] OR voluntary Malaria workers*[tiab] OR village malaria worker*[tiab] OR Raedat*[tiab] OR postnatal support worker*[tiab] OR mental health worker*[tiab] OR mother coordinator*[tiab] OR rural health worker*[tiab] OR village health promoter*[tiab] OR accompagnateur*[tiab] OR Saksham Sahaya*[tiab] OR anganwandi worker*[tiab] OR accredited social health activist*[tiab] OR community-based worker*[tiab] OR community health volunteer*[tiab] OR village health guide*[tiab] OR maternal and child health promotion worker*[tiab] OR maternal child health worker*[tiab] OR kader posyandu*[tiab] OR behvarz*[tiab] OR village health helper*[tiab] OR colaborador voluntario*[tiab] OR nutrition volunteers*[tiab] OR village drug-kit manager*[tiab] OR brigadistas*[tiab] OR female community health volunteer*[tiab] OR Agente Comunitario de Salud*[tiab] OR nutrition worker*[tiab] OR community reproductive health worker*[tiab] OR community drug distributor*[tiab] OR community volunteer*[tiab] OR community health advocate*[tiab] OR lay health visitor*[tiab] OR Promotoras de Salud[tiab]	174984
#2	Program[tiab] OR programs[tiab] OR programme[tiab] OR programmes[tiab] OR initiative*[tiab] OR project[tiab] OR projects[tiab]	959578
#3	"Maternal health"[mh] OR "Maternal Welfare"[mh] OR "child health"[mh] OR "child care"[mh] OR "child welfare"[mh] OR "maternal-child health services"[mh] OR "child health services"[mh:noexp] OR maternal child health[tiab] OR maternal newborn child health[tiab]	71349

Search	Query	Records retrieved
#4	((developing country[tw] OR developing countries[tw] OR developing nation[tw] OR developing nations[tw] OR developing population[tw] OR developing populations[tw] OR developing world[tw] OR less developed country[tw] OR less developed countries[tw] OR less developed nation[tw] OR less developed nations[tw] OR less developed population[tw] OR less developed populations[tw] OR less developed world[tw] OR lesser developed country[tw] OR lesser developed countries[tw] OR lesser developed nation[tw] OR lesser developed nations[tw] OR lesser developed population[tw] OR lesser developed populations[tw] OR lesser developed world[tw] OR under developed country[tw] OR under developed countries[tw] OR under developed nation[tw] OR under developed nations[tw] OR under developed population[tw] OR under developed populations[tw] OR under developed world[tw] OR underdeveloped country[tw] OR underdeveloped countries[tw] OR underdeveloped nation[tw] OR underdeveloped nations[tw] OR underdeveloped population[tw] OR underdeveloped populations[tw] OR underdeveloped world[tw] OR middle income country[tw] OR middle income countries[tw] OR middle income nation[tw] OR middle income nations[tw] OR middle income population[tw] OR middle income populations[tw] OR low income country[tw] OR low income countries[tw] OR low income nation[tw] OR low income nations[tw] OR low income population[tw] OR low income populations[tw] OR lower income country[tw] OR lower income countries[tw] OR lower income nation[tw] OR lower income nations[tw] OR lower income population[tw] OR lower income populations[tw] OR underserved country[tw] OR underserved countries[tw] OR underserved nation[tw] OR underserved nations[tw] OR underserved population[tw] OR underserved populations[tw] OR underserved world[tw] OR under served country[tw] OR under served countries[tw] OR under served nation[tw] OR under served nations[tw] OR under served population[tw] OR under served populations[tw] OR under served world[tw] OR deprived country[tw] OR deprived countries[tw] OR deprived nation[tw] OR deprived nations[tw] OR deprived population[tw] OR deprived populations[tw] OR deprived world[tw] OR poor country[tw] OR poor countries[tw] OR poor nation[tw] OR poor nations[tw] OR poor population[tw] OR poor populations[tw] OR poor world[tw] OR poorer country[tw] OR poorer countries[tw] OR poorer nation[tw] OR poorer nations[tw] OR poorer population[tw] OR poorer populations[tw] OR poorer world[tw] OR developing economy[tw] OR developing economies[tw] OR less developed economy[tw] OR less developed economies[tw] OR lesser developed economy[tw] OR lesser developed economies[tw] OR under developed economy[tw] OR under developed economies[tw] OR underdeveloped economy[tw] OR underdeveloped economies[tw] OR middle income economy[tw] OR middle income economies[tw] OR low income economy[tw] OR low income economies[tw] OR lower income economy[tw] OR lower income economies[tw] OR low gdp[tw] OR low gnp[tw] OR low gross domestic[tw] OR low gross national[tw] OR lower gdp[tw] OR lower gnp[tw] OR lower gross domestic[tw] OR lower gross national[tw] OR lmic[tw] OR lmics[tw] OR third world[tw] OR lami country[tw] OR lami countries[tw] OR transitional country[tw] OR transitional countries[tw]) OR (Africa[tw] OR Asia[tw] OR Caribbean[tw] OR West Indies[tw] OR South America[tw] OR Latin America[tw] OR Central America[tw] OR Afghanistan[tw] OR Albania[tw] OR Algeria[tw] OR Angola[tw] OR Antigua[tw] OR Barbuda[tw] OR Argentina[tw] OR Armenia[tw] OR Armenian[tw] OR Aruba[tw] OR Azerbaijan[tw] OR Bahrain[tw] OR Bangladesh[tw] OR Barbados[tw] OR Benin[tw] OR Byelarus[tw] OR Byelorussian[tw] OR Belarus[tw] OR Belorussian[tw] OR Belorussia[tw] OR Belize[tw] OR Bhutan[tw] OR Bolivia[tw] OR Bosnia[tw] OR Herzegovina[tw] OR Hercegovina[tw] OR Botswana[tw] OR Brasil[tw] OR Brazil[tw] OR Bulgaria[tw] OR Burkina Faso[tw] OR Burkina Fasso[tw] OR Upper Volta[tw] OR Burundi[tw] OR Urundi[tw] OR Cambodia[tw] OR Khmer Republic[tw] OR Kampuchea[tw] OR Cameroon[tw] OR Cameroons[tw] OR Cameron[tw] OR Camerons[tw] OR Cape Verde[tw] OR Central African Republic[tw] OR Chad[tw] OR Chile[tw] OR China[tw] OR Colombia[tw] OR Comoros[tw] OR Comoro Islands[tw] OR Comores[tw] OR Mayotte[tw] OR Congo[tw] OR Zaire[tw] OR Costa Rica[tw] OR Cote d'Ivoire[tw] OR Ivory Coast[tw] OR Croatia[tw] OR Cuba[tw] OR Cyprus[tw] OR Czechoslovakia[tw] OR Czech Republic[tw] OR Slovakia[tw] OR Slovak Republic[tw] OR Djibouti[tw] OR French Somaliland[tw] OR Dominica[tw] OR Dominican	1903167

Search	Query	Records retrieved
	Republic[tw] OR East Timor[tw] OR East Timur[tw] OR Timor Leste[tw] OR Ecuador[tw] OR Egypt[tw] OR United Arab Republic[tw] OR El Salvador[tw] OR Eritrea[tw] OR Estonia[tw] OR Ethiopia[tw] OR Fiji[tw] OR Gabon[tw] OR Gabonese Republic[tw] OR Gambia[tw] OR Gaza[tw] OR Georgia Republic[tw] OR Georgian Republic[tw] OR Ghana[tw] OR Gold Coast[tw] OR Greece[tw] OR Grenada[tw] OR Guatemala[tw] OR Guinea[tw] OR Guam[tw] OR Guiana[tw] OR Guyana[tw] OR Haiti[tw] OR Honduras[tw] OR Hungary[tw] OR India[tw] OR Maldives[tw] OR Indonesia[tw] OR Iran[tw] OR Iraq[tw] OR Isle of Man[tw] OR Jamaica[tw] OR Jordan[tw] OR Kazakhstan[tw] OR Kazakh[tw] OR Kenya[tw] OR Kiribati[tw] OR Korea[tw] OR Kosovo[tw] OR Kyrgyzstan[tw] OR Kirghizia[tw] OR Kyrgyz Republic[tw] OR Kirghiz[tw] OR Kirgizstan[tw] OR Lao PDR[tw] OR Laos[tw] OR Latvia[tw] OR Lebanon[tw] OR Lesotho[tw] OR Basutoland[tw] OR Liberia[tw] OR Libya[tw] OR Lithuania[tw]) OR (Macedonia[tw] OR Madagascar[tw] OR Malagasy Republic[tw] OR Malaysia[tw] OR Malaya[tw] OR Malay[tw] OR Sabah[tw] OR Sarawak[tw] OR Malawi[tw] OR Nyasaland[tw] OR Mali[tw] OR Malta[tw] OR Marshall Islands[tw] OR Mauritania[tw] OR Mauritius[tw] OR Agalega Islands[tw] OR Mexico[tw] OR Micronesia[tw] OR Middle East[tw] OR Moldova[tw] OR Moldovia[tw] OR Moldovian[tw] OR Mongolia[tw] OR Montenegro[tw] OR Morocco[tw] OR Ifni[tw] OR Mozambique[tw] OR Myanmar[tw] OR Myanma[tw] OR Burma[tw] OR Namibia[tw] OR Nepal[tw] OR Netherlands Antilles[tw] OR New Caledonia[tw] OR Nicaragua[tw] OR Niger[tw] OR Nigeria[tw] OR Northern Mariana Islands[tw] OR Oman[tw] OR Muscat[tw] OR Pakistan[tw] OR Palau[tw] OR Palestine[tw] OR Panama[tw] OR Paraguay[tw] OR Peru[tw] OR Philippines[tw] OR Philipines[tw] OR Phillipines[tw] OR Phillippines[tw] OR Poland[tw] OR Portugal[tw] OR Puerto Rico[tw] OR Romania[tw] OR Rumania[tw] OR Roumania[tw] OR Russia[tw] OR Russian[tw] OR Rwanda[tw] OR Ruanda[tw] OR Saint Kitts[tw] OR St Kitts[tw] OR Nevis[tw] OR Saint Lucia[tw] OR St Lucia[tw] OR Saint Vincent[tw] OR St Vincent[tw] OR Grenadines[tw] OR Samoa[tw] OR Samoan Islands[tw] OR Navigator Island[tw] OR Navigator Islands[tw] OR Sao Tome[tw] OR Saudi Arabia[tw] OR Senegal[tw] OR Serbia[tw] OR Montenegro[tw] OR Seychelles[tw] OR Sierra Leone[tw] OR Slovenia[tw] OR Sri Lanka[tw] OR Ceylon[tw] OR Solomon Islands[tw] OR Somalia[tw] OR Sudan[tw] OR Suriname[tw] OR Surinam[tw] OR Swaziland[tw] OR Syria[tw] OR Tajikistan[tw] OR Tadzhikistan[tw] OR Tadjikistan[tw] OR Tadzhik[tw] OR Tanzania[tw] OR Thailand[tw] OR Togo[tw] OR Togolese Republic[tw] OR Tonga[tw] OR Trinidad[tw] OR Tobago[tw] OR Tunisia[tw] OR Turkey[tw] OR Turkmenistan[tw] OR Turkmen[tw] OR Uganda[tw] OR Ukraine[tw] OR Uruguay[tw] OR USSR[tw] OR Soviet Union[tw] OR Union of Soviet Socialist Republics[tw] OR Uzbekistan[tw] OR Uzbek OR Vanuatu[tw] OR New Hebrides[tw] OR Venezuela[tw] OR Vietnam[tw] OR Viet Nam[tw] OR West Bank[tw] OR Yemen[tw] OR Yugoslavia[tw] OR Zambia[tw] OR Zimbabwe[tw] OR Rhodesia[tw]) OR (Developing Countries[Mesh:noexp] OR Africa[Mesh:noexp] OR Africa, Northern[Mesh:noexp] OR Africa South of the Sahara[Mesh:noexp] OR Africa, Central[Mesh:noexp] OR Africa, Eastern[Mesh:noexp] OR Africa, Southern[Mesh:noexp] OR Africa, Western[Mesh:noexp] OR Asia[Mesh:noexp] OR Asia, Central[Mesh:noexp] OR Asia, Southeastern[Mesh:noexp] OR Asia, Western[Mesh:noexp] OR Caribbean Region[Mesh:noexp] OR West Indies[Mesh:noexp] OR South America[Mesh:noexp] OR Latin America[Mesh:noexp] OR Central America[Mesh:noexp] OR Afghanistan[Mesh:noexp] OR Albania[Mesh:noexp] OR Algeria[Mesh:noexp] OR American Samoa[Mesh:noexp] OR Angola[Mesh:noexp] OR "Antigua and Barbuda"[Mesh:noexp] OR Argentina[Mesh:noexp] OR Armenia[Mesh:noexp] OR Azerbaijan[Mesh:noexp] OR Bahrain[Mesh:noexp] OR Bangladesh[Mesh:noexp] OR Barbados[Mesh:noexp] OR Benin[Mesh:noexp] OR Byelarus[Mesh:noexp] OR Belize[Mesh:noexp] OR Bhutan[Mesh:noexp] OR Bolivia[Mesh:noexp] OR Bosnia-Herzegovina[Mesh:noexp] OR Botswana[Mesh:noexp] OR Brazil[Mesh:noexp] OR Bulgaria[Mesh:noexp] OR Burkina Faso[Mesh:noexp] OR Burundi[Mesh:noexp] OR Cambodia[Mesh:noexp] OR Cameroon[Mesh:noexp] OR Cape Verde[Mesh:noexp] OR Central African Republic[Mesh:noexp] OR Chad[Mesh:noexp] OR Chile[Mesh:noexp] OR China[Mesh:noexp] OR Colombia[Mesh:noexp] OR Comoros[Mesh:noexp] OR Congo[Mesh:noexp] OR Costa Rica[Mesh:noexp] OR	

Search	Query	Records retrieved
	Cote d'Ivoire[Mesh:noexp] OR Croatia[Mesh:noexp] OR Cuba[Mesh:noexp] OR Cyprus[Mesh:noexp] OR Czechoslovakia[Mesh:noexp] OR Czech Republic[Mesh:noexp] OR Slovakia[Mesh:noexp] OR Djibouti[Mesh:noexp] OR "Democratic Republic of the Congo"[Mesh:noexp] OR Dominica[Mesh:noexp] OR Dominican Republic[Mesh:noexp] OR East Timor[Mesh:noexp] OR Ecuador[Mesh:noexp] OR Egypt[Mesh:noexp] OR El Salvador[Mesh:noexp] OR Eritrea[Mesh:noexp] OR Estonia[Mesh:noexp] OR Ethiopia[Mesh:noexp] OR Fiji[Mesh:noexp] OR Gabon[Mesh:noexp] OR Gambia[Mesh:noexp] OR "Georgia (Republic)"[Mesh:noexp] OR Ghana[Mesh:noexp] OR Greece[Mesh:noexp] OR Grenada[Mesh:noexp] OR Guatemala[Mesh:noexp] OR Guinea[Mesh:noexp] OR Guinea-Bissau[Mesh:noexp] OR Guam[Mesh:noexp] OR Guyana[Mesh:noexp] OR Haiti[Mesh:noexp] OR Honduras[Mesh:noexp] OR Hungary[Mesh:noexp] OR India[Mesh:noexp] OR Indonesia[Mesh:noexp] OR Iran[Mesh:noexp] OR Iraq[Mesh:noexp] OR Jamaica[Mesh:noexp] OR Jordan[Mesh:noexp] OR Kazakhstan[Mesh:noexp] OR Kenya[Mesh:noexp] OR Korea[Mesh:noexp] OR Kosovo[Mesh:noexp] OR Kyrgyzstan[Mesh:noexp] OR Laos[Mesh:noexp] OR Latvia[Mesh:noexp] OR Lebanon[Mesh:noexp] OR Lesotho[Mesh:noexp] OR Liberia[Mesh:noexp] OR Libya[Mesh:noexp] OR Lithuania[Mesh:noexp] OR Macedonia[Mesh:noexp] OR Madagascar[Mesh:noexp] OR Malaysia[Mesh:noexp] OR Malawi[Mesh:noexp] OR Mali[Mesh:noexp] OR Malta[Mesh:noexp] OR Mauritania[Mesh:noexp] OR Mauritius[Mesh:noexp] OR Mexico[Mesh:noexp] OR Micronesia[Mesh:noexp] OR Middle East[Mesh:noexp] OR Moldova[Mesh:noexp] OR Mongolia[Mesh:noexp] OR Montenegro[Mesh:noexp] OR Morocco[Mesh:noexp] OR Mozambique[Mesh:noexp] OR Myanmar[Mesh:noexp] OR Namibia[Mesh:noexp] OR Nepal[Mesh:noexp] OR Netherlands Antilles[Mesh:noexp] OR New Caledonia[Mesh:noexp] OR Nicaragua[Mesh:noexp] OR Niger[Mesh:noexp] OR Nigeria[Mesh:noexp] OR Oman[Mesh:noexp] OR Pakistan[Mesh:noexp] OR Palau[Mesh:noexp] OR Panama[Mesh:noexp] OR Papua New Guinea[Mesh:noexp] OR Paraguay[Mesh:noexp] OR Peru[Mesh:noexp] OR Philippines[Mesh:noexp] OR Poland[Mesh:noexp] OR Portugal[Mesh:noexp] OR Puerto Rico[Mesh:noexp] OR Romania[Mesh:noexp] OR Russia[Mesh:noexp] OR "Russia (Pre-1917)"[Mesh:noexp] OR Rwanda[Mesh:noexp] OR "Saint Kitts and Nevis"[Mesh:noexp] OR Saint Lucia[Mesh:noexp] OR "Saint Vincent and the Grenadines"[Mesh:noexp] OR Samoa[Mesh:noexp] OR Saudi Arabia[Mesh:noexp] OR Senegal[Mesh:noexp] OR Serbia[Mesh:noexp] OR Montenegro[Mesh:noexp] OR Seychelles[Mesh:noexp] OR Sierra Leone[Mesh:noexp] OR Slovenia[Mesh:noexp] OR Sri Lanka[Mesh:noexp] OR Somalia[Mesh:noexp] OR South Africa[Mesh:noexp] OR Sudan[Mesh:noexp] OR Suriname[Mesh:noexp] OR Swaziland[Mesh:noexp] OR Syria[Mesh:noexp] OR Tajikistan[Mesh:noexp] OR Tanzania[Mesh:noexp] OR Thailand[Mesh:noexp] OR Togo[Mesh:noexp] OR Tonga[Mesh:noexp] OR "Trinidad and Tobago"[Mesh:noexp] OR Tunisia[Mesh:noexp] OR Turkey[Mesh:noexp] OR Turkmenistan[Mesh:noexp] OR Uganda[Mesh:noexp] OR Ukraine[Mesh:noexp] OR Uruguay[Mesh:noexp] OR USSR[Mesh:noexp] OR Uzbekistan[Mesh:noexp] OR Vanuatu[Mesh:noexp] OR Venezuela[Mesh:noexp] OR Vietnam[Mesh:noexp] OR Yemen[Mesh:noexp] OR Yugoslavia[Mesh:noexp] OR Zambia[Mesh:noexp] OR Zimbabwe[Mesh:noexp]))	
#5	#1 AND #2 AND #3 AND #4	956
Limited to 1978 onwards in English language only		863

CINAHL

Community health worker	Program	MCH	LMIC
MH “community health workers” OR MH “rural health personnel” OR TX “community health worker*” OR TX “community health aide*” OR TX “village health worker*” OR TX “barefoot doctor*” OR TX “family planning personnel*” OR TX “health extension worker*” OR TX “lady health worker*” OR TX “community health agent*” OR TX “Shasthyo Sebika*” OR TX “community nutrition worker*” OR TX “maternal health worker*” OR TX “voluntary Malaria worker*” OR TX “village malaria worker*” OR TX “Raedat*” OR TX “postnatal support worker*” OR TX “mental health worker*” OR TX “mother coordinator*” OR TX “rural health worker*” OR TX “village health promoter*” OR TX accompagnateur* OR TX “Saksham Sahaya*” OR TX “anganwandi worker*” OR TX “accredited social health activist*” OR TX “community-based worker*” OR TX “community health volunteer*” OR TX “village health guide*” OR TX “maternal and child health promotion worker*” OR TX “maternal child health worker*” OR TX “kader posyandu*” OR TX behvarz* OR TX “village health helper*” OR TX “colaborador voluntario*” OR TX “nutrition volunteers*” OR TX “village drug-kit manager*” OR TX brigadistas* OR TX “female community health volunteer*” OR TX “Agente Comunitario de Salud*” OR TX “nutrition worker*” OR TX “community reproductive health worker*” OR TX “community drug distributor*” OR TX “community volunteer*”	TX Program OR TX programs OR TX programme OR TX programmes OR TX initiative* OR TX project OR TX projects	MH “Maternal-Child Health” OR TX “maternal-child health”	MH “low and middle income countries” OR MH “developing countries” OR TX Afghanistan OR TX Albania OR TX Algeria OR TX Angola OR TX Antigua OR TX Barbuda OR TX Argentina OR TX Armenia OR TX Armenian OR TX Aruba OR TX Azerbaijan OR TX Bahrain OR TX Bangladesh OR TX Barbados OR TX Benin OR TX Byelarus OR TX Byelorussian OR TX Belarus OR TX Belorussian OR TX Belorussia OR TX Belize OR TX Bhutan OR TX Bolivia OR TX Bosnia OR TX Herzegovina OR TX Hercegovina OR TX Botswana OR TX Brasil OR TX Brazil OR TX Bulgaria OR TX Burkina Faso OR TX Burkina Fasso OR TX Upper Volta OR TX Burundi OR TX Urundi OR TX Cambodia OR TX Khmer Republic OR TX Kampuchea OR TX Cameroon OR TX Cameroons OR TX Cameron OR TX Camerons OR TX Cape Verde OR TX “Central African Republic” OR TX Chad OR TX Chile OR TX China OR TX Colombia OR TX Comoros OR TX “Comoro Islands” OR TX Comores OR TX Mayotte OR TX Congo OR TX Zaire OR TX “Costa Rica” OR TX “Cote d'Ivoire” OR TX “Ivory Coast” OR TX Croatia OR TX Cuba OR TX Cyprus OR TX Czechoslovakia OR TX “Czech Republic” OR TX Slovakia OR TX “Slovak Republic” OR TX Djibouti OR TX “French Somaliland” OR TX Dominica OR TX “Dominican Republic” OR TX “East Timor” OR TX “East Timur” OR TX “Timor Leste” OR TX Ecuador OR TX Egypt OR TX “United Arab Republic” OR TX “El Salvador” OR TX Eritrea OR TX Estonia OR TX Ethiopia OR TX Fiji OR TX Gabon OR TX “Gabonese Republic” OR TX Gambia OR TX Gaza OR TX “Georgia Republic” OR TX “Georgian Republic” OR TX Ghana OR TX “Gold Coast” OR TX Greece OR TX Grenada OR TX Guatemala OR TX Guinea OR TX Guam OR TX Guiana OR TX Guyana OR TX Haiti OR TX Honduras OR TX Hungary OR TX India OR TX Maldives OR TX Indonesia OR TX Iran OR TX Iraq OR TX “Isle of Man” OR TX Jamaica OR TX Jordan OR TX Kazakhstan OR TX Kazakh OR TX Kenya OR TX Kiribati OR TX Korea OR TX Kosovo OR TX Kyrgyzstan OR TX Kirghizia OR TX “Kyrgyz Republic” OR TX Kirghiz OR TX Kirgizstan OR TX “Lao PDR” OR TX Laos OR TX Latvia OR TX Lebanon OR

Community health worker	Program	MCH	LMIC
OR TX “community health advocate*” OR TX “lay health visitor*” OR TX “Promotoras de Salud”			TX Lesotho OR TX Basutoland OR TX Liberia OR TX Libya OR TX Lithuania OR TX Macedonia OR TX Madagascar OR TX “Malagasy Republic” OR TX Malaysia OR TX Malaya OR TX Malay OR TX Sabah OR TX Sarawak OR TX Malawi OR TX Nyasaland OR TX Mali OR TX Malta OR TX “Marshall Islands” OR TX Mauritania OR TX Mauritius OR TX “Agalega Islands” OR TX Mexico OR TX Micronesia OR TX “Middle East” OR TX Moldova OR TX Moldovia OR TX Moldovian OR TX Mongolia OR TX Montenegro OR TX Morocco OR TX Ifni OR TX Mozambique OR TX Myanmar OR TX Myanma OR TX Burma OR TX Namibia OR TX Nepal OR TX “Netherlands Antilles” OR TX “New Caledonia” OR TX Nicaragua OR TX Niger OR TX Nigeria OR TX “Northern Mariana Islands” OR TX Oman OR TX Muscat OR TX Pakistan OR TX Palau OR TX Palestine OR TX Panama OR TX Paraguay OR TX Peru OR TX Philippines OR TX Philipines OR TX Phillipines OR TX Phillippines OR TX Poland OR TX Portugal OR TX “Puerto Rico” OR TX Romania OR TX Rumania OR TX Roumania OR TX Russia OR TX Russian OR TX Rwanda OR TX Ruanda OR TX “Saint Kitts” OR TX “St Kitts” OR TX Nevis OR TX “Saint Lucia” OR TX “St Lucia” OR TX “Saint Vincent” OR TX “St Vincent” OR TX Grenadines OR TX Samoa OR TX “Samoan Islands” OR TX “Navigator Island” OR TX “Navigator Islands” OR TX “Sao Tome” OR TX “Saudi Arabia” OR TX Senegal OR TX Serbia OR TX Montenegro OR TX Seychelles OR TX “Sierra Leone” OR TX Slovenia OR TX “Sri Lanka” OR TX Ceylon OR TX “Solomon Islands” OR TX Somalia OR TX Sudan OR TX Suriname OR TX Surinam OR TX Swaziland OR TX Syria OR TX Tajikistan OR TX Tadzhikistan OR TX Tadjikistan OR TX Tadzhik OR TX Tanzania OR TX Thailand OR TX Togo OR TX “Togolese Republic” OR TX Tonga OR TX Trinidad OR TX Tobago OR TX Tunisia OR TX Turkey OR TX Turkmenistan OR TX Turkmen OR TX Uganda OR TX Ukraine OR TX Uruguay OR TX USSR OR TX “Soviet Union” OR TX “Union of Soviet Socialist Republics” OR TX Uzbekistan OR TX Uzbek OR TX Vanuatu OR TX “New Hebrides” OR TX Venezuela OR TX Vietnam OR TX “Viet Nam” OR TX “West Bank” OR TX Yemen OR TX Yugoslavia OR TX Zambia OR TX Zimbabwe OR TX Rhodesia

EMBASE

Community health worker	Program	MCH	LMIC
"Health Auxiliary"/de OR "community health worker*":ti,ab OR "community health aide*":ti,ab OR "village health worker*":ti,ab OR "barefoot doctor*":ti,ab OR "family planning personnel*":ti,ab OR "health extension worker*":ti,ab OR "lady health worker*":ti,ab OR "community health agent*":ti,ab OR "Shasthyo Sebika*":ti,ab OR "community nutrition worker*":ti,ab OR "maternal health worker*":ti,ab OR "voluntary Malaria worker*":ti,ab OR "village malaria worker*":ti,ab OR Raedat*:ti,ab OR "postnatal support worker*":ti,ab OR "mental health worker*":ti,ab OR "mother coordinator*":ti,ab OR "rural health worker*":ti,ab OR "village health promoter*":ti,ab OR accompagnateur*:ti,ab OR "Saksham Sahaya*":ti,ab OR "anganwandi worker*":ti,ab OR "accredited social health activist*":ti,ab OR "community-based worker*":ti,ab OR "community health volunteer*":ti,ab OR "village health guide*":ti,ab OR "maternal and child health promotion worker*":ti,ab OR "maternal child health worker*":ti,ab OR "kader posyandu*":ti,ab OR behvarz*:ti,ab OR "village health helper*":ti,ab OR "colaborador	Program:ti,ab OR programs:ti,ab OR programme:ti,ab OR programmes:ti,ab OR initiative*:ti,ab OR project:ti,ab OR projects:ti,ab	"Maternal child health care"/de OR "Maternal Welfare":ti,ab OR "child health":ti,ab OR "child care":ti,ab OR "child welfare":ti,ab OR "maternal-child health services":ti,ab OR "child health services":ti,ab OR "maternal child health":ti,ab OR "maternal newborn child health":ti,ab	Afghanistan:ti,ab OR Albania:ti,ab OR Algeria:ti,ab OR Angola:ti,ab OR Antigua:ti,ab OR Barbuda:ti,ab OR Argentina:ti,ab OR Armenia:ti,ab OR Armenian:ti,ab OR Aruba:ti,ab OR Azerbaijan:ti,ab OR Bahrain:ti,ab OR Bangladesh:ti,ab OR Barbados:ti,ab OR Benin:ti,ab OR Byelarus:ti,ab OR Byelorussian:ti,ab OR Belarus:ti,ab OR Belorussian:ti,ab OR Belorussia:ti,ab OR Belize:ti,ab OR Bhutan:ti,ab OR Bolivia:ti,ab OR Bosnia:ti,ab OR Herzegovina:ti,ab OR Hercegovina:ti,ab OR Botswana:ti,ab OR Brasil:ti,ab OR Brazil:ti,ab OR Bulgaria:ti,ab OR Burkina Faso:ti,ab OR "Burkina Fasso":ti,ab OR "Upper Volta":ti,ab OR Burundi:ti,ab OR Urundi:ti,ab OR Cambodia:ti,ab OR "Khmer Republic":ti,ab OR Kampuchea:ti,ab OR Cameroon:ti,ab OR Cameroons:ti,ab OR Cameron:ti,ab OR Camerons:ti,ab OR "Cape Verde":ti,ab OR "Central African Republic":ti,ab OR Chad:ti,ab OR Chile:ti,ab OR China:ti,ab OR Colombia:ti,ab OR Comoros:ti,ab OR "Comoro Islands":ti,ab OR Comores:ti,ab OR Mayotte:ti,ab OR Congo:ti,ab OR Zaire:ti,ab OR "Costa Rica":ti,ab OR "Cote d Ivoire":ti,ab OR "Ivory Coast":ti,ab OR Croatia:ti,ab OR Cuba:ti,ab OR Cyprus:ti,ab OR Czechoslovakia:ti,ab OR "Czech Republic":ti,ab OR Slovakia:ti,ab OR "Slovak Republic":ti,ab OR Djibouti:ti,ab OR "French Somaliland":ti,ab OR Dominica:ti,ab OR "Dominican Republic":ti,ab OR "East Timor":ti,ab OR "East Timur":ti,ab OR Timor Leste":ti,ab OR Ecuador:ti,ab OR Egypt:ti,ab OR "United Arab Republic":ti,ab OR "El Salvador":ti,ab OR Eritrea:ti,ab OR Estonia:ti,ab OR Ethiopia:ti,ab OR Fiji:ti,ab OR Gabon:ti,ab OR "Gabonese Republic":ti,ab OR Gambia:ti,ab OR Gaza:ti,ab OR "Georgia Republic":ti,ab OR "Georgian Republic":ti,ab OR Ghana:ti,ab OR Gold Coast:ti,ab OR Greece:ti,ab OR Grenada:ti,ab OR Guatemala:ti,ab OR Guinea:ti,ab OR Guam:ti,ab OR Guiana:ti,ab OR Guyana:ti,ab OR Haiti:ti,ab OR Honduras:ti,ab OR Hungary:ti,ab OR India:ti,ab OR Maldives:ti,ab OR Indonesia:ti,ab OR Iran:ti,ab OR Iraq:ti,ab OR "Isle of Man":ti,ab OR Jamaica:ti,ab OR Jordan:ti,ab OR Kazakhstan:ti,ab OR Kazakh:ti,ab OR Kenya:ti,ab OR Kiribati:ti,ab OR Korea:ti,ab OR Kosovo:ti,ab OR Kyrgyzstan:ti,ab OR Kirghizia:ti,ab OR "Kyrgyz Republic":ti,ab OR Kirghiz:ti,ab OR Kirgizstan:ti,ab OR Lao PDR:ti,ab OR Laos:ti,ab OR Latvia:ti,ab OR Lebanon:ti,ab OR Lesotho:ti,ab OR Basutoland:ti,ab OR Liberia:ti,ab OR Libya:ti,ab OR Lithuania:ti,ab OR Macedonia:ti,ab OR Madagascar:ti,ab OR "Malagasy Republic":ti,ab OR Malaysia:ti,ab OR Malaya:ti,ab OR Malay:ti,ab OR

Community health worker	Program	MCH	LMIC
voluntario*”:ti,ab OR “nutrition volunteers*”:ti,ab OR “village drug-kit manager*”:ti,ab OR brigadistas*:ti,ab OR “female community health volunteer*”:ti,ab OR “Agente Comunitario de Salud*”:ti,ab OR “nutrition worker*”:ti,ab OR “community reproductive health worker*”:ti,ab OR “community drug distributor*”:ti,ab OR “community volunteer*”:ti,ab OR “community health advocate*”:ti,ab OR “lay health visitor*”:ti,ab OR “Promotoras de Salud”:ti,ab			Sabah:ti,ab OR Sarawak:ti,ab OR Malawi:ti,ab OR Nyasaland:ti,ab OR Mali:ti,ab OR Malta:ti,ab OR “Marshall Islands”:ti,ab OR Mauritania:ti,ab OR Mauritius:ti,ab OR “Agalega Islands”:ti,ab OR Mexico:ti,ab OR Micronesia:ti,ab OR “Middle East”:ti,ab OR Moldova:ti,ab OR Moldovia:ti,ab OR Moldovian:ti,ab OR Mongolia:ti,ab OR Montenegro:ti,ab OR Morocco:ti,ab OR Ifni:ti,ab OR Mozambique:ti,ab OR Myanmar:ti,ab OR Myanma:ti,ab OR Burma:ti,ab OR Namibia:ti,ab OR Nepal:ti,ab OR “Netherlands Antilles”:ti,ab OR “New Caledonia”:ti,ab OR Nicaragua:ti,ab OR Niger:ti,ab OR Nigeria:ti,ab OR “Northern Mariana Islands”:ti,ab OR Oman:ti,ab OR Muscat:ti,ab OR Pakistan:ti,ab OR Palau:ti,ab OR Palestine:ti,ab OR Panama:ti,ab OR Paraguay:ti,ab OR Peru:ti,ab OR Philippines:ti,ab OR Philipines:ti,ab OR Phillipines:ti,ab OR Phillippines:ti,ab OR Poland:ti,ab OR Portugal:ti,ab OR “Puerto Rico”:ti,ab OR Romania:ti,ab OR Rumania:ti,ab OR Roumania:ti,ab OR Russia:ti,ab OR Russian:ti,ab OR Rwanda:ti,ab OR Ruanda:ti,ab OR “Saint Kitts”:ti,ab OR St Kitts:ti,ab OR Nevis:ti,ab OR “Saint Lucia”:ti,ab OR “St Lucia”:ti,ab OR “Saint Vincent”:ti,ab OR “St Vincent”:ti,ab OR Grenadines:ti,ab OR Samoa:ti,ab OR “Samoan Islands”:ti,ab OR “Navigator Island”:ti,ab OR “Navigator Islands”:ti,ab OR Sao Tome:ti,ab OR “Saudi Arabia”:ti,ab OR Senegal:ti,ab OR Serbia:ti,ab OR Montenegro:ti,ab OR Seychelles:ti,ab OR “Sierra Leone”:ti,ab OR Slovenia:ti,ab OR “Sri Lanka”:ti,ab OR Ceylon:ti,ab OR “Solomon Islands”:ti,ab OR Somalia:ti,ab OR Sudan:ti,ab OR Suriname:ti,ab OR Surinam:ti,ab OR Swaziland:ti,ab OR Syria:ti,ab OR Tajikistan:ti,ab OR Tadzhikistan:ti,ab OR Tadjikistan:ti,ab OR Tadzhik:ti,ab OR Tanzania:ti,ab OR Thailand:ti,ab OR Togo:ti,ab OR “Togolese Republic”:ti,ab OR Tonga:ti,ab OR Trinidad:ti,ab OR Tobago:ti,ab OR Tunisia:ti,ab OR Turkey:ti,ab OR Turkmenistan:ti,ab OR Turkmen:ti,ab OR Uganda:ti,ab OR Ukraine:ti,ab OR Uruguay:ti,ab OR USSR:ti,ab OR “Soviet Union”:ti,ab OR “Union of Soviet Socialist Republics”:ti,ab OR Uzbekistan:ti,ab OR Uzbek OR Vanuatu:ti,ab OR “New Hebrides”:ti,ab OR Venezuela:ti,ab OR Vietnam:ti,ab OR Viet Nam:ti,ab OR West Bank:ti,ab OR Yemen:ti,ab OR Yugoslavia:ti,ab OR Zambia:ti,ab OR Zimbabwe:ti,ab OR Rhodesia:ti,ab OR “Developing Country”/de OR Africa/exp OR Asia/exp OR Caribbean/exp OR “West Indies”/exp OR “South America”/exp OR “Latin America”/exp OR “Central America”/exp OR “Developing Countr*”:ti,ab

SCOPUS

Community health worker	Program	MCH	LMIC
"Health Auxiliary" OR "community health worker*" OR "community health aide*" OR "village health worker*" OR "barefoot doctor*" OR "family planning personnel*" OR "health extension worker*" OR "lady health worker*" OR "community health agent*" OR "Shasthyo Sebika*" OR "community nutrition worker*" OR "maternal health worker*" OR "voluntary Malaria worker*" OR "village malaria worker*" OR Raedat* OR "postnatal support worker*" OR "mental health worker*" OR "mother coordinator*" OR "rural health worker*" OR "village health promoter*" OR accompagnateur* OR "Saksham Sahaya*" OR "anganwandi worker*" OR "accredited social health activist*" OR "community-based worker*" OR "community health volunteer*" OR "village health guide*" OR "maternal and child health promotion worker*" OR "maternal child health worker*" OR "kader posyandu*" OR behvarz* OR "village health helper*" OR "colaborador voluntario*" OR "nutrition volunteers*" OR "village drug-kit manager*" OR brigadistas* OR "female community health volunteer*" OR "Agente Comunitario de Salud*" OR "nutrition worker*" OR "community reproductive health worker*" OR "community drug distributor*" OR "community	Program OR programs OR programme OR programmes OR initiative* OR project OR projects	"Maternal child health care"/de OR "Maternal Welfare" OR "child health" OR "child care" OR "child welfare" OR "maternal-child health services" OR "child health services" OR "maternal child health" OR "maternal newborn child health"	Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR "Burkina Fasso" OR "Upper Volta" OR Burundi OR Urundi OR Cambodia OR "Khmer Republic" OR Kampuchea OR Cameroon OR Cameroons OR Cameron OR Camerons OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR "Comoro Islands" OR Comores OR Mayotte OR Congo OR Zaire OR "Costa Rica" OR "Cote d'Ivoire" OR "Ivory Coast" OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR "Czech Republic" OR Slovakia OR "Slovak Republic" OR Djibouti OR "French Somaliland" OR Dominica OR "Dominican Republic" OR "East Timor" OR "East Timur" OR "Timor Leste" OR Ecuador OR Egypt OR "United Arab Republic" OR "El Salvador" OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR "Gabonese Republic" OR Gambia OR Gaza OR "Georgia Republic" OR "Georgian Republic" OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR "Isle of Man" OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR "Kyrgyz Republic" OR Kirghiz OR Kirgizstan OR Lao PDR OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR "Malagasy Republic" OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR "Marshall Islands" OR Mauritania OR Mauritius OR "Agalega Islands" OR Mexico OR Micronesia OR "Middle East" OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia

Community health worker	Program	MCH	LMIC
volunteer*" OR "community health advocate*" OR "lay health visitor*" OR "Promotoras de Salud"			OR Nepal OR "Netherlands Antilles" OR "New Caledonia" OR Nicaragua OR Niger OR Nigeria OR "Northern Mariana Islands" OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR "Puerto Rico" OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR "Saint Kitts" OR St Kitts OR Nevis OR "Saint Lucia" OR "St Lucia" OR "Saint Vincent" OR "St Vincent" OR Grenadines OR Samoa OR "Samoan Islands" OR "Navigator Island" OR "Navigator Islands" OR Sao Tome OR "Saudi Arabia" OR Senegal OR Serbia OR Montenegro OR Seychelles OR "Sierra Leone" OR Slovenia OR "Sri Lanka" OR Ceylon OR "Solomon Islands" OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR "Togolese Republic" OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR "Soviet Union" OR "Union of Soviet Socialist Republics" OR Uzbekistan OR Uzbek OR Vanuatu OR "New Hebrides" OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia OR "Developing Country" OR Africa OR Asia OR Caribbean OR "West Indies" OR "South America" OR "Latin America" OR "Central America" OR "Developing Countr*"

Appendix II: Data Charting Form

Scoping Review Title: Application of Primary Health Care Principles in National Community Health Worker Programs in Low- and Middle –Income Countries?	
Data charted by:	
Date of data charting:	
Study Details and Characteristics	
Study citation details (author, year, title, journal, volume, issue, pages)	
Country of origin	
Study objective / aim	
Type of Study	Qualitative / Quantitative
Methods:	
Study Setting:	
CHW Program Details	
Name of the CHW Program	
Objective of the CHW Program	
Year the program started	
End date	
Implemented by	
Funded by	
Details / Results charted from the Study (in relation to the concept of the scoping review)	
Which PHC principle is reflected in the reported objective of the national program?	• Universal access / Equity • Community participation • Intersectoral collaboration • Appropriateness
How are they implementing the PHC principle (s)?	
Stated outcome / achievement of the CHW program with reference to PHC principle (s)	
Key findings of the article	
Characteristics of CHWs	
Key role of CHWs stated	
Nomenclature of CHWs	
Gender	
Employment status	
Pre-service training	
Catchment area	
Additional notes:	

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	
Limitations	20	Discuss the limitations of the scoping review process.	
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

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Application of Primary Health Care Principles in National Community Health Worker Programs in Low- and Middle - Income Countries: A Scoping Review

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Keywords:	PRIMARY CARE, Human resource management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PUBLIC HEALTH

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Title of the article: Application of Primary Health Care Principles in National Community Health Worker Programs in low- and Middle -Income Countries: A Scoping Review

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Abstract

Objective: To identify which PHC principles are reflected in the implementation of national CHW programs and how they may contribute to the outcomes of these programs in the context of low-and middle-income countries (LMICs).

Design: Scoping review

Data sources: A systematic search was conducted through PubMed, CINAHL, EMBASE and Scopus databases.

Eligibility Criteria: The review only considered published primary studies on national programs, projects or initiatives utilising the services of CHWs in LMICs focused on maternal and child health. We included only English language studies. Excluded were programs operated by non-government organisations, study protocols, reviews, commentaries, opinion papers, editorials and conference proceedings.

Data extraction and Synthesis: We reviewed the application of four PHC principles (universal health coverage, community participation, intersectoral coordination and appropriateness) in the CHW program's objectives, implementation and stated outcomes. Data extraction was undertaken systematically in an excel spreadsheet while the findings were synthesised in a narrative manner. The quality appraisal of the selected studies was not performed in this scoping review.

Results: From 1,280 papers published between 1983 and 2019, 26 met the inclusion criteria. These 26 papers included 14 CHW programs from 13 LMICs. Universal health coverage and community participation were the two commonly reported PHC principles, while intersectoral coordination was generally missing. Similarly, the cultural acceptability aspect of the principle of appropriateness was present in all programs as these programs select CHWs from within the communities. Other aspects, particularly effectiveness, were not evident.

Conclusion: The implementation of PHC principles across national CHW programs in LMICs is patchy. For comprehensiveness and improved health outcomes, programs need to incorporate all attributes of PHC principles. Future research may focus on how to incorporate more attributes of PHC principles while implementing national CHW programs in LMICs. Better documentation and publications of CHW program implementation are also needed.

Keywords: Primary Health Care, Community Health Worker; Community Health Program; Low-and Middle-Income Countries.

Strengths and limitations of the study

- CHW programs in developing and lower middle income countries are an essential aspect of the strategy to achieve health for all and sustainable development goals, and this scoping review can be considered as an important step towards reviewing national community health worker programs in LMICs applying the lens of primary health care principles
- Four bibliographic databases were searched using a basic search strategy that was modified as per the database requirement.
- The studies were heterogeneous in their methods and outcomes assessed and that posed a challenge in comparing primary health care principles
- The generalisability of the results of this study is limited to larger national-level programs in developing and lower- and middle--income countries only.

BACKGROUND

Primary Health Care (PHC), as an approach to a reorientation of health services and provision of universal health care, has remained the benchmark for most countries' discourse on health since the PHC approach was mobilized by the Alma Ata Health for All (HFA) declaration for comprehensive, evidence-based responses to local health needs with reference to the social context.[1] PHC is a whole-of-society approach to health and aims to attain the highest possible level and distribution of health and well-being by providing an accessible and wide range of services, including health promotion; disease prevention, treatment and rehabilitation; and palliative care.[1]

'Health for All' requires that health systems respond to the challenges of a changing world and growing expectations for better performance. PHC includes the key elements needed to improve health security, through a focus on community engagement, preventative collective action, access to good quality medicines, rational prescribing, and a core set of essential public health functions, including surveillance and early response.[1] A PHC approach achieves this by strengthening community-based initiatives and building resilience.

Across a wide variety of settings in low-, middle-, and high-income countries, PHC-oriented health systems have consistently produced better health outcomes, enhanced equity, and improved efficiency.[1] In Brazil, for example, enrolment in the family health strategy has been linked to a higher likelihood of regular care, better access to medication, and improved patient satisfaction. Hence, PHC has been rightly advocated as the key to achieving HFA and the 2018 Astana Declaration reiterated the importance of this approach for achieving Universal Health Coverage (UHC).[2 3]

PHC, as an approach to achieve HFA goals,' was built on the principles of equity in access to health services and the right of people to participate in decisions about their own health care.[1] These principles i.e. 'equity' and 'community empowerment' underpin preventive and promotive health services, appropriate technology, and intersectoral collaboration.[4] Evidence suggests that if countries have explicitly organised their health systems around PHC principles, it has led to improved health outcomes. For example, in Portugal, by 2008, the life expectancy at birth increased 9.2 years more than it was 30 years ago. In Congo, the case-fatality rate after caesarean section dropped from 7% to less than 3% from 1985 to 2000. In, Iran, the

under-five child mortality reduced from 80 per 1000 to less than 20 per 1000 in rural areas from 1980 to 2000. [5]

PHC's emphasis on community-based services is an important way to ensure access, even in rural, remote areas and for disadvantaged populations. With limited resources and geographical and epidemiological context, it is a challenge for health care systems in LMICs to reach out to the whole populations. Therefore, as part of the PHC approach and with a view to its principle of community empowerment, CHW programs were envisioned as a way to reach a wider population for essential health needs and to achieve HFA. National CHW programs were implemented by many governments from 1978.[6-10] Established under the PHC principles, these programs were expected to encompass and promote them and in doing so achieve improvements in health outcomes.[11] The focus of this study is 'strengthening community-based initiatives' part of the PHC approach i.e. CHW programs that operate at the interface between communities and the primary care level of the health system.

National CHW programs, as vehicles to incorporate PHC principles into healthcare provision, have contributed significantly in reducing under-five child mortality in Brazil[12], Indonesia[12], and Nepal[13]. In Indonesia, immunization coverage also improved many-fold with an increase in community health workers. These examples demonstrate a clear link and need for incorporating PHC principles when implementing CHW programs. Over decades of implementation CHW programs have also faced various challenges including the loss of the PHC movement.[14 15] Though, the PHC principles are evident in the program design and policies of the CHW programs in various countries.[16-20] There is not widespread/comprehensive evidence of the extent to which PHC principles are systematically applied across the national CHW programs. This study aims to identify the PHC principles in the implementation of these programs in the context of LMICs and to understand their contribution to the outcomes of those programs.

METHODS

A systematic scoping review was conducted using a predefined protocol[21] and reported as per the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.[22] The databases searched in September 2019 were PubMed (MEDLINE), CINAHL (EBSCOhost),

EMBASE (Elsevier) and Scopus (Elsevier). The review only considered published primary studies on programs, projects or initiatives utilising the services of CHWs in LMICs. We focused on the national level CHW programs defined as any CHW program that is operated or implemented by the government of a specific country, on multiple sites (jurisdictions/provinces/regions) within a country and has been functional for a minimum of three years. We considered national CHW programs with a maternal and child health (MCH) focus as it is a national priority in the majority of LMICs.

Papers published only in the English language from October 1978 to September 2019 were considered as 1978 was the year of the Alma-Ata declaration that promoted the establishment of national-level CHW programs under the PHC principles. Excluded were study protocols, narrative reviews, commentaries, text and opinion papers, viewpoints, editorials, conference proceedings/abstracts, correspondences, systematic and scoping reviews and the papers on the CHW programs operated by a non-government organisation (NGOs). Papers were also excluded if they involved health professionals other than CHWs such as midwives, nurses and traditional birth attendants. Papers were not excluded based on the unavailability of the abstract.

The search strategy, including all identified keywords and index terms, was adapted for each included database (appendix I – logic grid). The search terms used included "community health worker", "Program", "Maternal and Child Health" and "Low-and Middle-Income Countries". The results of the search are presented in the PRISMA-ScR flow diagram in the results section.

Following the search, all identified records were collated and uploaded into Covidence software[23] and duplicates removed. Two authors (SP and ZL) independently screened titles and abstracts and then matched the full texts selected during screening against the inclusion criteria. The reference lists of relevant papers were also searched for additional studies. Papers meeting the inclusion criteria were included in the review for data charting. In scoping reviews, the data extraction process is referred to as charting the results.[24] SP and ZL completed data charting using a pre-developed data charting form. Key attributes of the data charting form included the country of origin, study objective, design and key findings, name of the CHW program, objective, and reflection of PHC principle/s in program objective, implementation activities, and stated outcomes along with the selection process of CHWs (appendix II). The data charting

form was pilot tested and modified accordingly. The operational definition of the PHC principles used as reference in this scoping review are as follows:

1. Universal Health Coverage: all people receive the health services they need, including public health services designed to promote better health, prevent illness, and to provide treatment, rehabilitation and palliative care of sufficient quality to be effective, while at the same time ensuring that the use of these services does not expose the user to financial hardship.[2 25]
2. Community Participation: Active community involvement in defining health problems and needs, developing solutions and implementing and evaluating programs.[2]
3. Intersectoral Coordination: The linkage between health and development.[2]
4. Appropriateness: Services should be effective, culturally acceptable, affordable and manageable.[2]

We examined the included studies in light of all or any of the sub-attribute of the above-listed four PHC principles and reported accordingly. The evidence is reported if it was mentioned explicitly in the article or inferred by the researchers reflecting the implementation of PHC principles even if the evidence was about only one aspect of a principle. The relevant evidence is extracted and explained in the results section.

There was no quality assessment conducted of the included studies. The findings were synthesised in a tabular and narrative manner. The conceptual framework, including definitions of the four principles, for collating and summarizing the data is presented in the published protocol.[21]

Patient and public involvement

We did not involve patients or the public in this scoping review.

RESULTS

Search Results

We identified 1,280 citations through database searches. After removing duplicates and screening out non-relevant abstracts, we assessed 281 full-text papers for eligibility. 263 of those 281 were excluded as these did not meet the eligibility criteria. In total, 18 papers [17-20 26-39], published from 1983 to 2019 met the eligibility criteria (Figure 1). Eight[40-47] papers were further included from the reference lists of the

included studies, making a total of 26 papers.

Of the 26 papers, two studies were conducted in western Asia[17 35], 12 studies were conducted in South Asia[18 27 29 31 33 37 38 40-44] and one study in South East Asia.[28] Seven studies were conducted in Africa ranging from the Horn of Africa[19 30 45 46], Central Africa[20], Western Africa[32] and South Africa[39]. Two studies were conducted in South America[34 47], one in Central America[36] and one study was conducted in the Caribbean.[26] Altogether, these 26 studies covered 14 CHW programs from 13 LMICs.

Fourteen of the 26 included studies were quantitative[19 26 28 31 32 34-36 40 42 43 45-47] and 12 studies were qualitative.[17 18 20 27 29 30 33 37-39 41 44] Supplementary table 1 provides an overview of the included studies outlining the key objective/s, methods and findings as reported by the authors.

Figure 1: PRISMA flowchart for study selection and inclusion process

Application of PHC Principles

The PHC principles were applied to a varied extent in the objective/s, implementation, and outcome of the national CHW programs reviewed in this study (Table 1). The evidence found in the objective, implementation, or the outcome of the included studies related to the application of the four PHC principles is organised in supplementary table 2.

Table 1: Application of primary health care principles as reflected in the national community health worker programs

Serial No.	Country / CHWP / year commenced	PHC Principle/s observed in the CHWP Objective	PHC Principle/s observed in the implementation of the CHWP	PHC Principle/s observed in the stated outcome/achievement of the CHWP
1.	**IRAN** / Women Health Volunteers Program / 1992 [17]	Community Participation	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation - Intersectoral coordination
2.	**IRAN** / Primary Health Care Network – EPI / 1983 [35]	Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Appropriateness
3.	**PAKISTAN** / National Program for Family Planning & Primary Health Care / 1994 [27 33]	Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation
4.	**INDIA** / Accredited Social Health Activist (ASHA) Program / 2005 [31 37 38]	- Universal Health Coverage - Appropriateness	- Universal Health Coverage - Community Participation	- Universal Health Coverage
5.	**BANGLADESH** / National MCH and Family Planning Program / 1976 [29]	Not reported	- Universal Health Coverage - Community Participation	Not reported
6.	**NEPAL** / Female Community Health Volunteer Program / 1988 [18]	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation	Not reported
7.	**CAMBODIA** / Village Malaria Worker Project as part of National Malaria Control Program / 2001 [28]	Not reported	- Universal Health Coverage - Community Participation*	- Universal Health Coverage
8.	**ETHIOPIA** / Health Extension Program / 2003 [19 30]	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation - Appropriateness

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Serial No.	Country / CHWP / year commenced	PHC Principle/s observed in the CHWP Objective	PHC Principle/s observed in the implementation of the CHWP	PHC Principle/s observed in the stated outcome/achievement of the CHWP
9.	**RWANDA** / RapidSMS program / 2013 [20]	- Universal Health Coverage - Appropriateness	- Universal Health Coverage - Community Participation - Appropriateness	- Appropriateness (use of technology, acceptability)
10.	**NIGER /** Rural Health Improvement Program / 1970s [32]	- Universal Health Coverage	- Universal Health Coverage	Not reported
11.	**SOUTH AFRICA /** ward-based outreach teams (WBOT) - national CHW program / 2011 [39]	- Universal Health Coverage	- Universal Health Coverage - Community Participation	- Appropriateness
12.	**BRAZIL /** Family Health Program (Programa de Saude da Familia, PSF) / 1994 [34]	- Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage
13.	**EL SAVADOR /** Rural Health Aide Program / 1976 [36]	- Universal Health Coverage	- Universal Health Coverage - Community Participation*	- Universal Health Coverage
14.	**JAMAICA /** Community Health Aide program / 1978 [26]	- Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage

CHWP = Community Health Worker Program, PHC = Primary Health Care

'Universal health coverage' and 'community participation' were the two commonly reflected PHC principles in the national CHW programs across their objective/s, implementation and outcomes. 'Intersectoral coordination' was only mentioned in the outcome of Iran's Women Health Volunteers (WHV) program.[17] The objective of two CHW programs not reported in the papers reviewed.[28 29] In addition, studies from Nepal[18 44], Bangladesh[29], and Niger[32] did not report on the outcomes of the CHW programs.

Universal Health Coverage (UHC)

We reviewed the national CHW programs for the application of this fundamental PHC principle in terms of coverage and access, equity and comprehensiveness. UHC was reflected in the objective of 11 CHW programs[18-20 26 27 32 34-37 39] and in the implementation of 14[17-20 26-29 32 34-37 39] programs through the service provision by CHWs in the MCH and family planning domain. These 14 programs reported improvements in the scope [population coverage] and range [comprehensiveness] of health services provided. For example, an outcome of the CHW program in Iran was increased utilisation of MCH care services as a result of the active follow-up by CHWs.[17] The increase in immunisation coverage of children in the rural areas was also attributed to the 'active' approach and vigilance of CHWs and vaccinators serving the PHC network of Iran.[35] In Pakistan the CHW program was claimed to be contributing to the increasing utilisation of antenatal care and family planning.[27] In Rwanda, mHealth was reported as improving communication between CHWs and community members leading to better use of the health services.[20]

The concept of 'care according to need' was reflected in the objective of Pakistan's CHW program that focuses on the provision of care in underserved areas.[27] Service provision to ethnic minorities was one of the focus areas of Nepal's CHW program.[18]

Community Participation

Only three[17-19] of the 14 CHW programs included in this review incorporated community participation in their program objective. In terms of implementation, 10 programs[17 18 20 27-31 35 36] reflected community participation as they engaged CHWs from within the local communities to provide care to the local population. Moreover, the selection of CHWs from the local community they serve facilitated their access to

households, development of good relationships and high acceptability in the community.[27 30 32] Three programs[32 34 39] did not mention the selection process of CHWs while in Jamaica it was not mandatory to select CHWs from within the local community.[26]

Examples of other activities reflecting the process of community participation[2] beyond the selction of CHWs were reported only in Ethiopia's Health Extension Program.[30] In this program the performance of health centres was evaluated by the community quarterly and the CHWs were monitored by the community volunteers.[30]

Intersectoral Coordination

PHC ought to involve the health sector and all related sectors and aspects of national and community development that have an impact on health.[2 48] Intersectoral coordination was not reflected in the objective/s or implementation of any CHW program and only in the outcome of one[17] program. The WHV Program of Iran explicitly described the intersectoral link between health and education sectors for transmitting health messages to the people.[17] The Accredited Social Health Activist (ASHA) program from India, while not reporting intersectoral collaboration directly, did report actions to enhance the role of women by creating opportunities by working with other sectors to empower women.[38]

Appropriateness

The final PHC principle assessed in this review was appropriateness: i.e. services that are effective, culturally acceptable and financially affordable. The included studies reflected one or another of these attributes but none reported all three attributes of appropriateness. For example, the concept of appropriateness was reflected explicitly in the objective of India's ASHA program (to provide affordable and quality health care) but did not mention cultural appropriateness.[31] The RapidSMS program of Rwanda reported the cultural acceptability of technology (phone messaging services) and its affordability considering that almost all populations had access to a mobile phone.[20]

DISCUSSION

This study has provided insights into the application of PHC principles in the implementation of national CHW programs. PHC principles do not appear to be applied with the rigor and regularity as one would expect considering the emphasis

laid on these during conceptualisation of this significant public health movement called 'PHC'.

Our results show that 'UHC' and 'community participation' were the most common PHC principles reflected in the national CHW programs. In contrast, intersectoral coordination was stated in the outcome of only one of the 14 CHW programs[17] while none of the studies described the programs with reference to all three attributes of appropriateness (effective, culturally acceptable and financially affordable).

'Enhanced coverage' attribute of UHC was most commonly reflected by the national CHW programs. There is limited evidence in the reviewed 26 papers on the implementation of other two attributes, i.e., coverage on the basis of need (equity) and comprehensiveness. This finding complements the fact that soon after Alma-Ata, selective PHC was proposed as an interim strategy for disease control in LMICs.[49 50] Many vertical programs utilised CHWs under different names and with different roles[51] resulting in a fragmented and disease-specific approach operating within the context of fragile health systems of LMICs. CHWs however, are not a "panacea for weak health systems." They require well-structured support from the formal health systems with which national CHW programs are linked. Therefore, achieving UHC requires strengthening of health systems with effective integration of comprehensive CHW programs in LMICs as PHC can only work when a country has the structures, skills and data to ensure that all people are covered.[15]

This review found that the implementation of community participation was patchy, and when it was employed it mainly reflected in the selection of CHWs from the local community. This is not surprising as after the Alma-Ata declaration several governments started CHW programs as a means for people's participation with local lay people trained to administer basic first-line healthcare in their communities.[7 15] While CHWs' position as community members themselves may provide a 'natural link' between them and the community, it may also appear to safeguard trust in[30 32] and respect for them from the community side and enhanced self-esteem from the CHW side.[30] A higher level of community participation where the community is given a stake in the evaluation and redefining of services was evident only in the Ethiopian CHW program.[30] A successful CHW program requires the support and ownership of the community through their active involvement in the entire process of defining health

problems and needs, developing solutions, implementing and evaluating the program, as well as establishing a supportive social and policy environment for community participation at national, district, and local levels.[52] CHW programs often struggle to be successful when not part of a broader community engagement process which requires explicit methods for involving individuals and communities, clearly defined roles and responsibilities, training of policymakers and adequate funding.[52] Recent WHO guidelines have explicitly recommended ways to select CHWs, engage and mobilize the community and this can be achieved if there is a supportive social and policy environment.[53] With little or no evidence as noted by this scoping review on community involvement in needs assessment, the design of programs and evaluation may indicate that invoking community participation is a challenge for these programs.[15] Community participation is a context-dependent, gradual process that is less controllable and less measurable, thereby making it harder to track.[54] There is a need for robust program evaluations of community participation activities that measure long-term outcomes and provide support for the CHW programs to broaden their scope of community participation. Moreover, CHW programs need to give attention to the experiences of CHWs themselves to address the feelings of powerlessness, and frustrations expressed by CHWs about how organisational processual and relational arrangements hindered them from achieving the desired impact. CHW programs should systematically identify disempowering organisational arrangements and take steps to remedy these.[55]

The operational problems related to partnerships working (intersectoral, interinstitutional, interdisciplinary and professional/lay partnerships) were highlighted in the early implementation years of these programs in LMICs.[56] Our review informs that this is still the case.[17] This finding corresponds with the fact that working relationships between partners have often proved difficult,[54 56] as each sector has its priorities.[54] Though some of the CHW programs reflect that the CHWs do understand how various actors relate to each other, and where their interests lie. And how they "use this understanding in particular situations to provide an interpretation of the situation and frame courses of action that appeal to existing interests and identities," inducing cooperation amongst a range of phenomena.[57]

The PHC literature reports that community participation and intersectoral coordination are the two most weakly implemented principles.[15 54] Our review findings also support

this evidence. National CHW programs ought to view these principles as two pillars that help achieve the universal health coverage of services that are appropriate for the community and their context.

By its nature, the provision of MCH services to women by female CHWs who are also selected from within the local community tends to make it culturally acceptable and meet the principle of appropriateness. However, CHW programs need to incorporate 'appropriateness' more explicitly in their objectives and then diligently pursue this in program implementation and outcomes, which may contribute to addressing the current lack of evidence on the effectiveness of these programs.[58]

Based on the findings of this scoping review it can also be inferred that if the CHW programs follow PHC principles they can be better positioned to help in current pandemic response and prevent future infectious outbreaks/epidemics by increasing access to health products and services, distributing health information, increasing social mobilization, completing surveillance activities and reducing the burden of formal health care system.[59]

The review has a number of limitations. Firstly, it relied solely on the information reported in the papers to assess the application of PHC principles within the programs. Many papers did not clearly articulate these principles or provide sufficient descriptions of the program to allow an assessment to be made. As such the reviewers needed to interpret the evidence about principles in how the program was implemented. These principles may be delineated elsewhere, for example program reports or funding agreements. Therefore, it is likely that we underestimated the application of PHC principles in these programs. However, the very fact that the research papers that we reviewed failed to document the implementation of those principles, illustrates less than the adequate emphasis on the application of these principles in national CHW programs.

Secondly, we reviewed the CHW programs identified only through the search of peer-reviewed published journal articles and there may be CHW programs that apply the PHC principles but are not published in peer-reviewed journals in a way to be captured in our search. This scoping review can be considered as a first step towards reviewing national CHW programs in LMICs applying the lens of PHC principles. Future studies

on the analysis of non-peer-reviewed publications or 'grey' literature may produce further evidence on this phenomenon.

CONCLUSION

This scoping review informs that the application of PHC principles across national CHW programs in LMICs is patchy. For comprehensiveness and improved health outcomes, programs need to incorporate all attributes of PHC principles. The findings also point to the limited research and published studies on this important topic. Better documentation and publications of program implementation with reference to PHC principles are needed. Further research is needed to identify reasons for this inadequate emphasis on historic PHC principles, and to find out what other principles are adhered to by the current CHW programs. Future research may also focus on how to incorporate more attributes of the PHC principles while implementing national CHW programs in LMICs.

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Contributors SP had the primary responsibility for writing the manuscript and making revisions. SP contributed to the design of the review, designed and conducted the search, adjudicated and appraised studies, charted and analysed data and drafted the manuscript. ZL was involved in the screening and data charting of the articles and review of the manuscript. CL and AM were involved in the conceptualisation and design of the scoping review, provided continuous supervision and feedback during the conduct of the scoping review and reviewed all the drafts and provided instrumental feedback to improve subsequent versions by SP. HP also reviewed the drafts critically and provided feedback. All authors approved the final version.

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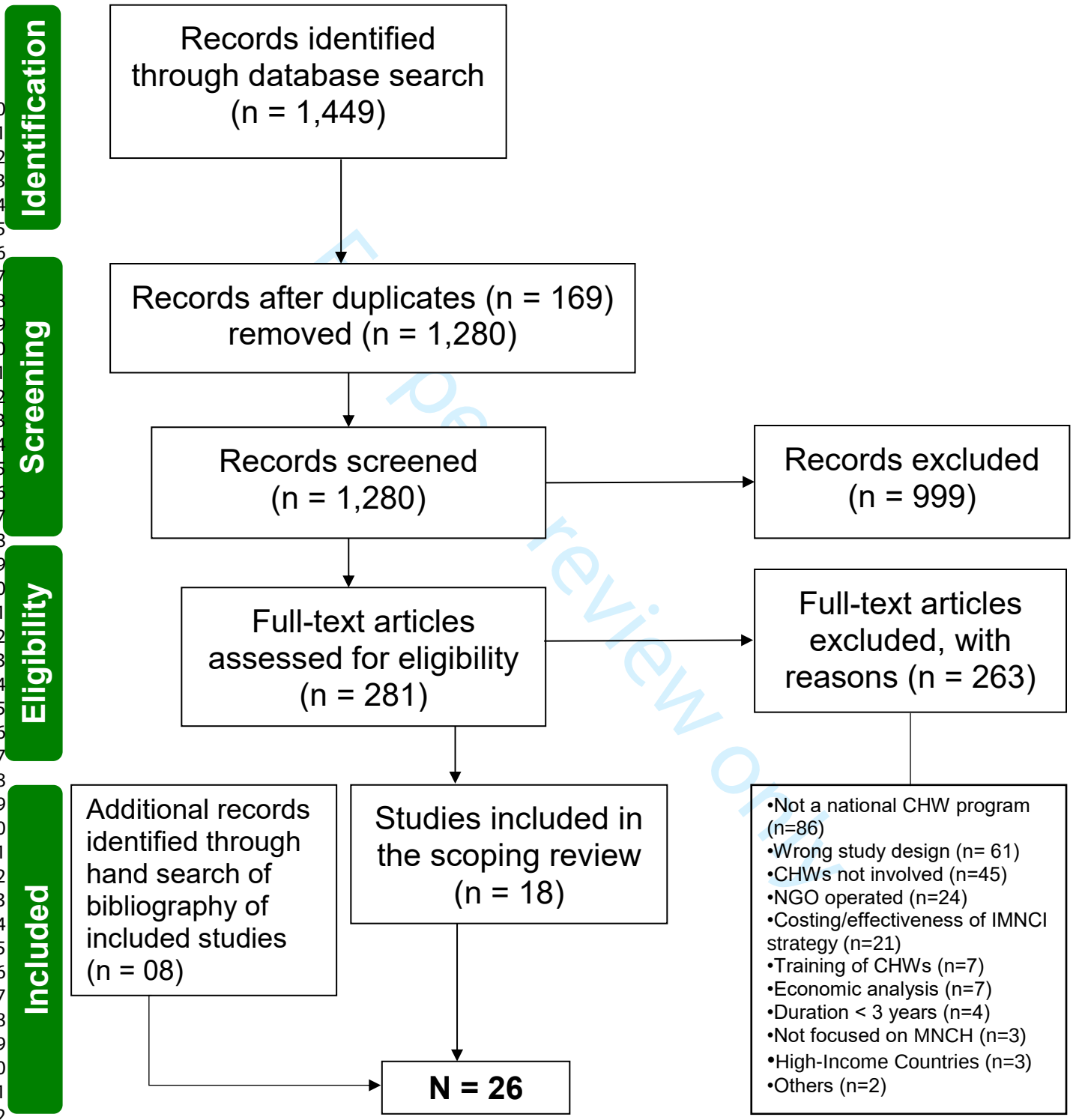

Figure 1: PRISMA flowchart for study selection and inclusion process

Supplementary Table 1: Key characteristics of included studies as reported by the authors

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Damari 2018 / **IRAN**[17]	To evaluate the national Iranian Women Health Volunteers program	Qualitative • Document review • One FGD • Semi-structured questionnaires filled by 44 key informants	Achievements: increased community participation, increasing health literacy, increased coverage and utilization of health services.
Nasseri 1991 / **IRAN**[35]	To determine the impact of PHC services on immunisation activities in areas where the two services are integrated	Quantitative • Cross-sectional survey	Higher coverage in rural areas is attributed to active approach of CHWs and vaccinators.
Memon 2016 / **PAKISTAN**[33]	To explore community barriers in accessing MCH services in 10 remote and rural districts of Pakistan	Qualitative • Sixty FGDs with mothers and fathers of children under five and CHWs - 20 each group	Better awareness was seen among community caregivers for antenatal care and family planning services in the CHW-covered areas.
Hafeez 2011 / **PAKISTAN**[27]	To assess the contribution of the LHWP in enhancing coverage and access of health care services as well as towards improvement of health indicators	Qualitative • Document review • Interviews, formal and informal interactions and discussions with all the stakeholders • Performance validation exercises in the field • Feedback from community being served by the program	The LHWP has led to a development of a very well-placed cadre that links first-level care facilities to the community, thus improving the delivery of PHC services. The health indicators are significantly better than the national average in the areas served by the CHWs.
Douthwaite 2005 / **PAKISTAN**[42]	To assess the impact of the LHWP on the uptake of modern contraceptive methods	Quantitative • Secondary data analysis from the 2002 national evaluation of the LHWP	The study provides strong evidence that the LHWP has succeeded in integrating family planning into the doorstep provision of preventive health care and in increasing the use of modern reversible methods in rural areas.
Afsar 2005 / **PAKISTAN**[41]	To assess the strengths and weaknesses of the LHWP from the Lady Health Workers perspective	Qualitative • 20 key informant interviews with CHWs (n=14), CHW Supervisors (n=4) and 2 medical officers (District	Major strengths: provision of services at the grassroots level, reinforcement of health messages and the community acceptability of workers. Weaknesses: contract-based job, low salaries, irregularity of payment, no career development, and poor logistical support.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
		Coordinator and District Health Education Officer)	
Afsar 2003 / **PAKISTAN**[40]	To estimate the proportion of patients who were referred and to identify the factors associated with unsuccessful referral in Karachi, Pakistan	Quantitative • Cross-sectional survey of 347 patients	A high referral rate (55%) by CHWs was found in this study; 76.4% (n=265) were successful and 23.6% (n=82) were unsuccessful referrals. Key factors for unsuccessful referral: never referred before, never visited the referral site before, no knowledge of who to meet at the referral site, and failure of CHW to follow up.
Kohli 2015 / **INDIA**[43]	To assess the knowledge and practices for maternal health care delivery among Accredited Social Health Activist workers in North-East district of Delhi, India	Quantitative • Descriptive cross-sectional study (n = 55)	CHWs' knowledge is good but practices about maternal health were not adequate due to the number of problems faced by them which need to be addressed through skill- based training in terms of good communication and problem solving. Monitoring should be made an integral part of CHW working in the field to ensure that knowledge is converted into practices as well.
Kosec 2015 / **INDIA**[31]	To understand predictors of essential health and nutrition service delivery in Bihar, India	Quantitative • Secondary data analysis of a 2012 cross-sectional survey of 6,002 households in 400 randomly selected villages in 1 district of Bihar state • Primary data collection from 382 CHWs	CHWs who maintained records of pregnant women were significantly associated with households receiving such information. Incentivizing frontline workers and helping them organize their work is associated with greater receipt of services by households.
Saprii 2015 / **INDIA**[37]	To explore stakeholders' perceptions and experiences of the CHW scheme in strengthening maternal health	Qualitative (exploratory study) • Eighteen in-depth interviews and 3 FGDs with CHWs, key stakeholders and community members	CHWs are valued for their contribution towards maternal health education and for their ability to provide basic biomedical care, but their role as social activists is much less visible as envisioned in the CHW operational guidelines

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Ved 2019 / **INDIA**[38]	To examine how the program is seeking to address gender inequalities facing CHWs, from the program's policy origins to recent adaptations	Qualitative • Document review • 12 key informant interviews	The value of community embeddedness for CHW programs is widely recognized as a mechanism to ensure program relevance to local needs and secure community ownership, support, and recognition of CHWs
Koblinsky 1989 / **BANGLADESH**[29]	To identify and examine organizational constraints to quality care and to provide a feasible strategy for program managers to overcome those barriers	Qualitative • Observations • FGDs – number not reported in the study	Only brief, interactions are possible if CHWs are to complete their rounds in the three-month period mandated by the government. The CHWs compensate for the pressure of their workload by skipping visits with some of the women in their area, by visiting even fewer during the monsoon season, and by neglecting to provide valuable information about family planning or health with some of the women they do visit
Panday 2019 / **NEPAL**[18]	To explore use of MCH care services delivered by CHWs and the reasons for the underutilisation of these services	Qualitative • Interviews and FGDs with 34 CHWs, 26 service users and 11 health workers	Perceived factors that discourage the use of healthcare services by ethnic minority groups are; 1. Lack of knowledge among service users - related to CHWs' inability to communicate health messages; 2. Lack of trust in volunteers; 3. Traditional beliefs and healthcare practices; 4. Low decision-making power of women –

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Panday 2017 / **NEPAL**[44]	To explore the role and experience of CHWs in maternal healthcare provision	Qualitative • Interviews with 20 CHWs, 26 service users and 11 health workers • Four FGDs with 18 CHWs	• All study participants acknowledged the contribution of CHWs in basic maternity care in villages • With support available to CHWs from the local health centres (regular training and access to medical supplies), CHWs were able to assist with childbirth, distribute medicines, and administer pregnancy tests. Whereas such activities were not reported in the other region where such support was not available to CHWs. • Key challenge: lack of monetary incentives
Hasegawa 2013 / **CAMBODIA**[28]	To identify determinants of caregivers' Village Malaria Workers service utilization for childhood illness and caregivers' knowledge of malaria management	Quantitative • Cross-sectional survey with CHWs and primary caregivers of children under five years	• Among the caregivers, 23% in M villages (villages with only malaria control services) and 52% in M+C villages (with both malaria and child health services) utilized CHW services for childhood illnesses. • Determinants of caregivers' utilization of CHWs in M villages included their VMWs' length of experience (AOR = 11.80, 95% confidence interval [CI] = 4.46-31.19) and CHWs' service quality (AOR = 2.04, CI = 1.01-4.11). • In M+C villages, CHWs' length of experience (AOR = 2.44, CI = 1.52-3.94) and caregivers' wealth index (AOR = 0.35, CI = 0.18-0.68) were associated with VMW service utilization. • Better service quality of VMWs (AOR = 3.21, CI = 1.34-7.66) and caregivers' literacy (AOR = 9.91, CI = 4.66-21.05) were positively associated with caregivers' knowledge of malaria management.
Negussie 2017 / **ETHIOPIA**[19]	To assess the contribution made by the CHWs in MCH care service delivery in Dale district, southern Ethiopia	Quantitative • Cross-sectional survey with 613 mothers of reproductive age (15-49), having at least one under-five child	• Overall service coverage of antenatal care (four and more visits), delivery and postnatal care services were low in the district as compared to the national status, and the input from the CHWs, in this regard, was unsatisfactory. • The number of home visits was also inadequate for the necessary support of the mothers.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
			• Mothers who listen to the radio and who had received information about the MCH services by CHWs were more likely to utilize MCH services.
Kok 2015 / **ETHIOPIA**[30]	To identify facilitators of and barriers to interpersonal relationships between CHWs and actors in the community and health sector	Qualitative • Fourteen FGDs and 44 interviews in 2013 with CHWs, traditional birth attendants, health professionals and community members	• CHWs were selected by their communities, which enhanced trust and engagement between them • Program design elements facilitating relationships: support for CHWs activities from the community and health sector, monitoring and accountability structures (community and health sector), referral, supervision and training (health sector)
Medhanyie 2012 / **ETHIOPIA**[45]	To investigate the role of CHWs in improving utilization of maternal health services by rural women	Quantitative • Cross-sectional survey with 725 women with under-five children	• CHWs have contributed substantially to the improvement in women's utilization of family planning, antenatal care and HIV testing.
Admassie 2009 / **ETHIOPIA**[46]	To evaluate the short-term and intermediate-term effects of the Ethiopian HEP on MCH indicators	Quantitative • Program evaluation using a propensity score matching method and village, facility and household surveys	• HEP has significantly increased the proportion of children fully and individually vaccinated • Women in the HEP villages appeared to make their first contact with a skilled health service provider significantly earlier during pregnancy; very little effect is detected on other prenatal and postnatal care services. • HEP has not reduced the incidence and duration of diarrhoea and respiratory diseases among under-five children
Musabyimana 2018 / **RWANDA**[20]	To explore perceptions of healthcare officials, providers, and beneficiaries on the impact of the RapidSMS program	Qualitative • 10 FGDs with 93 participants • In-depth interviews with 56 beneficiaries and 36 CHWs	The effectiveness of use of mobile phones to remind of the appointments for improved access to midwifery services at the health facilities was found to be limited. Indirectly, it alerts to the emerging role of contemporary technologies in community health program.
Magnani 1996 / **NIGER**[32]	To assess the impact of differential access to health services through the comparison of service use patterns and under-five mortality levels among villages provided different levels of health services	Quantitative • Secondary data analysis of National Morbidity and Mortality Survey – 1985 on 974 women of reproductive age	• Children residing in villages proximate to health dispensaries were approximately 32% less likely to have died during the study period than children living further away.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Wilford 2018 / **SOUTH AFRICA**[39]	To explore the quality of CHW household visits providing MCH services	Qualitative • 30 observations [a CHW visit to a mother or pregnant woman was observed by a field worker, followed by an in-depth interview with the participating women and CHWs] • 15 in-depth interviews with mothers/pregnant women and 15 in-depth interviews with CHWs	• Mothers receiving the services were satisfied with CHW visits and appreciated that CHWs understood their life experiences and provided relevant and accessible advice and support. • CHWs expressed concern of not having the required knowledge to undertake all activities in the household, and requested training and support from supervisors during household visits
Mues 2012 / **BRAZIL**[34]	To assess factors influencing perspectives on Brazil's national family health program and perceptions about PSF accessibility among frequent users (primary caretakers of children under 5)	Quantitative • Cross-sectional household survey of 253 households with at least one child 5 years or younger and covered by the PSF	• Most caretakers of young children were satisfied. However, less than half of the caretakers perceived the PSF unit as being accessible • about a quarter of households in the Vespasiano PSF coverage area were not receiving an agent home visit once a month
Aquino 2009 / **BRAZIL**[47]	To evaluate the effects of the implementation of the CHW Program on infant mortality rates in Brazilian municipalities from 1996 to 2004	Quantitative – ecological and longitudinal approach • Secondary data analysis from 1991 and 2000 national census and data from Brazilian MoH of 721 municipalities	A statistically significant negative association between CHW program coverage and infant mortality rate was found after controlling for potential confounders.
Rubin 1983 / **EL SAVADOR**[36]	To evaluate the health service impact of the Rural Health Aide Program in El Salvador	Quantitative • Survey of 363 respondents in cantons served by CHWs for one year and 169 in cantons served by CHWs for two years	Compared to villagers of cantons served by CHWs for one year, those in cantons served by CHWs for 2 years were: -more likely to be visited by their CHW & to visit their CHW -more likely to visit their health centres after referral by their CHW -more likely to have their children vaccinated
Ennever 1990 / **JAMAICA**[26]	• To describe the activities of CHWs currently employed, and their perceptions about supervision and management	Quantitative • Survey of 415 CHWs currently employed and 134 CHWs who had left the service	• Currently employed CHWs continued to perform duties in the community & in health centres with emphasis on the MCH services and the management of diabetics and hypertensives.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
	• To describe the current employment status of CHWs who had left the service between 1982 and 1986, and use of the skills they had learned as CHWs.		• Previously employed CHWs unemployed though many continued to use their skills on a voluntary basis.

CHW = Community Health Worker, FGD = Focus Group Discussion, HEP = Health Extension Program (Ethiopia) LHWP = Lady Health Worker Program (Pakistan), MCH = Maternal and Child Health, PSF = Programa de Saude da Familia (Family Health Program, Brazil)

Supplementary Table 2: Evidence for the application of primary health care principles as reflected in the national community health worker programs

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
1.	**IRAN** / Women Health Volunteers Program / 1992 [17]	Principle observed: - Community Participation as the program aims to increase community involvement in health related activities in order to empower them	Principles observed: - UHC - Community Participation* • The CHWs encouraged and actively followed up on individuals to visit health centres at their required time especially those who needed special care --- thus contributing to increased service utilisation • CHWs delivering health messages to families and distributing educational materials reflect one aspect of comprehensiveness as part of universal health coverage • CHWs are selected from the local community - Community Participation and appropriateness	Principles observed: - UHC - Community Participation* - Intersectoral coordination - The active follow up by WHV increased utilization of health services – contributing to universal health coverage • The experts and stakeholders believed that CHW program increased people's participation and created self-esteem and self-reliance in people – However, the evidence on how it achieved this is not available in this study • The WHV network connects MoH, medical universities and health centers to the people – Intersectoral coordination
2.	**IRAN** / Primary Health Care Network – EPI / 1983 [35]	Principle observed: - UHC • As the program aimed to increase immunisation coverage in Iranian children to 90% by their first birthday	Principles observed: - UHC - Community Participation* • CHWS were involved in provision of general preventive services for all the individuals in their coverage area – Comprehensiveness, Universal health coverage • CHWs were also expected to provide basic therapeutic measures for minor illnesses and refer other cases to their immediate Rural Health Centre – universal health coverage • CHWs were selected from the same area in which they work – community participation	Principle observed: - UHC - Appropriateness • Immunisation coverage of children improved significantly in 1987 as compared to 1984 especially for BCG (56.3%) - universal health coverage • Mothers in rural areas with PHC services receive much better MCH care, advice and attention in comparison to mothers in other rural and most urban areas – appropriateness

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
3.	**PAKISTAN** / National Program for Family Planning & Primary Health Care / 1994 [27 33]	Principle observed: - UHC as the program aimed to increase utilisation of promotive, preventive and curative services at the community level particularly for women and children in poor and underserved areas – comprehensiveness & equity	Principles observed: - UHC - Community Participation* • CHWs were involved in health education and community mobilization along with provision of immunization, family planning services, basic curative care to the community at the doorstep and referral of patients to the appropriate health facility - reflecting universal health coverage	Principles observed: - UHC - Community Participation* • Increased utilisation of antenatal care and family planning - universal health coverage • Improved infant mortality rate, maternal mortality ratio and contraceptive prevalence rate in CHW covered areas as compared to national average - universal health coverage • Cultural acceptability of CHWs, unlimited access to households and free interaction with local women – community participation and appropriateness
4.	**INDIA** / Accredited Social Health Activist (ASHA) Program / 2005 [31 37 38]	Principles observed: - UHC through accessible care to rural population especially vulnerable groups - Appropriateness via provision of affordable and quality health care	Principles observed: - UHC via CHWs as 'service extension and link workers' - Community Participation as CHWs are selected from the local communities	Principles observed: - UHC as CHWs were motivating women for antenatal care and hospital delivery through home visits • Women empowerment – as CHWs have reported an increased sense of empowerment and personal growth, in part through their belief in the social value of their work. • Additionally, becoming a CHW enabled rural women to gain knowledge, status as a role model, and exposure beyond the village, as well as to access a limited amount of remuneration
5.	**BANGLADESH** / National MCH and Family Planning Program / 1976 [29]	Not reported	Principles observed: - UHC - Community Participation* • CHWs were utilised for health education and extending immunisation and family planning services at the household level. They also provided referral for antenatal, perinatal, and	Not reported

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
			postnatal care. – comprehensiveness as part of universal health coverage	
6.	**NEPAL /** Female Community Health Volunteer Program / 1988 [18]	Principles observed: - UHC via low cost health service provision in remote areas - Community Participation via increase in local women's participation in health promotion	Principles observed: - Community Participation* - UHC via provision of MCH care by CHWs in rural communities	Not reported
7.	**CAMBODIA /** Village Malaria Worker Project as part of National Malaria Control Program / 2001 [28]	Not reported	Principles observed: - UHC - Community Participation* • Malaria prevention, diagnosis and treatment services to remote villages by CHWs – universal health coverage - Management of minor childhood illness, prescribing and providing basic medications, referral and health promotion – comprehensiveness as part of universal health coverage	Principle observed: - UHC • 15,898 children received child health services from village Malaria Workers in 2011
8.	**ETHIOPIA /** Health Extension Program / 2003 [19 30]	Principles observed: - UHC - Community Participation • To improve access and utilization of health care particularly for	Principles observed: - UHC - Community Participation • CHWs providing antenatal and postnatal care, family planning and immunization services and conducting clean and safe deliveries - Universal Health Coverage	Principles observed: - UHC - Community Participation • Increased use of health post for antenatal care, family planning, delivery and other illnesses such as diarrhoea – reflecting universal health coverage

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		children and mothers in rural communities – Universal Health Coverage • To improve the health status of families with their full participation, using local technologies & the community's skill & knowledge - Community Participation	• Quarterly evaluation of health centers performance by the community during facility or public forums. Monitoring of CHWs by the *kebele* (lowest administrative unit) administration at the health post level. Need based adjustment of maternal health education – Community Participation	• Statistically significant increase in the proportion of children fully and individually vaccinated against tuberculosis, polio, diphtheria–pertussis–tetanus, and measles in the program villages. • Mothers reported that CHWs were available at health posts during their last visit for MCH services • Mothers also indicated that they had gotten a complete explanation of their own/child's health condition from the CHWs • Moreover, CHWs were understanding, friendly and helpful thus assured a "natural link" between them and the community - appropriateness • Community members reported that HEWs being female was important to them, as they prefer to discuss maternal health issues amongst women - appropriateness
9.	**RWANDA** / RapidSMS program / 2013 [20]	<u>Principles observed:</u> - UHC - Appropriateness • To improve access to antenatal, PNC, institutional delivery and emergency obstetric care • To facilitate communication between CHWs and the broader health system, including the ambulance system,	<u>Principles observed</u>: - UHC - Community Participation* - Appropriateness – use of technology • The RapidSMS system sent automatic reminders to CHWs for clinical appointments, delivery, and post-natal care visits, with the intent of increasing timely access and utilization • Provision of a quick link to emergency obstetric care through so-called Red Alerts and creation of a database of clinical records on maternal care delivery – use of technology for increasing access to health care	<u>Principles observed:</u> - Appropriateness (use of technology, acceptability) RapidSMS was well accepted by most CHWs and community members – acceptability aspect of appropriateness principle • mHealth appeared to have helped improve communication and potentially service use • Claims that mHealth has contributed to maternal mortality reduction are not substantiated considering the difficulties that were highlighted by the respondents

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		health facilities, and MoH officials		
10.	**NIGER /** Rural Health Improvement Program / 1970s [32]	Principle observed: - UHC – as the program aimed to extend the coverage of PHC services throughout rural Niger	Principle observed: - UHC – By upgrading existing health dispensaries and deploying trained village health teams to unserved villages to deliver PHC services	Not reported
11.	**SOUTH AFRICA /** ward-based outreach teams (WBOT) - national CHW program / 2011 [39]	Principle observed: - UHC – via improving health outcomes by providing home and community-based health services	Principle observed: - UHC - Community Participation* • Universal health coverage via CHWs providing treatment support and home-based care in underserved rural areas. Core MCH activities include visiting all mothers during pregnancy, antenatal education and support. Moreover, CHWs are linked in with local PHC clinics	Principle observed: - Appropriateness as CHWs were trusted, accessible and able to understand the mother's situation
12.	**BRAZIL /** Family Health Program (Programa de Saude da Familia, PSF) / 1994 [34]	Principle observed: - UHC – as the organizational principles include universality and equity	Principle observed: - UHC - Community Participation* - Universal health coverage via provision of promotive, preventive and basic curative services by CHWs to mothers and children	Principle observed: - UHC – as the growth of the CHW program was associated with a decrease in infant and child mortality rates • Caretakers who reported that their agent made at least one home visit per month were significantly more likely to have received care for child diarrhoea from an agent
13.	**EL SAVADOR /** Rural Health Aide Program / 1976 [36]	Principle observed: - UHC – via provision of PHC and family planning services	Principle observed: - UHC - Community Participation* • Health education by CHWs for rural families • Provision of family planning supplies to women	Principle observed: - UHC • Appropriately trained PHC workers promote contact between rural populations and the health care system

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
			• Provision of systematic treatment of minor illnesses; administration of prescribed intramuscular injections; dispensing of antiparasitic medication; and performance of simple first-aid measures • Promotion of registration of births and deaths	• To the extent that this improves the health status of the population, particularly in the area of MCH, we might expect to see better health indices in rural populations served by these workers than in populations without them
14.	**JAMAICA /** Community Health Aide program / 1978 [26]	Principle observed: - UHC as the program aimed to train local women to provide basic health care and health education to families.	Principles observed: - UHC – CHWs encouraging for immunization and family planning, weighing babies and testing urine - Community Participation*	Principle observed: - UHC • CHWs have been functioning in both health centre and community, encouraging people to utilize the services and assisting in some of the less technical duties such as weighing babies and testing urine

UHC = Universal Health Coverage

Appendix I: Logic grids for information sources

PubMed

Search	Query	Records retrieved
#1	"community health workers"[mh] OR community health worker*[tiab] OR community health aide*[tiab] OR village health worker*[tiab] OR barefoot doctor*[tiab] OR family planning personnel*[tiab] OR health extension worker*[tiab] OR lady health worker*[tiab] OR community health agent*[tiab] OR Shasthyo Sebika*[tiab] OR community nutrition worker*[tiab] OR maternal health worker*[tiab] OR voluntary Malaria workers*[tiab] OR village malaria worker*[tiab] OR Raedat*[tiab] OR postnatal support worker*[tiab] OR mental health worker*[tiab] OR mother coordinator*[tiab] OR rural health worker*[tiab] OR village health promoter*[tiab] OR accompagnateur*[tiab] OR Saksham Sahaya*[tiab] OR anganwandi worker*[tiab] OR accredited social health activist*[tiab] OR community-based worker*[tiab] OR community health volunteer*[tiab] OR village health guide*[tiab] OR maternal and child health promotion worker*[tiab] OR maternal child health worker*[tiab] OR kader posyandu*[tiab] OR behvarz*[tiab] OR village health helper*[tiab] OR colaborador voluntario*[tiab] OR nutrition volunteers*[tiab] OR village drug-kit manager*[tiab] OR brigadistas*[tiab] OR female community health volunteer*[tiab] OR Agente Comunitario de Salud*[tiab] OR nutrition worker*[tiab] OR community reproductive health worker*[tiab] OR community drug distributor*[tiab] OR community volunteer*[tiab] OR community health advocate*[tiab] OR lay health visitor*[tiab] OR Promotoras de Salud[tiab]	174984
#2	Program[tiab] OR programs[tiab] OR programme[tiab] OR programmes[tiab] OR initiative*[tiab] OR project[tiab] OR projects[tiab]	959578
#3	"Maternal health"[mh] OR "Maternal Welfare"[mh] OR "child health"[mh] OR "child care"[mh] OR "child welfare"[mh] OR "maternal-child health services"[mh] OR "child health services"[mh:noexp] OR maternal child health[tiab] OR maternal newborn child health[tiab]	71349

Search	Query	Records retrieved
#4	((developing country[tw] OR developing countries[tw] OR developing nation[tw] OR developing nations[tw] OR developing population[tw] OR developing populations[tw] OR developing world[tw] OR less developed country[tw] OR less developed countries[tw] OR less developed nation[tw] OR less developed nations[tw] OR less developed population[tw] OR less developed populations[tw] OR less developed world[tw] OR lesser developed country[tw] OR lesser developed countries[tw] OR lesser developed nation[tw] OR lesser developed nations[tw] OR lesser developed population[tw] OR lesser developed populations[tw] OR lesser developed world[tw] OR under developed country[tw] OR under developed countries[tw] OR under developed nation[tw] OR under developed nations[tw] OR under developed population[tw] OR under developed populations[tw] OR under developed world[tw] OR underdeveloped country[tw] OR underdeveloped countries[tw] OR underdeveloped nation[tw] OR underdeveloped nations[tw] OR underdeveloped population[tw] OR underdeveloped populations[tw] OR underdeveloped world[tw] OR middle income country[tw] OR middle income countries[tw] OR middle income nation[tw] OR middle income nations[tw] OR middle income population[tw] OR middle income populations[tw] OR low income country[tw] OR low income countries[tw] OR low income nation[tw] OR low income nations[tw] OR low income population[tw] OR low income populations[tw] OR lower income country[tw] OR lower income countries[tw] OR lower income nation[tw] OR lower income nations[tw] OR lower income population[tw] OR lower income populations[tw] OR underserved country[tw] OR underserved countries[tw] OR underserved nation[tw] OR underserved nations[tw] OR underserved population[tw] OR underserved populations[tw] OR underserved world[tw] OR under served country[tw] OR under served countries[tw] OR under served nation[tw] OR under served nations[tw] OR under served population[tw] OR under served populations[tw] OR under served world[tw] OR deprived country[tw] OR deprived countries[tw] OR deprived nation[tw] OR deprived nations[tw] OR deprived population[tw] OR deprived populations[tw] OR deprived world[tw] OR poor country[tw] OR poor countries[tw] OR poor nation[tw] OR poor nations[tw] OR poor population[tw] OR poor populations[tw] OR poor world[tw] OR poorer country[tw] OR poorer countries[tw] OR poorer nation[tw] OR poorer nations[tw] OR poorer population[tw] OR poorer populations[tw] OR poorer world[tw] OR developing economy[tw] OR developing economies[tw] OR less developed economy[tw] OR less developed economies[tw] OR lesser developed economy[tw] OR lesser developed economies[tw] OR under developed economy[tw] OR under developed economies[tw] OR underdeveloped economy[tw] OR underdeveloped economies[tw] OR middle income economy[tw] OR middle income economies[tw] OR low income economy[tw] OR low income economies[tw] OR lower income economy[tw] OR lower income economies[tw] OR low gdp[tw] OR low gnp[tw] OR low gross domestic[tw] OR low gross national[tw] OR lower gdp[tw] OR lower gnp[tw] OR lower gross domestic[tw] OR lower gross national[tw] OR lmic[tw] OR lmics[tw] OR third world[tw] OR lami country[tw] OR lami countries[tw] OR transitional country[tw] OR transitional countries[tw]) OR (Africa[tw] OR Asia[tw] OR Caribbean[tw] OR West Indies[tw] OR South America[tw] OR Latin America[tw] OR Central America[tw] OR Afghanistan[tw] OR Albania[tw] OR Algeria[tw] OR Angola[tw] OR Antigua[tw] OR Barbuda[tw] OR Argentina[tw] OR Armenia[tw] OR Armenian[tw] OR Aruba[tw] OR Azerbaijan[tw] OR Bahrain[tw] OR Bangladesh[tw] OR Barbados[tw] OR Benin[tw] OR Byelarus[tw] OR Byelorussian[tw] OR Belarus[tw] OR Belorussian[tw] OR Belorussia[tw] OR Belize[tw] OR Bhutan[tw] OR Bolivia[tw] OR Bosnia[tw] OR Herzegovina[tw] OR Hercegovina[tw] OR Botswana[tw] OR Brasil[tw] OR Brazil[tw] OR Bulgaria[tw] OR Burkina Faso[tw] OR Burkina Fasso[tw] OR Upper Volta[tw] OR Burundi[tw] OR Urundi[tw] OR Cambodia[tw] OR Khmer Republic[tw] OR Kampuchea[tw] OR Cameroon[tw] OR Cameroons[tw] OR Cameron[tw] OR Camerons[tw] OR Cape Verde[tw] OR Central African Republic[tw] OR Chad[tw] OR Chile[tw] OR China[tw] OR Colombia[tw] OR Comoros[tw] OR Comoro Islands[tw] OR Comores[tw] OR Mayotte[tw] OR Congo[tw] OR Zaire[tw] OR Costa Rica[tw] OR Cote d'Ivoire[tw] OR Ivory Coast[tw] OR Croatia[tw] OR Cuba[tw] OR Cyprus[tw] OR Czechoslovakia[tw] OR Czech Republic[tw] OR Slovakia[tw] OR Slovak Republic[tw] OR Djibouti[tw] OR French Somaliland[tw] OR Dominica[tw] OR Dominican	1903167

Search	Query	Records retrieved
	Republic[tw] OR East Timor[tw] OR East Timur[tw] OR Timor Leste[tw] OR Ecuador[tw] OR Egypt[tw] OR United Arab Republic[tw] OR El Salvador[tw] OR Eritrea[tw] OR Estonia[tw] OR Ethiopia[tw] OR Fiji[tw] OR Gabon[tw] OR Gabonese Republic[tw] OR Gambia[tw] OR Gaza[tw] OR Georgia Republic[tw] OR Georgian Republic[tw] OR Ghana[tw] OR Gold Coast[tw] OR Greece[tw] OR Grenada[tw] OR Guatemala[tw] OR Guinea[tw] OR Guam[tw] OR Guiana[tw] OR Guyana[tw] OR Haiti[tw] OR Honduras[tw] OR Hungary[tw] OR India[tw] OR Maldives[tw] OR Indonesia[tw] OR Iran[tw] OR Iraq[tw] OR Isle of Man[tw] OR Jamaica[tw] OR Jordan[tw] OR Kazakhstan[tw] OR Kazakh[tw] OR Kenya[tw] OR Kiribati[tw] OR Korea[tw] OR Kosovo[tw] OR Kyrgyzstan[tw] OR Kirghizia[tw] OR Kyrgyz Republic[tw] OR Kirghiz[tw] OR Kirgizstan[tw] OR Lao PDR[tw] OR Laos[tw] OR Latvia[tw] OR Lebanon[tw] OR Lesotho[tw] OR Basutoland[tw] OR Liberia[tw] OR Libya[tw] OR Lithuania[tw]) OR (Macedonia[tw] OR Madagascar[tw] OR Malagasy Republic[tw] OR Malaysia[tw] OR Malaya[tw] OR Malay[tw] OR Sabah[tw] OR Sarawak[tw] OR Malawi[tw] OR Nyasaland[tw] OR Mali[tw] OR Malta[tw] OR Marshall Islands[tw] OR Mauritania[tw] OR Mauritius[tw] OR Agalega Islands[tw] OR Mexico[tw] OR Micronesia[tw] OR Middle East[tw] OR Moldova[tw] OR Moldovia[tw] OR Moldovian[tw] OR Mongolia[tw] OR Montenegro[tw] OR Morocco[tw] OR Ifni[tw] OR Mozambique[tw] OR Myanmar[tw] OR Myanma[tw] OR Burma[tw] OR Namibia[tw] OR Nepal[tw] OR Netherlands Antilles[tw] OR New Caledonia[tw] OR Nicaragua[tw] OR Niger[tw] OR Nigeria[tw] OR Northern Mariana Islands[tw] OR Oman[tw] OR Muscat[tw] OR Pakistan[tw] OR Palau[tw] OR Palestine[tw] OR Panama[tw] OR Paraguay[tw] OR Peru[tw] OR Philippines[tw] OR Philipines[tw] OR Phillipines[tw] OR Phillippines[tw] OR Poland[tw] OR Portugal[tw] OR Puerto Rico[tw] OR Romania[tw] OR Rumania[tw] OR Roumania[tw] OR Russia[tw] OR Russian[tw] OR Rwanda[tw] OR Ruanda[tw] OR Saint Kitts[tw] OR St Kitts[tw] OR Nevis[tw] OR Saint Lucia[tw] OR St Lucia[tw] OR Saint Vincent[tw] OR St Vincent[tw] OR Grenadines[tw] OR Samoa[tw] OR Samoan Islands[tw] OR Navigator Island[tw] OR Navigator Islands[tw] OR Sao Tome[tw] OR Saudi Arabia[tw] OR Senegal[tw] OR Serbia[tw] OR Montenegro[tw] OR Seychelles[tw] OR Sierra Leone[tw] OR Slovenia[tw] OR Sri Lanka[tw] OR Ceylon[tw] OR Solomon Islands[tw] OR Somalia[tw] OR Sudan[tw] OR Suriname[tw] OR Surinam[tw] OR Swaziland[tw] OR Syria[tw] OR Tajikistan[tw] OR Tadzhikistan[tw] OR Tadjikistan[tw] OR Tadzhik[tw] OR Tanzania[tw] OR Thailand[tw] OR Togo[tw] OR Togolese Republic[tw] OR Tonga[tw] OR Trinidad[tw] OR Tobago[tw] OR Tunisia[tw] OR Turkey[tw] OR Turkmenistan[tw] OR Turkmen[tw] OR Uganda[tw] OR Ukraine[tw] OR Uruguay[tw] OR USSR[tw] OR Soviet Union[tw] OR Union of Soviet Socialist Republics[tw] OR Uzbekistan[tw] OR Uzbek OR Vanuatu[tw] OR New Hebrides[tw] OR Venezuela[tw] OR Vietnam[tw] OR Viet Nam[tw] OR West Bank[tw] OR Yemen[tw] OR Yugoslavia[tw] OR Zambia[tw] OR Zimbabwe[tw] OR Rhodesia[tw]) OR (Developing Countries[Mesh:noexp] OR Africa[Mesh:noexp] OR Africa, Northern[Mesh:noexp] OR Africa South of the Sahara[Mesh:noexp] OR Africa, Central[Mesh:noexp] OR Africa, Eastern[Mesh:noexp] OR Africa, Southern[Mesh:noexp] OR Africa, Western[Mesh:noexp] OR Asia[Mesh:noexp] OR Asia, Central[Mesh:noexp] OR Asia, Southeastern[Mesh:noexp] OR Asia, Western[Mesh:noexp] OR Caribbean Region[Mesh:noexp] OR West Indies[Mesh:noexp] OR South America[Mesh:noexp] OR Latin America[Mesh:noexp] OR Central America[Mesh:noexp] OR Afghanistan[Mesh:noexp] OR Albania[Mesh:noexp] OR Algeria[Mesh:noexp] OR American Samoa[Mesh:noexp] OR Angola[Mesh:noexp] OR "Antigua and Barbuda"[Mesh:noexp] OR Argentina[Mesh:noexp] OR Armenia[Mesh:noexp] OR Azerbaijan[Mesh:noexp] OR Bahrain[Mesh:noexp] OR Bangladesh[Mesh:noexp] OR Barbados[Mesh:noexp] OR Benin[Mesh:noexp] OR Byelarus[Mesh:noexp] OR Belize[Mesh:noexp] OR Bhutan[Mesh:noexp] OR Bolivia[Mesh:noexp] OR Bosnia-Herzegovina[Mesh:noexp] OR Botswana[Mesh:noexp] OR Brazil[Mesh:noexp] OR Bulgaria[Mesh:noexp] OR Burkina Faso[Mesh:noexp] OR Burundi[Mesh:noexp] OR Cambodia[Mesh:noexp] OR Cameroon[Mesh:noexp] OR Cape Verde[Mesh:noexp] OR Central African Republic[Mesh:noexp] OR Chad[Mesh:noexp] OR Chile[Mesh:noexp] OR China[Mesh:noexp] OR Colombia[Mesh:noexp] OR Comoros[Mesh:noexp] OR Congo[Mesh:noexp] OR Costa Rica[Mesh:noexp] OR	

Search	Query	Records retrieved
	Cote d'Ivoire[Mesh:noexp] OR Croatia[Mesh:noexp] OR Cuba[Mesh:noexp] OR Cyprus[Mesh:noexp] OR Czechoslovakia[Mesh:noexp] OR Czech Republic[Mesh:noexp] OR Slovakia[Mesh:noexp] OR Djibouti[Mesh:noexp] OR "Democratic Republic of the Congo"[Mesh:noexp] OR Dominica[Mesh:noexp] OR Dominican Republic[Mesh:noexp] OR East Timor[Mesh:noexp] OR Ecuador[Mesh:noexp] OR Egypt[Mesh:noexp] OR El Salvador[Mesh:noexp] OR Eritrea[Mesh:noexp] OR Estonia[Mesh:noexp] OR Ethiopia[Mesh:noexp] OR Fiji[Mesh:noexp] OR Gabon[Mesh:noexp] OR Gambia[Mesh:noexp] OR "Georgia (Republic)"[Mesh:noexp] OR Ghana[Mesh:noexp] OR Greece[Mesh:noexp] OR Grenada[Mesh:noexp] OR Guatemala[Mesh:noexp] OR Guinea[Mesh:noexp] OR Guinea-Bissau[Mesh:noexp] OR Guam[Mesh:noexp] OR Guyana[Mesh:noexp] OR Haiti[Mesh:noexp] OR Honduras[Mesh:noexp] OR Hungary[Mesh:noexp] OR India[Mesh:noexp] OR Indonesia[Mesh:noexp] OR Iran[Mesh:noexp] OR Iraq[Mesh:noexp] OR Jamaica[Mesh:noexp] OR Jordan[Mesh:noexp] OR Kazakhstan[Mesh:noexp] OR Kenya[Mesh:noexp] OR Korea[Mesh:noexp] OR Kosovo[Mesh:noexp] OR Kyrgyzstan[Mesh:noexp] OR Laos[Mesh:noexp] OR Latvia[Mesh:noexp] OR Lebanon[Mesh:noexp] OR Lesotho[Mesh:noexp] OR Liberia[Mesh:noexp] OR Libya[Mesh:noexp] OR Lithuania[Mesh:noexp] OR Macedonia[Mesh:noexp] OR Madagascar[Mesh:noexp] OR Malaysia[Mesh:noexp] OR Malawi[Mesh:noexp] OR Mali[Mesh:noexp] OR Malta[Mesh:noexp] OR Mauritania[Mesh:noexp] OR Mauritius[Mesh:noexp] OR Mexico[Mesh:noexp] OR Micronesia[Mesh:noexp] OR Middle East[Mesh:noexp] OR Moldova[Mesh:noexp] OR Mongolia[Mesh:noexp] OR Montenegro[Mesh:noexp] OR Morocco[Mesh:noexp] OR Mozambique[Mesh:noexp] OR Myanmar[Mesh:noexp] OR Namibia[Mesh:noexp] OR Nepal[Mesh:noexp] OR Netherlands Antilles[Mesh:noexp] OR New Caledonia[Mesh:noexp] OR Nicaragua[Mesh:noexp] OR Niger[Mesh:noexp] OR Nigeria[Mesh:noexp] OR Oman[Mesh:noexp] OR Pakistan[Mesh:noexp] OR Palau[Mesh:noexp] OR Panama[Mesh:noexp] OR Papua New Guinea[Mesh:noexp] OR Paraguay[Mesh:noexp] OR Peru[Mesh:noexp] OR Philippines[Mesh:noexp] OR Poland[Mesh:noexp] OR Portugal[Mesh:noexp] OR Puerto Rico[Mesh:noexp] OR Romania[Mesh:noexp] OR Russia[Mesh:noexp] OR "Russia (Pre-1917)"[Mesh:noexp] OR Rwanda[Mesh:noexp] OR "Saint Kitts and Nevis"[Mesh:noexp] OR Saint Lucia[Mesh:noexp] OR "Saint Vincent and the Grenadines"[Mesh:noexp] OR Samoa[Mesh:noexp] OR Saudi Arabia[Mesh:noexp] OR Senegal[Mesh:noexp] OR Serbia[Mesh:noexp] OR Montenegro[Mesh:noexp] OR Seychelles[Mesh:noexp] OR Sierra Leone[Mesh:noexp] OR Slovenia[Mesh:noexp] OR Sri Lanka[Mesh:noexp] OR Somalia[Mesh:noexp] OR South Africa[Mesh:noexp] OR Sudan[Mesh:noexp] OR Suriname[Mesh:noexp] OR Swaziland[Mesh:noexp] OR Syria[Mesh:noexp] OR Tajikistan[Mesh:noexp] OR Tanzania[Mesh:noexp] OR Thailand[Mesh:noexp] OR Togo[Mesh:noexp] OR Tonga[Mesh:noexp] OR "Trinidad and Tobago"[Mesh:noexp] OR Tunisia[Mesh:noexp] OR Turkey[Mesh:noexp] OR Turkmenistan[Mesh:noexp] OR Uganda[Mesh:noexp] OR Ukraine[Mesh:noexp] OR Uruguay[Mesh:noexp] OR USSR[Mesh:noexp] OR Uzbekistan[Mesh:noexp] OR Vanuatu[Mesh:noexp] OR Venezuela[Mesh:noexp] OR Vietnam[Mesh:noexp] OR Yemen[Mesh:noexp] OR Yugoslavia[Mesh:noexp] OR Zambia[Mesh:noexp] OR Zimbabwe[Mesh:noexp]))	
#5	#1 AND #2 AND #3 AND #4	956
Limited to 1978 onwards in English language only		863

CINAHL

Community health worker	Program	MCH	LMIC
MH "community health workers" OR MH "rural health personnel" OR TX "community health worker*" OR TX "community health aide*" OR TX "village health worker*" OR TX "barefoot doctor*" OR TX "family planning personnel*" OR TX "health extension worker*" OR TX "lady health worker*" OR TX "community health agent*" OR TX "Shasthyo Sebika*" OR TX "community nutrition worker*" OR TX "maternal health worker*" OR TX "voluntary Malaria worker*" OR TX "village malaria worker*" OR TX "Raedat*" OR TX "postnatal support worker*" OR TX "mental health worker*" OR TX "mother coordinator*" OR TX "rural health worker*" OR TX "village health promoter*" OR TX accompagnateur* OR TX "Saksham Sahaya*" OR TX "anganwandi worker*" OR TX "accredited social health activist*" OR TX "community-based worker*" OR TX "community health volunteer*" OR TX "village health guide*" OR TX "maternal and child health promotion worker*" OR TX "maternal child health worker*" OR TX "kader posyandu*" OR TX behvarz* OR TX "village health helper*" OR TX "colaborador voluntario*" OR TX "nutrition volunteers*" OR TX "village drug-kit manager*" OR TX brigadistas* OR TX "female community health volunteer*" OR TX "Agente Comunitario de Salud*" OR TX "nutrition worker*" OR TX "community reproductive health worker*" OR TX "community drug distributor*" OR TX "community volunteer*"	TX Program OR TX programs OR TX programme OR TX programmes OR TX initiative* OR TX project OR TX projects	MH "Maternal-Child Health" OR TX "maternal-child health"	MH "low and middle income countries" OR MH "developing countries" OR TX Afghanistan OR TX Albania OR TX Algeria OR TX Angola OR TX Antigua OR TX Barbuda OR TX Argentina OR TX Armenia OR TX Armenian OR TX Aruba OR TX Azerbaijan OR TX Bahrain OR TX Bangladesh OR TX Barbados OR TX Benin OR TX Byelarus OR TX Byelorussian OR TX Belarus OR TX Belorussian OR TX Belorussia OR TX Belize OR TX Bhutan OR TX Bolivia OR TX Bosnia OR TX Herzegovina OR TX Hercegovina OR TX Botswana OR TX Brasil OR TX Brazil OR TX Bulgaria OR TX Burkina Faso OR TX Burkina Fasso OR TX Upper Volta OR TX Burundi OR TX Urundi OR TX Cambodia OR TX Khmer Republic OR TX Kampuchea OR TX Cameroon OR TX Cameroons OR TX Cameron OR TX Camerons OR TX Cape Verde OR TX "Central African Republic" OR TX Chad OR TX Chile OR TX China OR TX Colombia OR TX Comoros OR TX "Comoro Islands" OR TX Comores OR TX Mayotte OR TX Congo OR TX Zaire OR TX "Costa Rica" OR TX "Cote d'Ivoire" OR TX "Ivory Coast" OR TX Croatia OR TX Cuba OR TX Cyprus OR TX Czechoslovakia OR TX "Czech Republic" OR TX Slovakia OR TX "Slovak Republic" OR TX Djibouti OR TX "French Somaliland" OR TX Dominica OR TX "Dominican Republic" OR TX "East Timor" OR TX "East Timur" OR TX "Timor Leste" OR TX Ecuador OR TX Egypt OR TX "United Arab Republic" OR TX "El Salvador" OR TX Eritrea OR TX Estonia OR TX Ethiopia OR TX Fiji OR TX Gabon OR TX "Gabonese Republic" OR TX Gambia OR TX Gaza OR TX "Georgia Republic" OR TX "Georgian Republic" OR TX Ghana OR TX "Gold Coast" OR TX Greece OR TX Grenada OR TX Guatemala OR TX Guinea OR TX Guam OR TX Guiana OR TX Guyana OR TX Haiti OR TX Honduras OR TX Hungary OR TX India OR TX Maldives OR TX Indonesia OR TX Iran OR TX Iraq OR TX "Isle of Man" OR TX Jamaica OR TX Jordan OR TX Kazakhstan OR TX Kazakh OR TX Kenya OR TX Kiribati OR TX Korea OR TX Kosovo OR TX Kyrgyzstan OR TX Kirghizia OR TX "Kyrgyz Republic" OR TX Kirghiz OR TX Kirgizstan OR TX "Lao PDR" OR TX Laos OR TX Latvia OR TX Lebanon OR

Community health worker	Program	MCH	LMIC
OR TX “community health advocate*” OR TX “lay health visitor*” OR TX “Promotoras de Salud”			TX Lesotho OR TX Basutoland OR TX Liberia OR TX Libya OR TX Lithuania OR TX Macedonia OR TX Madagascar OR TX “Malagasy Republic” OR TX Malaysia OR TX Malaya OR TX Malay OR TX Sabah OR TX Sarawak OR TX Malawi OR TX Nyasaland OR TX Mali OR TX Malta OR TX “Marshall Islands” OR TX Mauritania OR TX Mauritius OR TX “Agalega Islands” OR TX Mexico OR TX Micronesia OR TX “Middle East” OR TX Moldova OR TX Moldovia OR TX Moldovian OR TX Mongolia OR TX Montenegro OR TX Morocco OR TX Ifni OR TX Mozambique OR TX Myanmar OR TX Myanma OR TX Burma OR TX Namibia OR TX Nepal OR TX “Netherlands Antilles” OR TX “New Caledonia” OR TX Nicaragua OR TX Niger OR TX Nigeria OR TX “Northern Mariana Islands” OR TX Oman OR TX Muscat OR TX Pakistan OR TX Palau OR TX Palestine OR TX Panama OR TX Paraguay OR TX Peru OR TX Philippines OR TX Philipines OR TX Phillipines OR TX Phillippines OR TX Poland OR TX Portugal OR TX “Puerto Rico” OR TX Romania OR TX Rumania OR TX Roumania OR TX Russia OR TX Russian OR TX Rwanda OR TX Ruanda OR TX “Saint Kitts” OR TX “St Kitts” OR TX Nevis OR TX “Saint Lucia” OR TX “St Lucia” OR TX “Saint Vincent” OR TX “St Vincent” OR TX Grenadines OR TX Samoa OR TX “Samoan Islands” OR TX “Navigator Island” OR TX “Navigator Islands” OR TX “Sao Tome” OR TX “Saudi Arabia” OR TX Senegal OR TX Serbia OR TX Montenegro OR TX Seychelles OR TX “Sierra Leone” OR TX Slovenia OR TX “Sri Lanka” OR TX Ceylon OR TX “Solomon Islands” OR TX Somalia OR TX Sudan OR TX Suriname OR TX Surinam OR TX Swaziland OR TX Syria OR TX Tajikistan OR TX Tadzhikistan OR TX Tadjikistan OR TX Tadzhik OR TX Tanzania OR TX Thailand OR TX Togo OR TX “Togolese Republic” OR TX Tonga OR TX Trinidad OR TX Tobago OR TX Tunisia OR TX Turkey OR TX Turkmenistan OR TX Turkmen OR TX Uganda OR TX Ukraine OR TX Uruguay OR TX USSR OR TX “Soviet Union” OR TX “Union of Soviet Socialist Republics” OR TX Uzbekistan OR TX Uzbek OR TX Vanuatu OR TX “New Hebrides” OR TX Venezuela OR TX Vietnam OR TX “Viet Nam” OR TX “West Bank” OR TX Yemen OR TX Yugoslavia OR TX Zambia OR TX Zimbabwe OR TX Rhodesia

EMBASE

Community health worker	Program	MCH	LMIC
"Health Auxiliary"/de OR "community health worker*":ti,ab OR "community health aide*":ti,ab OR "village health worker*":ti,ab OR "barefoot doctor*":ti,ab OR "family planning personnel*":ti,ab OR "health extension worker*":ti,ab OR "lady health worker*":ti,ab OR "community health agent*":ti,ab OR "Shasthyo Sebika*":ti,ab OR "community nutrition worker*":ti,ab OR "maternal health worker*":ti,ab OR "voluntary Malaria worker*":ti,ab OR "village malaria worker*":ti,ab OR Raedat*:ti,ab OR "postnatal support worker*":ti,ab OR "mental health worker*":ti,ab OR "mother coordinator*":ti,ab OR "rural health worker*":ti,ab OR "village health promoter*":ti,ab OR accompagnateur*:ti,ab OR "Saksham Sahaya*":ti,ab OR "anganwandi worker*":ti,ab OR "accredited social health activist*":ti,ab OR "community-based worker*":ti,ab OR "community health volunteer*":ti,ab OR "village health guide*":ti,ab OR "maternal and child health promotion worker*":ti,ab OR "maternal child health worker*":ti,ab OR "kader posyandu*":ti,ab OR behvarz*:ti,ab OR "village health helper*":ti,ab OR "colaborador	Program:ti,ab OR programs:ti,ab OR programme:ti,ab OR programmes:ti,ab OR initiative*:ti,ab OR project:ti,ab OR projects:ti,ab	"Maternal child health care"/de OR "Maternal Welfare":ti,ab OR "child health":ti,ab OR "child care":ti,ab OR "child welfare":ti,ab OR "maternal-child health services":ti,ab OR "child health services":ti,ab OR "maternal child health":ti,ab OR "maternal newborn child health":ti,ab	Afghanistan:ti,ab OR Albania:ti,ab OR Algeria:ti,ab OR Angola:ti,ab OR Antigua:ti,ab OR Barbuda:ti,ab OR Argentina:ti,ab OR Armenia:ti,ab OR Armenian:ti,ab OR Aruba:ti,ab OR Azerbaijan:ti,ab OR Bahrain:ti,ab OR Bangladesh:ti,ab OR Barbados:ti,ab OR Benin:ti,ab OR Byelarus:ti,ab OR Byelorussian:ti,ab OR Belarus:ti,ab OR Belorussian:ti,ab OR Belorussia:ti,ab OR Belize:ti,ab OR Bhutan:ti,ab OR Bolivia:ti,ab OR Bosnia:ti,ab OR Herzegovina:ti,ab OR Hercegovina:ti,ab OR Botswana:ti,ab OR Brasil:ti,ab OR Brazil:ti,ab OR Bulgaria:ti,ab OR Burkina Faso:ti,ab OR "Burkina Fasso":ti,ab OR "Upper Volta":ti,ab OR Burundi:ti,ab OR Urundi:ti,ab OR Cambodia:ti,ab OR "Khmer Republic":ti,ab OR Kampuchea:ti,ab OR Cameroon:ti,ab OR Cameroons:ti,ab OR Cameron:ti,ab OR Camerons:ti,ab OR "Cape Verde":ti,ab OR "Central African Republic":ti,ab OR Chad:ti,ab OR Chile:ti,ab OR China:ti,ab OR Colombia:ti,ab OR Comoros:ti,ab OR "Comoro Islands":ti,ab OR Comores:ti,ab OR Mayotte:ti,ab OR Congo:ti,ab OR Zaire:ti,ab OR "Costa Rica":ti,ab OR "Cote d Ivoire":ti,ab OR "Ivory Coast":ti,ab OR Croatia:ti,ab OR Cuba:ti,ab OR Cyprus:ti,ab OR Czechoslovakia:ti,ab OR "Czech Republic":ti,ab OR Slovakia:ti,ab OR "Slovak Republic":ti,ab OR Djibouti:ti,ab OR "French Somaliland":ti,ab OR Dominica:ti,ab OR "Dominican Republic":ti,ab OR "East Timor":ti,ab OR "East Timur":ti,ab OR Timor Leste":ti,ab OR Ecuador:ti,ab OR Egypt:ti,ab OR "United Arab Republic":ti,ab OR "El Salvador":ti,ab OR Eritrea:ti,ab OR Estonia:ti,ab OR Ethiopia:ti,ab OR Fiji:ti,ab OR Gabon:ti,ab OR "Gabonese Republic":ti,ab OR Gambia:ti,ab OR Gaza:ti,ab OR "Georgia Republic":ti,ab OR "Georgian Republic":ti,ab OR Ghana:ti,ab OR Gold Coast:ti,ab OR Greece:ti,ab OR Grenada:ti,ab OR Guatemala:ti,ab OR Guinea:ti,ab OR Guam:ti,ab OR Guiana:ti,ab OR Guyana:ti,ab OR Haiti:ti,ab OR Honduras:ti,ab OR Hungary:ti,ab OR India:ti,ab OR Maldives:ti,ab OR Indonesia:ti,ab OR Iran:ti,ab OR Iraq:ti,ab OR "Isle of Man":ti,ab OR Jamaica:ti,ab OR Jordan:ti,ab OR Kazakhstan:ti,ab OR Kazakh:ti,ab OR Kenya:ti,ab OR Kiribati:ti,ab OR Korea:ti,ab OR Kosovo:ti,ab OR Kyrgyzstan:ti,ab OR Kirghizia:ti,ab OR "Kyrgyz Republic":ti,ab OR Kirghiz:ti,ab OR Kirgizstan:ti,ab OR Lao PDR:ti,ab OR Laos:ti,ab OR Latvia:ti,ab OR Lebanon:ti,ab OR Lesotho:ti,ab OR Basutoland:ti,ab OR Liberia:ti,ab OR Libya:ti,ab OR Lithuania:ti,ab OR Macedonia:ti,ab OR Madagascar:ti,ab OR "Malagasy Republic":ti,ab OR Malaysia:ti,ab OR Malaya:ti,ab OR Malay:ti,ab OR

Community health worker	Program	MCH	LMIC
voluntario*”:ti,ab OR “nutrition volunteers*”:ti,ab OR “village drug-kit manager*”:ti,ab OR brigadistas*:ti,ab OR “female community health volunteer*”:ti,ab OR “Agente Comunitario de Salud*”:ti,ab OR “nutrition worker*”:ti,ab OR “community reproductive health worker*”:ti,ab OR “community drug distributor*”:ti,ab OR “community volunteer*”:ti,ab OR “community health advocate*”:ti,ab OR “lay health visitor*”:ti,ab OR “Promotoras de Salud”:ti,ab			Sabah:ti,ab OR Sarawak:ti,ab OR Malawi:ti,ab OR Nyasaland:ti,ab OR Mali:ti,ab OR Malta:ti,ab OR “Marshall Islands”:ti,ab OR Mauritania:ti,ab OR Mauritius:ti,ab OR “Agalega Islands”:ti,ab OR Mexico:ti,ab OR Micronesia:ti,ab OR “Middle East”:ti,ab OR Moldova:ti,ab OR Moldovia:ti,ab OR Moldovian:ti,ab OR Mongolia:ti,ab OR Montenegro:ti,ab OR Morocco:ti,ab OR Ifni:ti,ab OR Mozambique:ti,ab OR Myanmar:ti,ab OR Myanma:ti,ab OR Burma:ti,ab OR Namibia:ti,ab OR Nepal:ti,ab OR “Netherlands Antilles”:ti,ab OR “New Caledonia”:ti,ab OR Nicaragua:ti,ab OR Niger:ti,ab OR Nigeria:ti,ab OR “Northern Mariana Islands”:ti,ab OR Oman:ti,ab OR Muscat:ti,ab OR Pakistan:ti,ab OR Palau:ti,ab OR Palestine:ti,ab OR Panama:ti,ab OR Paraguay:ti,ab OR Peru:ti,ab OR Philippines:ti,ab OR Philipines:ti,ab OR Phillipines:ti,ab OR Phillippines:ti,ab OR Poland:ti,ab OR Portugal:ti,ab OR “Puerto Rico”:ti,ab OR Romania:ti,ab OR Rumania:ti,ab OR Roumania:ti,ab OR Russia:ti,ab OR Russian:ti,ab OR Rwanda:ti,ab OR Ruanda:ti,ab OR “Saint Kitts”:ti,ab OR St Kitts:ti,ab OR Nevis:ti,ab OR “Saint Lucia”:ti,ab OR “St Lucia”:ti,ab OR “Saint Vincent”:ti,ab OR “St Vincent”:ti,ab OR Grenadines:ti,ab OR Samoa:ti,ab OR “Samoan Islands”:ti,ab OR “Navigator Island”:ti,ab OR “Navigator Islands”:ti,ab OR Sao Tome:ti,ab OR “Saudi Arabia”:ti,ab OR Senegal:ti,ab OR Serbia:ti,ab OR Montenegro:ti,ab OR Seychelles:ti,ab OR “Sierra Leone”:ti,ab OR Slovenia:ti,ab OR “Sri Lanka”:ti,ab OR Ceylon:ti,ab OR “Solomon Islands”:ti,ab OR Somalia:ti,ab OR Sudan:ti,ab OR Suriname:ti,ab OR Surinam:ti,ab OR Swaziland:ti,ab OR Syria:ti,ab OR Tajikistan:ti,ab OR Tadzhikistan:ti,ab OR Tadjikistan:ti,ab OR Tadzhik:ti,ab OR Tanzania:ti,ab OR Thailand:ti,ab OR Togo:ti,ab OR “Togolese Republic”:ti,ab OR Tonga:ti,ab OR Trinidad:ti,ab OR Tobago:ti,ab OR Tunisia:ti,ab OR Turkey:ti,ab OR Turkmenistan:ti,ab OR Turkmen:ti,ab OR Uganda:ti,ab OR Ukraine:ti,ab OR Uruguay:ti,ab OR USSR:ti,ab OR “Soviet Union”:ti,ab OR “Union of Soviet Socialist Republics”:ti,ab OR Uzbekistan:ti,ab OR Uzbek OR Vanuatu:ti,ab OR “New Hebrides”:ti,ab OR Venezuela:ti,ab OR Vietnam:ti,ab OR Viet Nam:ti,ab OR West Bank:ti,ab OR Yemen:ti,ab OR Yugoslavia:ti,ab OR Zambia:ti,ab OR Zimbabwe:ti,ab OR Rhodesia:ti,ab OR “Developing Country”/de OR Africa/exp OR Asia/exp OR Caribbean/exp OR “West Indies”/exp OR “South America”/exp OR “Latin America”/exp OR “Central America”/exp OR “Developing Countr*”:ti,ab

SCOPUS

Community health worker	Program	MCH	LMIC
"Health Auxiliary" OR "community health worker*" OR "community health aide*" OR "village health worker*" OR "barefoot doctor*" OR "family planning personnel*" OR "health extension worker*" OR "lady health worker*" OR "community health agent*" OR "Shasthyo Sebika*" OR "community nutrition worker*" OR "maternal health worker*" OR "voluntary Malaria worker*" OR "village malaria worker*" OR Raedat* OR "postnatal support worker*" OR "mental health worker*" OR "mother coordinator*" OR "rural health worker*" OR "village health promoter*" OR accompagnateur* OR "Saksham Sahaya*" OR "anganwandi worker*" OR "accredited social health activist*" OR "community-based worker*" OR "community health volunteer*" OR "village health guide*" OR "maternal and child health promotion worker*" OR "maternal child health worker*" OR "kader posyandu*" OR behvarz* OR "village health helper*" OR "colaborador voluntario*" OR "nutrition volunteers*" OR "village drug-kit manager*" OR brigadistas* OR "female community health volunteer*" OR "Agente Comunitario de Salud*" OR "nutrition worker*" OR "community reproductive health worker*" OR "community drug distributor*" OR "community	Program OR programs OR programme OR programmes OR initiative* OR project OR projects	"Maternal child health care"/de OR "Maternal Welfare" OR "child health" OR "child care" OR "child welfare" OR "maternal-child health services" OR "child health services" OR "maternal child health" OR "maternal newborn child health"	Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR "Burkina Fasso" OR "Upper Volta" OR Burundi OR Urundi OR Cambodia OR "Khmer Republic" OR Kampuchea OR Cameroon OR Cameroons OR Cameron OR Camerons OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR "Comoro Islands" OR Comores OR Mayotte OR Congo OR Zaire OR "Costa Rica" OR "Cote d'Ivoire" OR "Ivory Coast" OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR "Czech Republic" OR Slovakia OR "Slovak Republic" OR Djibouti OR "French Somaliland" OR Dominica OR "Dominican Republic" OR "East Timor" OR "East Timur" OR "Timor Leste" OR Ecuador OR Egypt OR "United Arab Republic" OR "El Salvador" OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR "Gabonese Republic" OR Gambia OR Gaza OR "Georgia Republic" OR "Georgian Republic" OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR "Isle of Man" OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR "Kyrgyz Republic" OR Kirghiz OR Kirgizstan OR Lao PDR OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR "Malagasy Republic" OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR "Marshall Islands" OR Mauritania OR Mauritius OR "Agalega Islands" OR Mexico OR Micronesia OR "Middle East" OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia

Community health worker	Program	MCH	LMIC
volunteer*" OR "community health advocate*" OR "lay health visitor*" OR "Promotoras de Salud"			OR Nepal OR "Netherlands Antilles" OR "New Caledonia" OR Nicaragua OR Niger OR Nigeria OR "Northern Mariana Islands" OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR "Puerto Rico" OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR "Saint Kitts" OR St Kitts OR Nevis OR "Saint Lucia" OR "St Lucia" OR "Saint Vincent" OR "St Vincent" OR Grenadines OR Samoa OR "Samoan Islands" OR "Navigator Island" OR "Navigator Islands" OR Sao Tome OR "Saudi Arabia" OR Senegal OR Serbia OR Montenegro OR Seychelles OR "Sierra Leone" OR Slovenia OR "Sri Lanka" OR Ceylon OR "Solomon Islands" OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR "Togolese Republic" OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR "Soviet Union" OR "Union of Soviet Socialist Republics" OR Uzbekistan OR Uzbek OR Vanuatu OR "New Hebrides" OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia OR "Developing Country" OR Africa OR Asia OR Caribbean OR "West Indies" OR "South America" OR "Latin America" OR "Central America" OR "Developing Countr*"

Appendix II: Data Charting Form

Scoping Review Title: Application of Primary Health Care Principles in National Community Health Worker Programs in Low- and Middle –Income Countries?	
Data charted by:	
Date of data charting:	
Study Details and Characteristics	
Study citation details (author, year, title, journal, volume, issue, pages)	
Country of origin	
Study objective / aim	
Type of Study	Qualitative / Quantitative
Methods:	
Study Setting:	
CHW Program Details	
Name of the CHW Program	
Objective of the CHW Program	
Year the program started	
End date	
Implemented by	
Funded by	
Details / Results charted from the Study (in relation to the concept of the scoping review)	
Which PHC principle is reflected in the reported objective of the national program?	• Universal access / Equity • Community participation • Intersectoral collaboration • Appropriateness
How are they implementing the PHC principle (s)?	
Stated outcome / achievement of the CHW program with reference to PHC principle (s)	
Key findings of the article	
Characteristics of CHWs	
Key role of CHWs stated	
Nomenclature of CHWs	
Gender	
Employment status	
Pre-service training	
Catchment area	
Additional notes:	

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	
Limitations	20	Discuss the limitations of the scoping review process.	
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.
* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

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Application of Primary Health Care Principles in National Community Health Worker Programs in Low- and Middle - Income Countries: A Scoping Review

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Title of the article: Application of Primary Health Care Principles in National Community Health Worker Programs in low- and Middle -Income Countries: A Scoping Review

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Abstract

Objective: To identify which PHC principles are reflected in the implementation of national community health worker (CHW) programs and how they may contribute to the outcomes of these programs in the context of low-and middle-income countries (LMICs).

Design: Scoping review

Data sources: A systematic search was conducted through PubMed, CINAHL, EMBASE and Scopus databases.

Eligibility Criteria: The review considered published primary studies on national programs, projects or initiatives utilising the services of CHWs in LMICs focused on maternal and child health. We included only English language studies. Excluded were programs operated by non-government organisations, study protocols, reviews, commentaries, opinion papers, editorials and conference proceedings.

Data extraction and Synthesis: We reviewed the application of four PHC principles (universal health coverage, community participation, intersectoral coordination and appropriateness) in the CHW program's objectives, implementation and stated outcomes. Data extraction was undertaken systematically in an excel spreadsheet while the findings were synthesised in a narrative manner. The quality appraisal of the selected studies was not performed in this scoping review.

Results: From 1,280 papers published between 1983 and 2019, 26 met the inclusion criteria. These 26 papers included 14 CHW programs from 13 LMICs. Universal health coverage and community participation were the two commonly reported PHC principles, while intersectoral coordination was generally missing. Similarly, the cultural acceptability aspect of the principle of appropriateness was present in all programs as these programs select CHWs from within the communities. Other aspects, particularly effectiveness, were not evident.

Conclusion: The implementation of PHC principles across national CHW programs in LMICs is patchy. For comprehensiveness and improved health outcomes, programs need to incorporate all attributes of PHC principles. Future research may focus on how to incorporate more attributes of PHC principles while implementing national CHW programs in LMICs. Better documentation and publications of CHW program implementation are also needed.

Keywords: Primary Health Care, Community Health Worker; Community Health Program; Low-and Middle-Income Countries.

Strengths and limitations of the study

- CHW programs in developing and lower middle income countries are an essential aspect of the strategy to achieve health for all and sustainable development goals, and this scoping review can be considered as an important step towards reviewing national community health worker programs in LMICs applying the lens of primary health care principles
- Four bibliographic databases were searched using a basic search strategy that was modified as per the database requirement.
- The studies were heterogeneous in their methods and outcomes assessed and that posed a challenge in comparing primary health care principles
- The generalisability of the results of this study is limited to larger national-level programs in developing and lower- and middle-income countries only.

BACKGROUND

Primary Health Care (PHC), as an approach to a reorientation of health services and provision of universal health care, has remained the benchmark for most countries' discourse on health since the PHC approach was mobilized by the Alma Ata Health for All (HFA) declaration for comprehensive, evidence-based responses to local health needs with reference to the social context.[1] PHC is a whole-of-society approach to health and aims to attain the highest possible level and distribution of health and well-being by providing an accessible and wide range of services, including health promotion; disease prevention, treatment and rehabilitation; and palliative care.[1]

'Health for All' requires that health systems respond to the challenges of a changing world and growing expectations for better performance. PHC includes the key elements needed to improve health security, through a focus on community engagement, preventative collective action, access to good quality medicines, rational prescribing, and a core set of essential public health functions, including surveillance and early response.[1] A PHC approach achieves this by strengthening community-based initiatives and building resilience.

Across a wide variety of settings in low-, middle-, and high-income countries, PHC-oriented health systems have consistently produced better health outcomes, enhanced equity, and improved efficiency.[1] In Brazil, for example, enrolment in the family health strategy has been linked to a higher likelihood of regular care, better access to medication, and improved patient satisfaction. Hence, PHC has been rightly advocated as the key to achieving HFA and the 2018 Astana Declaration reiterated the importance of this approach for achieving Universal Health Coverage (UHC).[2 3]

PHC, as an approach to achieve HFA goals,' was built on the principles of equity in access to health services and the right of people to participate in decisions about their own health care.[1] These principles i.e. 'equity' and 'community empowerment' underpin preventive and promotive health services, appropriate technology, and intersectoral collaboration.[4] Evidence suggests that if countries have explicitly organised their health systems around PHC principles, it has led to improved health outcomes. For example, in Portugal, by 2008, the life expectancy at birth increased 9.2 years more than it was 30 years ago. In Congo, the case-fatality rate after caesarean section dropped from 7% to less than 3% from 1985 to 2000. In, Iran, the

under-five child mortality reduced from 80 per 1000 to less than 20 per 1000 in rural areas from 1980 to 2000. [5]

PHC's emphasis on community-based services is an important way to ensure access, in rural, remote areas and for disadvantaged populations. With limited resources and geographical and epidemiological context, it is a challenge for health care systems in LMICs to reach out to the whole population. Therefore, as part of the PHC approach and with a view to its principle of community empowerment, CHW programs were envisioned as a way to reach a wider population for essential health needs and to achieve HFA. National CHW programs were implemented by many governments from 1978, operating at the interface between communities and the primary care level of the health system.[6-10] Established under the PHC principles, these programs were expected to encompass and promote them and in doing so achieve improvements in health outcomes.[11]

National CHW programs, as vehicles to incorporate PHC principles into healthcare provision, have contributed significantly in reducing under-five child mortality in Brazil[12], Indonesia[12], and Nepal[13]. In Indonesia, immunization coverage also improved many-fold with an increase in community health workers. These examples demonstrate a clear link and need for incorporating PHC principles when implementing CHW programs. Over decades of implementation CHW programs have also faced various challenges including the loss of the PHC movement.[14 15] Though, the PHC principles are evident in the program design and policies of the CHW programs in various countries.[16-20] There is not widespread/comprehensive evidence of the extent to which PHC principles are systematically applied across the national CHW programs. This study aims to identify the PHC principles in the implementation of these programs in LMICs and to understand their contribution to the outcomes of those programs.

METHODS

A systematic scoping review was conducted using a predefined protocol[21] and reported as per the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.[22] The databases searched in September 2019 were PubMed (MEDLINE), CINAHL (EBSCOhost), EMBASE (Elsevier) and Scopus (Elsevier). The review only considered published primary studies on programs, projects or initiatives utilising the services of CHWs in

LMICs. We focused on the national level CHW programs defined as any CHW program that is operated or implemented by the government of a specific country, on multiple sites (jurisdictions/provinces/regions) within a country and has been functional for a minimum of three years. We considered national CHW programs with a maternal and child health (MCH) focus as it is a national priority in the majority of LMICs.

Papers published only in the English language from October 1978 to September 2019 were considered as 1978 was the year of the Alma-Ata declaration that promoted the establishment of national-level CHW programs under the PHC principles. Excluded were study protocols, narrative reviews, commentaries, text and opinion papers, viewpoints, editorials, conference proceedings/abstracts, correspondences, systematic and scoping reviews and the papers on the CHW programs operated by a non-government organisation (NGOs). Papers were also excluded if they involved health professionals other than CHWs such as midwives, nurses and traditional birth attendants. Papers were not excluded based on the unavailability of the abstract.

The search strategy, including all identified keywords and index terms, was adapted for each included database (appendix I – logic grid). The search terms used included "community health worker", "Program", "Maternal and Child Health" and "Low-and Middle-Income Countries". The results of the search are presented in the PRISMA-ScR flow diagram in the results section.

Following the search, all identified records were collated and uploaded into Covidence software[23] and duplicates removed. Two authors (SP and ZL) independently screened titles and abstracts and then matched the full texts selected during screening against the inclusion criteria. The reference lists of relevant papers were also searched for additional studies. Papers meeting the inclusion criteria were included in the review for data charting. In scoping reviews, the data extraction process is referred to as charting the results.[24] SP and ZL completed data charting using a pre-developed data charting form. Key attributes of the data charting form included the country of origin, study objective, design and key findings, name of the CHW program, objective, and reflection of PHC principle/s in program objective, implementation activities, and stated outcomes along with the selection process of CHWs (appendix II). The data charting form was pilot tested and modified accordingly. The operational definition of the PHC principles used as reference in this scoping review are as follows:

1. Universal Health Coverage: all people receive the health services they need, including public health services designed to promote better health, prevent illness, and to provide treatment, rehabilitation and palliative care of sufficient quality to be effective, while at the same time ensuring that the use of these services does not expose the user to financial hardship.[2 25]
2. Community Participation: Active community involvement in defining health problems and needs, developing solutions and implementing and evaluating programs.[2]
3. Intersectoral Coordination: The linkage between health and development.[2]
4. Appropriateness: Services should be effective, culturally acceptable, affordable and manageable.[2]

We examined the included studies in light of all or any of the sub-attribute of the above-listed four PHC principles and reported accordingly. The evidence is reported if it was mentioned explicitly in the article or inferred by the researchers reflecting the implementation of PHC principles even if the evidence was about only one aspect of a principle. The relevant evidence is extracted and reported in the results section.

There was no quality assessment conducted of the included studies. The findings were synthesised in a tabular and narrative manner. The conceptual framework, including definitions of the four principles, for collating and summarizing the data is presented in the published protocol.[21]

Patient and public involvement

We did not involve patients or the public in this scoping review.

RESULTS

Search Results

We identified 1,280 citations through database searches. After removing duplicates and screening out non-relevant abstracts, we assessed 281 full-text papers for eligibility. 263 of those 281 were excluded as these did not meet the eligibility criteria. In total, 18 papers [17-20 26-39], published from 1983 to 2019 met the eligibility criteria (Figure 1). Eight[40-47] papers were further included from the reference lists of the included studies, making a total of 26 papers.

Of the 26 papers, two studies were conducted in western Asia[17 35], 12 studies were conducted in South Asia[18 27 29 31 33 37 38 40-44] and one study in South East Asia.[28] Seven

studies were conducted in Africa ranging from the Horn of Africa[19 30 45 46], Central Africa[20], Western Africa[32] and South Africa[39]. Two studies were conducted in South America[34 47], one in Central America[36] and one study was conducted in the Caribbean.[26] Altogether, these 26 studies covered 14 CHW programs from 13 LMICs.

Fourteen of the 26 included studies were quantitative[19 26 28 31 32 34-36 40 42 43 45-47] and 12 studies were qualitative.[17 18 20 27 29 30 33 37-39 41 44] Supplementary table 1 provides an overview of the included studies outlining the key objective/s, methods and findings as reported by the authors.

Figure 1: PRISMA flowchart for study selection and inclusion process

Application of PHC Principles

The PHC principles were applied to a varied extent in the objective/s, implementation, and outcome of the national CHW programs reviewed in this study (Table 1). The evidence found in the objective, implementation, or the outcome of the included studies related to the application of the four PHC principles is organised in supplementary table 2.

Table 1: Application of primary health care principles as reflected in the national community health worker programs

Serial No.	Country / CHWP / year commenced	PHC Principle/s observed in the CHWP Objective	PHC Principle/s observed in the implementation of the CHWP	PHC Principle/s observed in the stated outcome/achievement of the CHWP
1.	**IRAN** / Women Health Volunteers Program / 1992 [17]	Community Participation	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation - Intersectoral coordination
2.	**IRAN** / Primary Health Care Network – EPI / 1983 [35]	Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Appropriateness
3.	**PAKISTAN** / National Program for Family Planning & Primary Health Care / 1994 [27 33]	Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation
4.	**INDIA** / Accredited Social Health Activist (ASHA) Program / 2005 [31 37 38]	- Universal Health Coverage - Appropriateness	- Universal Health Coverage - Community Participation	- Universal Health Coverage
5.	**BANGLADESH** / National MCH and Family Planning Program / 1976 [29]	Not reported	- Universal Health Coverage - Community Participation	Not reported
6.	**NEPAL** / Female Community Health Volunteer Program / 1988 [18]	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation	Not reported
7.	**CAMBODIA** / Village Malaria Worker Project as part of National Malaria Control Program / 2001 [28]	Not reported	- Universal Health Coverage - Community Participation*	- Universal Health Coverage
8.	**ETHIOPIA** / Health Extension Program / 2003 [19 30]	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation	- Universal Health Coverage - Community Participation - Appropriateness

Serial No.	Country / CHWP / year commenced	PHC Principle/s observed in the CHWP Objective	PHC Principle/s observed in the implementation of the CHWP	PHC Principle/s observed in the stated outcome/achievement of the CHWP
9.	**RWANDA** / RapidSMS program / 2013 [20]	- Universal Health Coverage - Appropriateness	- Universal Health Coverage - Community Participation - Appropriateness	- Appropriateness (use of technology, acceptability)
10.	**NIGER /** Rural Health Improvement Program / 1970s [32]	- Universal Health Coverage	- Universal Health Coverage	Not reported
11.	**SOUTH AFRICA /** ward-based outreach teams (WBOT) - national CHW program / 2011 [39]	- Universal Health Coverage	- Universal Health Coverage - Community Participation	- Appropriateness
12.	**BRAZIL /** Family Health Program (Programa de Saude da Familia, PSF) / 1994 [34]	- Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage
13.	**EL SAVADOR /** Rural Health Aide Program / 1976 [36]	- Universal Health Coverage	- Universal Health Coverage - Community Participation*	- Universal Health Coverage
14.	**JAMAICA /** Community Health Aide program / 1978 [26]	- Universal Health Coverage	- Universal Health Coverage - Community Participation	- Universal Health Coverage

221 CHWP = Community Health Worker Program, PHC = Primary Health Care

'Universal health coverage' and 'community participation' were the two commonly reflected PHC principles in the national CHW programs across their objective/s, implementation and outcomes. 'Intersectoral coordination' was only mentioned in the outcome of Iran's Women Health Volunteers (WHV) program.[17] The objective of two CHW programs not reported in the papers reviewed.[28 29] In addition, studies from Nepal[18 44], Bangladesh[29], and Niger[32] did not report on the outcomes of the CHW programs.

Universal Health Coverage (UHC)

We reviewed the national CHW programs for the application of this fundamental PHC principle in terms of coverage and access, equity and comprehensiveness. UHC was reflected in the objective of 11 CHW programs[18-20 26 27 32 34-37 39] and in the implementation of 14[17-20 26-29 32 34-37 39] programs through the service provision by CHWs in the MCH and family planning domain. These 14 programs reported improvements in the scope [population coverage] and range [comprehensiveness] of health services provided. For example, an outcome of the CHW program in Iran was increased utilisation of MCH care services as a result of the active follow-up by CHWs.[17] The increase in immunisation coverage of children in the rural areas was also attributed to the 'active' approach and vigilance of CHWs and vaccinators serving the PHC network of Iran.[35] In Pakistan the CHW program was claimed to be contributing to the increasing utilisation of antenatal care and family planning.[27] In Rwanda, mHealth was reported as improving communication between CHWs and community members leading to better use of the health services.[20]

The concept of 'care according to need' was reflected in the objective of Pakistan's CHW program that focuses on the provision of care in underserved areas.[27] Service provision to ethnic minorities was one of the focus areas of Nepal's CHW program.[18]

Community Participation

Only three[17-19] of the 14 CHW programs included in this review incorporated community participation in their program objective. In terms of implementation, 10 programs[17 18 20 27-31 35 36] reflected community participation as they engaged CHWs from within the local communities to provide care to the local population. Moreover, the selection of CHWs from the local community they serve facilitated their access to households, development of good relationships and high acceptability in the community.[27 30 32] Three programs[32 34 39] did not mention the selection process of

CHWs while in Jamaica it was not mandatory to select CHWs from within the local community.[26]

Examples of other activities reflecting the process of community participation [2] beyond the selection of CHWs were reported only in Ethiopia's Health Extension Program.[30] In this program the performance of health centres was evaluated by the community quarterly and the CHWs were monitored by the community volunteers.[30]

Intersectoral Coordination

PHC ought to involve the health sector and all related sectors and aspects of national and community development that have an impact on health.[2 48] Intersectoral coordination was not reflected in the objective/s or implementation of any CHW program and only in the outcome of one[17] program. The WHV Program of Iran explicitly described the intersectoral link between health and education sectors for transmitting health messages to the people.[17] The Accredited Social Health Activist (ASHA) program from India, while not reporting intersectoral collaboration directly, did report actions to enhance the role of women by creating opportunities by working with other sectors to empower women.[38]

Appropriateness

The final PHC principle assessed in this review was appropriateness: i.e. services that are effective, culturally acceptable and financially affordable. The included studies reflected one or another of these attributes but none reported all three attributes of appropriateness. For example, the concept of appropriateness was reflected explicitly in the objective of India's ASHA program (to provide affordable and quality health care) but did not mention cultural appropriateness.[31] The RapidSMS program of Rwanda reported the cultural acceptability of technology (phone messaging services) and its affordability considering that almost all populations had access to a mobile phone.[20]

DISCUSSION

This study has provided insights into the application of PHC principles in the implementation of national CHW programs. PHC principles do not appear to be applied with the rigor and regularity as one would expect considering the emphasis laid on these during conceptualisation of this significant public health movement called 'PHC'.

Our results show that 'UHC' and 'community participation' were the most common PHC principles reflected in the national CHW programs. In contrast, intersectoral coordination was stated in the outcome of only one of the 14 CHW programs[17] while none of the studies described the programs with reference to all three attributes of appropriateness (effective, culturally acceptable and financially affordable).

'Enhanced coverage' attribute of UHC was most commonly reflected by the national CHW programs. There is limited evidence in the reviewed 26 papers on the implementation of other two attributes, i.e., coverage on the basis of need (equity) and comprehensiveness. This finding complements the fact that soon after Alma-Ata, selective PHC was proposed as an interim strategy for disease control in LMICs.[49 50] Many vertical programs utilised CHWs under different names and with different roles[51] resulting in a fragmented and disease-specific approach operating within the context of fragile health systems of LMICs. CHWs however, are not a "panacea for weak health systems." They require well-structured support from the formal health systems with which national CHW programs are linked. Therefore, achieving UHC requires strengthening of health systems with effective integration of comprehensive CHW programs in LMICs as PHC can only work when a country has the structures, skills and data to ensure that all people are covered.[15]

This review found that the implementation of community participation was patchy, and when it was employed it mainly reflected in the selection of CHWs from the local community. This is not surprising as after the Alma-Ata declaration several governments started CHW programs as a means for people's participation with local lay people trained to administer basic first-line healthcare in their communities.[7 15] While CHWs' position as community members themselves may provide a 'natural link' between them and the community, it may also appear to safeguard trust in[30 32] and respect for them from the community side and enhanced self-esteem from the CHW side.[30] A higher level of community participation where the community is given a stake in the evaluation and redefining of services was evident only in the Ethiopian CHW program.[30] A successful CHW program requires the support and ownership of the community through their active involvement in the entire process of defining health problems and needs, developing solutions, implementing and evaluating the program, as well as establishing a supportive social and policy environment for community

participation at national, district, and local levels.[52] CHW programs often struggle to be successful when not part of a broader community engagement process which requires explicit methods for involving individuals and communities, clearly defined roles and responsibilities, training of policymakers and adequate funding.[52] Recent WHO guidelines have explicitly recommended ways to select CHWs, engage and mobilize the community and this can be achieved if there is a supportive social and policy environment.[53] With little or no evidence as noted by this scoping review on community involvement in needs assessment, the design of programs and evaluation may indicate that invoking community participation is a challenge for these programs.[15] Community participation is a context-dependent, gradual process that is less controllable and less measurable, thereby making it harder to track.[54] There is a need for robust program evaluations of community participation activities that measure long-term outcomes and provide support for the CHW programs to broaden their scope of community participation. Moreover, CHW programs need to give attention to the experiences of CHWs themselves to address the feelings of powerlessness, and frustrations expressed by CHWs about how organisational processual and relational arrangements hindered them from achieving the desired impact. CHW programs should systematically identify disempowering organisational arrangements and take steps to remedy these.[55]

The operational problems related to partnerships working (intersectoral, interinstitutional, interdisciplinary and professional/lay partnerships) were highlighted in the early implementation years of these programs in LMICs.[56] Our review informs that this is still the case.[17] This finding corresponds with the fact that working relationships between partners have often proved difficult,[54 56] as each sector has its priorities.[54] Though some of the CHW programs reflect that the CHWs do understand how various actors relate to each other, and where their interests lie and how they "use this understanding in particular situations to provide an interpretation of the situation and frame courses of action that appeal to existing interests and identities," inducing cooperation amongst a range of phenomena.[57]

The PHC literature reports that community participation and intersectoral coordination are the two most weakly implemented principles.[15 54] Our review findings also support this evidence. National CHW programs ought to view these principles as two pillars

that help achieve the universal health coverage of services that are appropriate for the community and their context.

By its nature, the provision of MCH services to women by female CHWs who are also selected from within the local community tends to make it culturally acceptable and meet the principle of appropriateness. However, CHW programs need to incorporate 'appropriateness' more explicitly in their objectives and then diligently pursue this in program implementation and outcomes, which may contribute to addressing the current lack of evidence on the effectiveness of these programs.[58]

Based on the findings of this scoping review it can also be inferred that if the CHW programs follow PHC principles they can be better positioned to help in current pandemic response and prevent future infectious outbreaks/epidemics by increasing access to health products and services, distributing health information, increasing social mobilization, completing surveillance activities and reducing the burden of formal health care system.[59]

The review has a number of limitations. Firstly, it relied solely on the information reported in the papers to assess the application of PHC principles within the programs. Many papers did not clearly articulate these principles or provide sufficient descriptions of the program to allow an assessment to be made. As such the reviewers needed to interpret the evidence about principles in how the program was implemented. These principles may be delineated elsewhere, for example program reports or funding agreements. Therefore, it is likely that we underestimated the application of PHC principles in these programs. However, the very fact that the research papers that we reviewed failed to document the implementation of those principles, illustrates less than the adequate emphasis on the application of these principles in national CHW programs.

Secondly, we reviewed the CHW programs identified only through the search of peer-reviewed published journal articles and there may be CHW programs that apply the PHC principles but are not published in peer-reviewed journals in a way to be captured in our search. This scoping review can be considered as a first step towards reviewing national CHW programs in LMICs applying the lens of PHC principles. Future studies on the analysis of non-peer-reviewed publications or 'grey' literature may produce further evidence on this phenomenon.

CONCLUSION

This scoping review informs that the application of PHC principles across national CHW programs in LMICs is patchy. For comprehensiveness and improved health outcomes, programs need to incorporate all attributes of PHC principles. The findings also point to the limited research and published studies on this important topic. Better documentation and publications of program implementation with reference to PHC principles are needed. Further research is needed to identify reasons for this inadequate emphasis on historic PHC principles, and to find out what other principles are adhered to by the current CHW programs. Future research may also focus on how to incorporate more attributes of the PHC principles while implementing national CHW programs in LMICs.

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Contributors SP had the primary responsibility for writing the manuscript and making revisions. SP contributed to the design of the review, designed and conducted the search, adjudicated and appraised studies, charted and analysed data and drafted the manuscript. ZL was involved in the screening and data charting of the articles and review of the manuscript. CL and AM were involved in the conceptualisation and design of the scoping review, provided continuous supervision and feedback during the conduct of the scoping review and reviewed all the drafts and provided instrumental feedback to improve subsequent versions by SP. HP also reviewed the drafts critically and provided feedback. All authors approved the final version.

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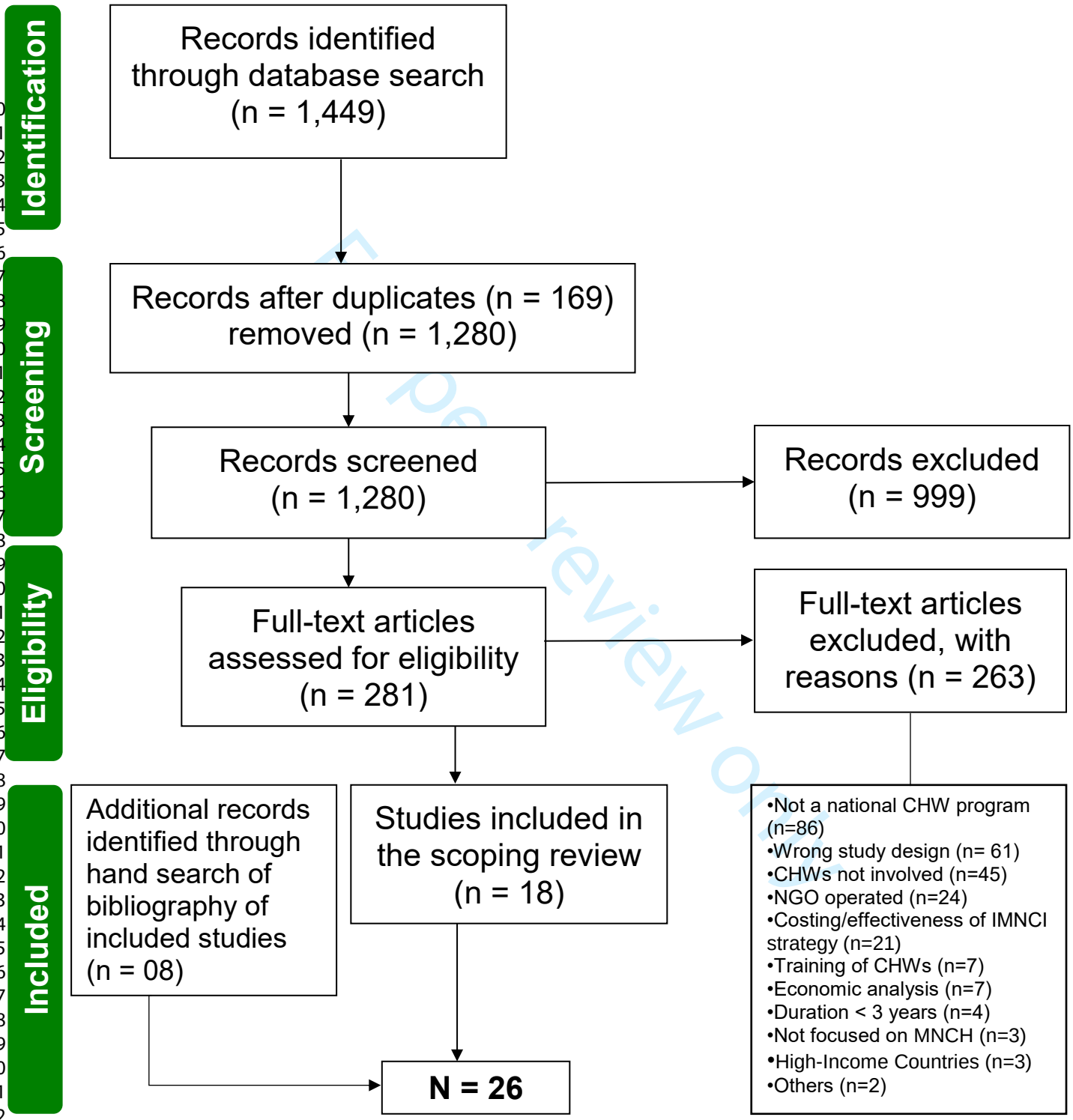

Figure 1: PRISMA flowchart for study selection and inclusion process

Appendix I: Logic grids for information sources

PubMed

Search	Query	Records retrieved
#1	"community health workers"[mh] OR community health worker*[tiab] OR community health aide*[tiab] OR village health worker*[tiab] OR barefoot doctor*[tiab] OR family planning personnel*[tiab] OR health extension worker*[tiab] OR lady health worker*[tiab] OR community health agent*[tiab] OR Shasthyo Sebika*[tiab] OR community nutrition worker*[tiab] OR maternal health worker*[tiab] OR voluntary Malaria workers*[tiab] OR village malaria worker*[tiab] OR Raedat*[tiab] OR postnatal support worker*[tiab] OR mental health worker*[tiab] OR mother coordinator*[tiab] OR rural health worker*[tiab] OR village health promoter*[tiab] OR accompagnateur*[tiab] OR Saksham Sahaya*[tiab] OR anganwandi worker*[tiab] OR accredited social health activist*[tiab] OR community-based worker*[tiab] OR community health volunteer*[tiab] OR village health guide*[tiab] OR maternal and child health promotion worker*[tiab] OR maternal child health worker*[tiab] OR kader posyandu*[tiab] OR behvarz*[tiab] OR village health helper*[tiab] OR colaborador voluntario*[tiab] OR nutrition volunteers*[tiab] OR village drug-kit manager*[tiab] OR brigadistas*[tiab] OR female community health volunteer*[tiab] OR Agente Comunitario de Salud*[tiab] OR nutrition worker*[tiab] OR community reproductive health worker*[tiab] OR community drug distributor*[tiab] OR community volunteer*[tiab] OR community health advocate*[tiab] OR lay health visitor*[tiab] OR Promotoras de Salud[tiab]	174984
#2	Program[tiab] OR programs[tiab] OR programme[tiab] OR programmes[tiab] OR initiative*[tiab] OR project[tiab] OR projects[tiab]	959578
#3	"Maternal health"[mh] OR "Maternal Welfare"[mh] OR "child health"[mh] OR "child care"[mh] OR "child welfare"[mh] OR "maternal-child health services"[mh] OR "child health services"[mh:noexp] OR maternal child health[tiab] OR maternal newborn child health[tiab]	71349

Search	Query	Records retrieved
#4	((developing country[tw] OR developing countries[tw] OR developing nation[tw] OR developing nations[tw] OR developing population[tw] OR developing populations[tw] OR developing world[tw] OR less developed country[tw] OR less developed countries[tw] OR less developed nation[tw] OR less developed nations[tw] OR less developed population[tw] OR less developed populations[tw] OR less developed world[tw] OR lesser developed country[tw] OR lesser developed countries[tw] OR lesser developed nation[tw] OR lesser developed nations[tw] OR lesser developed population[tw] OR lesser developed populations[tw] OR lesser developed world[tw] OR under developed country[tw] OR under developed countries[tw] OR under developed nation[tw] OR under developed nations[tw] OR under developed population[tw] OR under developed populations[tw] OR under developed world[tw] OR underdeveloped country[tw] OR underdeveloped countries[tw] OR underdeveloped nation[tw] OR underdeveloped nations[tw] OR underdeveloped population[tw] OR underdeveloped populations[tw] OR underdeveloped world[tw] OR middle income country[tw] OR middle income countries[tw] OR middle income nation[tw] OR middle income nations[tw] OR middle income population[tw] OR middle income populations[tw] OR low income country[tw] OR low income countries[tw] OR low income nation[tw] OR low income nations[tw] OR low income population[tw] OR low income populations[tw] OR lower income country[tw] OR lower income countries[tw] OR lower income nation[tw] OR lower income nations[tw] OR lower income population[tw] OR lower income populations[tw] OR underserved country[tw] OR underserved countries[tw] OR underserved nation[tw] OR underserved nations[tw] OR underserved population[tw] OR underserved populations[tw] OR underserved world[tw] OR under served country[tw] OR under served countries[tw] OR under served nation[tw] OR under served nations[tw] OR under served population[tw] OR under served populations[tw] OR under served world[tw] OR deprived country[tw] OR deprived countries[tw] OR deprived nation[tw] OR deprived nations[tw] OR deprived population[tw] OR deprived populations[tw] OR deprived world[tw] OR poor country[tw] OR poor countries[tw] OR poor nation[tw] OR poor nations[tw] OR poor population[tw] OR poor populations[tw] OR poor world[tw] OR poorer country[tw] OR poorer countries[tw] OR poorer nation[tw] OR poorer nations[tw] OR poorer population[tw] OR poorer populations[tw] OR poorer world[tw] OR developing economy[tw] OR developing economies[tw] OR less developed economy[tw] OR less developed economies[tw] OR lesser developed economy[tw] OR lesser developed economies[tw] OR under developed economy[tw] OR under developed economies[tw] OR underdeveloped economy[tw] OR underdeveloped economies[tw] OR middle income economy[tw] OR middle income economies[tw] OR low income economy[tw] OR low income economies[tw] OR lower income economy[tw] OR lower income economies[tw] OR low gdp[tw] OR low gnp[tw] OR low gross domestic[tw] OR low gross national[tw] OR lower gdp[tw] OR lower gnp[tw] OR lower gross domestic[tw] OR lower gross national[tw] OR lmic[tw] OR lmics[tw] OR third world[tw] OR lami country[tw] OR lami countries[tw] OR transitional country[tw] OR transitional countries[tw]) OR (Africa[tw] OR Asia[tw] OR Caribbean[tw] OR West Indies[tw] OR South America[tw] OR Latin America[tw] OR Central America[tw] OR Afghanistan[tw] OR Albania[tw] OR Algeria[tw] OR Angola[tw] OR Antigua[tw] OR Barbuda[tw] OR Argentina[tw] OR Armenia[tw] OR Armenian[tw] OR Aruba[tw] OR Azerbaijan[tw] OR Bahrain[tw] OR Bangladesh[tw] OR Barbados[tw] OR Benin[tw] OR Byelarus[tw] OR Byelorussian[tw] OR Belarus[tw] OR Belorussian[tw] OR Belorussia[tw] OR Belize[tw] OR Bhutan[tw] OR Bolivia[tw] OR Bosnia[tw] OR Herzegovina[tw] OR Hercegovina[tw] OR Botswana[tw] OR Brasil[tw] OR Brazil[tw] OR Bulgaria[tw] OR Burkina Faso[tw] OR Burkina Fasso[tw] OR Upper Volta[tw] OR Burundi[tw] OR Urundi[tw] OR Cambodia[tw] OR Khmer Republic[tw] OR Kampuchea[tw] OR Cameroon[tw] OR Cameroons[tw] OR Cameron[tw] OR Camerons[tw] OR Cape Verde[tw] OR Central African Republic[tw] OR Chad[tw] OR Chile[tw] OR China[tw] OR Colombia[tw] OR Comoros[tw] OR Comoro Islands[tw] OR Comores[tw] OR Mayotte[tw] OR Congo[tw] OR Zaire[tw] OR Costa Rica[tw] OR Cote d'Ivoire[tw] OR Ivory Coast[tw] OR Croatia[tw] OR Cuba[tw] OR Cyprus[tw] OR Czechoslovakia[tw] OR Czech Republic[tw] OR Slovakia[tw] OR Slovak Republic[tw] OR Djibouti[tw] OR French Somaliland[tw] OR Dominica[tw] OR Dominican	1903167

Search	Query	Records retrieved
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Search	Query	Records retrieved
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#5	#1 AND #2 AND #3 AND #4	956
Limited to 1978 onwards in English language only		863

CINAHL

Community health worker	Program	MCH	LMIC
MH "community health workers" OR MH "rural health personnel" OR TX "community health worker*" OR TX "community health aide*" OR TX "village health worker*" OR TX "barefoot doctor*" OR TX "family planning personnel*" OR TX "health extension worker*" OR TX "lady health worker*" OR TX "community health agent*" OR TX "Shasthyo Sebika*" OR TX "community nutrition worker*" OR TX "maternal health worker*" OR TX "voluntary Malaria worker*" OR TX "village malaria worker*" OR TX "Raedat*" OR TX "postnatal support worker*" OR TX "mental health worker*" OR TX "mother coordinator*" OR TX "rural health worker*" OR TX "village health promoter*" OR TX accompagnateur* OR TX "Saksham Sahaya*" OR TX "anganwandi worker*" OR TX "accredited social health activist*" OR TX "community-based worker*" OR TX "community health volunteer*" OR TX "village health guide*" OR TX "maternal and child health promotion worker*" OR TX "maternal child health worker*" OR TX "kader posyandu*" OR TX behvarz* OR TX "village health helper*" OR TX "colaborador voluntario*" OR TX "nutrition volunteers*" OR TX "village drug-kit manager*" OR TX brigadistas* OR TX "female community health volunteer*" OR TX "Agente Comunitario de Salud*" OR TX "nutrition worker*" OR TX "community reproductive health worker*" OR TX "community drug distributor*" OR TX "community volunteer*"	TX Program OR TX programs OR TX programme OR TX programmes OR TX initiative* OR TX project OR TX projects	MH "Maternal-Child Health" OR TX "maternal-child health"	MH "low and middle income countries" OR MH "developing countries" OR TX Afghanistan OR TX Albania OR TX Algeria OR TX Angola OR TX Antigua OR TX Barbuda OR TX Argentina OR TX Armenia OR TX Armenian OR TX Aruba OR TX Azerbaijan OR TX Bahrain OR TX Bangladesh OR TX Barbados OR TX Benin OR TX Byelarus OR TX Byelorussian OR TX Belarus OR TX Belorussian OR TX Belorussia OR TX Belize OR TX Bhutan OR TX Bolivia OR TX Bosnia OR TX Herzegovina OR TX Hercegovina OR TX Botswana OR TX Brasil OR TX Brazil OR TX Bulgaria OR TX Burkina Faso OR TX Burkina Fasso OR TX Upper Volta OR TX Burundi OR TX Urundi OR TX Cambodia OR TX Khmer Republic OR TX Kampuchea OR TX Cameroon OR TX Cameroons OR TX Cameron OR TX Camerons OR TX Cape Verde OR TX "Central African Republic" OR TX Chad OR TX Chile OR TX China OR TX Colombia OR TX Comoros OR TX "Comoro Islands" OR TX Comores OR TX Mayotte OR TX Congo OR TX Zaire OR TX "Costa Rica" OR TX "Cote d'Ivoire" OR TX "Ivory Coast" OR TX Croatia OR TX Cuba OR TX Cyprus OR TX Czechoslovakia OR TX "Czech Republic" OR TX Slovakia OR TX "Slovak Republic" OR TX Djibouti OR TX "French Somaliland" OR TX Dominica OR TX "Dominican Republic" OR TX "East Timor" OR TX "East Timur" OR TX "Timor Leste" OR TX Ecuador OR TX Egypt OR TX "United Arab Republic" OR TX "El Salvador" OR TX Eritrea OR TX Estonia OR TX Ethiopia OR TX Fiji OR TX Gabon OR TX "Gabonese Republic" OR TX Gambia OR TX Gaza OR TX "Georgia Republic" OR TX "Georgian Republic" OR TX Ghana OR TX "Gold Coast" OR TX Greece OR TX Grenada OR TX Guatemala OR TX Guinea OR TX Guam OR TX Guiana OR TX Guyana OR TX Haiti OR TX Honduras OR TX Hungary OR TX India OR TX Maldives OR TX Indonesia OR TX Iran OR TX Iraq OR TX "Isle of Man" OR TX Jamaica OR TX Jordan OR TX Kazakhstan OR TX Kazakh OR TX Kenya OR TX Kiribati OR TX Korea OR TX Kosovo OR TX Kyrgyzstan OR TX Kirghizia OR TX "Kyrgyz Republic" OR TX Kirghiz OR TX Kirgizstan OR TX "Lao PDR" OR TX Laos OR TX Latvia OR TX Lebanon OR

Community health worker	Program	MCH	LMIC
OR TX “community health advocate*” OR TX “lay health visitor*” OR TX “Promotoras de Salud”			TX Lesotho OR TX Basutoland OR TX Liberia OR TX Libya OR TX Lithuania OR TX Macedonia OR TX Madagascar OR TX “Malagasy Republic” OR TX Malaysia OR TX Malaya OR TX Malay OR TX Sabah OR TX Sarawak OR TX Malawi OR TX Nyasaland OR TX Mali OR TX Malta OR TX “Marshall Islands” OR TX Mauritania OR TX Mauritius OR TX “Agalega Islands” OR TX Mexico OR TX Micronesia OR TX “Middle East” OR TX Moldova OR TX Moldovia OR TX Moldovian OR TX Mongolia OR TX Montenegro OR TX Morocco OR TX Ifni OR TX Mozambique OR TX Myanmar OR TX Myanma OR TX Burma OR TX Namibia OR TX Nepal OR TX “Netherlands Antilles” OR TX “New Caledonia” OR TX Nicaragua OR TX Niger OR TX Nigeria OR TX “Northern Mariana Islands” OR TX Oman OR TX Muscat OR TX Pakistan OR TX Palau OR TX Palestine OR TX Panama OR TX Paraguay OR TX Peru OR TX Philippines OR TX Philipines OR TX Phillipines OR TX Phillippines OR TX Poland OR TX Portugal OR TX “Puerto Rico” OR TX Romania OR TX Rumania OR TX Roumania OR TX Russia OR TX Russian OR TX Rwanda OR TX Ruanda OR TX “Saint Kitts” OR TX “St Kitts” OR TX Nevis OR TX “Saint Lucia” OR TX “St Lucia” OR TX “Saint Vincent” OR TX “St Vincent” OR TX Grenadines OR TX Samoa OR TX “Samoan Islands” OR TX “Navigator Island” OR TX “Navigator Islands” OR TX “Sao Tome” OR TX “Saudi Arabia” OR TX Senegal OR TX Serbia OR TX Montenegro OR TX Seychelles OR TX “Sierra Leone” OR TX Slovenia OR TX “Sri Lanka” OR TX Ceylon OR TX “Solomon Islands” OR TX Somalia OR TX Sudan OR TX Suriname OR TX Surinam OR TX Swaziland OR TX Syria OR TX Tajikistan OR TX Tadzhikistan OR TX Tadjikistan OR TX Tadzhik OR TX Tanzania OR TX Thailand OR TX Togo OR TX “Togolese Republic” OR TX Tonga OR TX Trinidad OR TX Tobago OR TX Tunisia OR TX Turkey OR TX Turkmenistan OR TX Turkmen OR TX Uganda OR TX Ukraine OR TX Uruguay OR TX USSR OR TX “Soviet Union” OR TX “Union of Soviet Socialist Republics” OR TX Uzbekistan OR TX Uzbek OR TX Vanuatu OR TX “New Hebrides” OR TX Venezuela OR TX Vietnam OR TX “Viet Nam” OR TX “West Bank” OR TX Yemen OR TX Yugoslavia OR TX Zambia OR TX Zimbabwe OR TX Rhodesia

EMBASE

Community health worker	Program	MCH	LMIC
"Health Auxiliary"/de OR "community health worker*":ti,ab OR "community health aide*":ti,ab OR "village health worker*":ti,ab OR "barefoot doctor*":ti,ab OR "family planning personnel*":ti,ab OR "health extension worker*":ti,ab OR "lady health worker*":ti,ab OR "community health agent*":ti,ab OR "Shasthyo Sebika*":ti,ab OR "community nutrition worker*":ti,ab OR "maternal health worker*":ti,ab OR "voluntary Malaria worker*":ti,ab OR "village malaria worker*":ti,ab OR Raedat*:ti,ab OR "postnatal support worker*":ti,ab OR "mental health worker*":ti,ab OR "mother coordinator*":ti,ab OR "rural health worker*":ti,ab OR "village health promoter*":ti,ab OR accompagnateur*:ti,ab OR "Saksham Sahaya*":ti,ab OR "anganwandi worker*":ti,ab OR "accredited social health activist*":ti,ab OR "community-based worker*":ti,ab OR "community health volunteer*":ti,ab OR "village health guide*":ti,ab OR "maternal and child health promotion worker*":ti,ab OR "maternal child health worker*":ti,ab OR "kader posyandu*":ti,ab OR behvarz*:ti,ab OR "village health helper*":ti,ab OR "colaborador	Program:ti,ab OR programs:ti,ab OR programme:ti,ab OR programmes:ti,ab OR initiative*:ti,ab OR project:ti,ab OR projects:ti,ab	"Maternal child health care"/de OR "Maternal Welfare":ti,ab OR "child health":ti,ab OR "child care":ti,ab OR "child welfare":ti,ab OR "maternal-child health services":ti,ab OR "child health services":ti,ab OR "maternal child health":ti,ab OR "maternal newborn child health":ti,ab	Afghanistan:ti,ab OR Albania:ti,ab OR Algeria:ti,ab OR Angola:ti,ab OR Antigua:ti,ab OR Barbuda:ti,ab OR Argentina:ti,ab OR Armenia:ti,ab OR Armenian:ti,ab OR Aruba:ti,ab OR Azerbaijan:ti,ab OR Bahrain:ti,ab OR Bangladesh:ti,ab OR Barbados:ti,ab OR Benin:ti,ab OR Byelarus:ti,ab OR Byelorussian:ti,ab OR Belarus:ti,ab OR Belorussian:ti,ab OR Belorussia:ti,ab OR Belize:ti,ab OR Bhutan:ti,ab OR Bolivia:ti,ab OR Bosnia:ti,ab OR Herzegovina:ti,ab OR Hercegovina:ti,ab OR Botswana:ti,ab OR Brasil:ti,ab OR Brazil:ti,ab OR Bulgaria:ti,ab OR Burkina Faso:ti,ab OR "Burkina Fasso":ti,ab OR "Upper Volta":ti,ab OR Burundi:ti,ab OR Urundi:ti,ab OR Cambodia:ti,ab OR "Khmer Republic":ti,ab OR Kampuchea:ti,ab OR Cameroon:ti,ab OR Cameroons:ti,ab OR Cameron:ti,ab OR Camerons:ti,ab OR "Cape Verde":ti,ab OR "Central African Republic":ti,ab OR Chad:ti,ab OR Chile:ti,ab OR China:ti,ab OR Colombia:ti,ab OR Comoros:ti,ab OR "Comoro Islands":ti,ab OR Comores:ti,ab OR Mayotte:ti,ab OR Congo:ti,ab OR Zaire:ti,ab OR "Costa Rica":ti,ab OR "Cote d Ivoire":ti,ab OR "Ivory Coast":ti,ab OR Croatia:ti,ab OR Cuba:ti,ab OR Cyprus:ti,ab OR Czechoslovakia:ti,ab OR "Czech Republic":ti,ab OR Slovakia:ti,ab OR "Slovak Republic":ti,ab OR Djibouti:ti,ab OR "French Somaliland":ti,ab OR Dominica:ti,ab OR "Dominican Republic":ti,ab OR "East Timor":ti,ab OR "East Timur":ti,ab OR Timor Leste":ti,ab OR Ecuador:ti,ab OR Egypt:ti,ab OR "United Arab Republic":ti,ab OR "El Salvador":ti,ab OR Eritrea:ti,ab OR Estonia:ti,ab OR Ethiopia:ti,ab OR Fiji:ti,ab OR Gabon:ti,ab OR "Gabonese Republic":ti,ab OR Gambia:ti,ab OR Gaza:ti,ab OR "Georgia Republic":ti,ab OR "Georgian Republic":ti,ab OR Ghana:ti,ab OR Gold Coast:ti,ab OR Greece:ti,ab OR Grenada:ti,ab OR Guatemala:ti,ab OR Guinea:ti,ab OR Guam:ti,ab OR Guiana:ti,ab OR Guyana:ti,ab OR Haiti:ti,ab OR Honduras:ti,ab OR Hungary:ti,ab OR India:ti,ab OR Maldives:ti,ab OR Indonesia:ti,ab OR Iran:ti,ab OR Iraq:ti,ab OR "Isle of Man":ti,ab OR Jamaica:ti,ab OR Jordan:ti,ab OR Kazakhstan:ti,ab OR Kazakh:ti,ab OR Kenya:ti,ab OR Kiribati:ti,ab OR Korea:ti,ab OR Kosovo:ti,ab OR Kyrgyzstan:ti,ab OR Kirghizia:ti,ab OR "Kyrgyz Republic":ti,ab OR Kirghiz:ti,ab OR Kirgizstan:ti,ab OR Lao PDR:ti,ab OR Laos:ti,ab OR Latvia:ti,ab OR Lebanon:ti,ab OR Lesotho:ti,ab OR Basutoland:ti,ab OR Liberia:ti,ab OR Libya:ti,ab OR Lithuania:ti,ab OR Macedonia:ti,ab OR Madagascar:ti,ab OR "Malagasy Republic":ti,ab OR Malaysia:ti,ab OR Malaya:ti,ab OR Malay:ti,ab OR

Community health worker	Program	MCH	LMIC
voluntario*”:ti,ab OR “nutrition volunteers*”:ti,ab OR “village drug-kit manager*”:ti,ab OR brigadistas*:ti,ab OR “female community health volunteer*”:ti,ab OR “Agente Comunitario de Salud*”:ti,ab OR “nutrition worker*”:ti,ab OR “community reproductive health worker*”:ti,ab OR “community drug distributor*”:ti,ab OR “community volunteer*”:ti,ab OR “community health advocate*”:ti,ab OR “lay health visitor*”:ti,ab OR “Promotoras de Salud”:ti,ab			Sabah:ti,ab OR Sarawak:ti,ab OR Malawi:ti,ab OR Nyasaland:ti,ab OR Mali:ti,ab OR Malta:ti,ab OR “Marshall Islands”:ti,ab OR Mauritania:ti,ab OR Mauritius:ti,ab OR “Agalega Islands”:ti,ab OR Mexico:ti,ab OR Micronesia:ti,ab OR “Middle East”:ti,ab OR Moldova:ti,ab OR Moldovia:ti,ab OR Moldovian:ti,ab OR Mongolia:ti,ab OR Montenegro:ti,ab OR Morocco:ti,ab OR Ifni:ti,ab OR Mozambique:ti,ab OR Myanmar:ti,ab OR Myanma:ti,ab OR Burma:ti,ab OR Namibia:ti,ab OR Nepal:ti,ab OR “Netherlands Antilles”:ti,ab OR “New Caledonia”:ti,ab OR Nicaragua:ti,ab OR Niger:ti,ab OR Nigeria:ti,ab OR “Northern Mariana Islands”:ti,ab OR Oman:ti,ab OR Muscat:ti,ab OR Pakistan:ti,ab OR Palau:ti,ab OR Palestine:ti,ab OR Panama:ti,ab OR Paraguay:ti,ab OR Peru:ti,ab OR Philippines:ti,ab OR Philipines:ti,ab OR Phillipines:ti,ab OR Phillippines:ti,ab OR Poland:ti,ab OR Portugal:ti,ab OR “Puerto Rico”:ti,ab OR Romania:ti,ab OR Rumania:ti,ab OR Roumania:ti,ab OR Russia:ti,ab OR Russian:ti,ab OR Rwanda:ti,ab OR Ruanda:ti,ab OR “Saint Kitts”:ti,ab OR St Kitts:ti,ab OR Nevis:ti,ab OR “Saint Lucia”:ti,ab OR “St Lucia”:ti,ab OR “Saint Vincent”:ti,ab OR “St Vincent”:ti,ab OR Grenadines:ti,ab OR Samoa:ti,ab OR “Samoan Islands”:ti,ab OR “Navigator Island”:ti,ab OR “Navigator Islands”:ti,ab OR Sao Tome:ti,ab OR “Saudi Arabia”:ti,ab OR Senegal:ti,ab OR Serbia:ti,ab OR Montenegro:ti,ab OR Seychelles:ti,ab OR “Sierra Leone”:ti,ab OR Slovenia:ti,ab OR “Sri Lanka”:ti,ab OR Ceylon:ti,ab OR “Solomon Islands”:ti,ab OR Somalia:ti,ab OR Sudan:ti,ab OR Suriname:ti,ab OR Surinam:ti,ab OR Swaziland:ti,ab OR Syria:ti,ab OR Tajikistan:ti,ab OR Tadzhikistan:ti,ab OR Tadjikistan:ti,ab OR Tadzhik:ti,ab OR Tanzania:ti,ab OR Thailand:ti,ab OR Togo:ti,ab OR “Togolese Republic”:ti,ab OR Tonga:ti,ab OR Trinidad:ti,ab OR Tobago:ti,ab OR Tunisia:ti,ab OR Turkey:ti,ab OR Turkmenistan:ti,ab OR Turkmen:ti,ab OR Uganda:ti,ab OR Ukraine:ti,ab OR Uruguay:ti,ab OR USSR:ti,ab OR “Soviet Union”:ti,ab OR “Union of Soviet Socialist Republics”:ti,ab OR Uzbekistan:ti,ab OR Uzbek OR Vanuatu:ti,ab OR “New Hebrides”:ti,ab OR Venezuela:ti,ab OR Vietnam:ti,ab OR Viet Nam:ti,ab OR West Bank:ti,ab OR Yemen:ti,ab OR Yugoslavia:ti,ab OR Zambia:ti,ab OR Zimbabwe:ti,ab OR Rhodesia:ti,ab OR “Developing Country”/de OR Africa/exp OR Asia/exp OR Caribbean/exp OR “West Indies”/exp OR “South America”/exp OR “Latin America”/exp OR “Central America”/exp OR “Developing Countr*”:ti,ab

SCOPUS

Community health worker	Program	MCH	LMIC
"Health Auxiliary" OR "community health worker*" OR "community health aide*" OR "village health worker*" OR "barefoot doctor*" OR "family planning personnel*" OR "health extension worker*" OR "lady health worker*" OR "community health agent*" OR "Shasthyo Sebika*" OR "community nutrition worker*" OR "maternal health worker*" OR "voluntary Malaria worker*" OR "village malaria worker*" OR Raedat* OR "postnatal support worker*" OR "mental health worker*" OR "mother coordinator*" OR "rural health worker*" OR "village health promoter*" OR accompagnateur* OR "Saksham Sahaya*" OR "anganwandi worker*" OR "accredited social health activist*" OR "community-based worker*" OR "community health volunteer*" OR "village health guide*" OR "maternal and child health promotion worker*" OR "maternal child health worker*" OR "kader posyandu*" OR behvarz* OR "village health helper*" OR "colaborador voluntario*" OR "nutrition volunteers*" OR "village drug-kit manager*" OR brigadistas* OR "female community health volunteer*" OR "Agente Comunitario de Salud*" OR "nutrition worker*" OR "community reproductive health worker*" OR "community drug distributor*" OR "community	Program OR programs OR programme OR programmes OR initiative* OR project OR projects	"Maternal child health care"/de OR "Maternal Welfare" OR "child health" OR "child care" OR "child welfare" OR "maternal-child health services" OR "child health services" OR "maternal child health" OR "maternal newborn child health"	Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR "Burkina Fasso" OR "Upper Volta" OR Burundi OR Urundi OR Cambodia OR "Khmer Republic" OR Kampuchea OR Cameroon OR Cameroons OR Cameron OR Camerons OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR "Comoro Islands" OR Comores OR Mayotte OR Congo OR Zaire OR "Costa Rica" OR "Cote d'Ivoire" OR "Ivory Coast" OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR "Czech Republic" OR Slovakia OR "Slovak Republic" OR Djibouti OR "French Somaliland" OR Dominica OR "Dominican Republic" OR "East Timor" OR "East Timur" OR "Timor Leste" OR Ecuador OR Egypt OR "United Arab Republic" OR "El Salvador" OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR "Gabonese Republic" OR Gambia OR Gaza OR "Georgia Republic" OR "Georgian Republic" OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR "Isle of Man" OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR "Kyrgyz Republic" OR Kirghiz OR Kirgizstan OR Lao PDR OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR "Malagasy Republic" OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR "Marshall Islands" OR Mauritania OR Mauritius OR "Agalega Islands" OR Mexico OR Micronesia OR "Middle East" OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia

Community health worker	Program	MCH	LMIC
volunteer*" OR "community health advocate*" OR "lay health visitor*" OR "Promotoras de Salud"			OR Nepal OR "Netherlands Antilles" OR "New Caledonia" OR Nicaragua OR Niger OR Nigeria OR "Northern Mariana Islands" OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR "Puerto Rico" OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR "Saint Kitts" OR St Kitts OR Nevis OR "Saint Lucia" OR "St Lucia" OR "Saint Vincent" OR "St Vincent" OR Grenadines OR Samoa OR "Samoan Islands" OR "Navigator Island" OR "Navigator Islands" OR Sao Tome OR "Saudi Arabia" OR Senegal OR Serbia OR Montenegro OR Seychelles OR "Sierra Leone" OR Slovenia OR "Sri Lanka" OR Ceylon OR "Solomon Islands" OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR "Togolese Republic" OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR "Soviet Union" OR "Union of Soviet Socialist Republics" OR Uzbekistan OR Uzbek OR Vanuatu OR "New Hebrides" OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia OR "Developing Country" OR Africa OR Asia OR Caribbean OR "West Indies" OR "South America" OR "Latin America" OR "Central America" OR "Developing Countr*"

Appendix II: Data Charting Form

Scoping Review Title: Application of Primary Health Care Principles in National Community Health Worker Programs in Low- and Middle –Income Countries?	
Data charted by:	
Date of data charting:	
Study Details and Characteristics	
Study citation details (author, year, title, journal, volume, issue, pages)	
Country of origin	
Study objective / aim	
Type of Study	Qualitative / Quantitative
Methods:	
Study Setting:	
CHW Program Details	
Name of the CHW Program	
Objective of the CHW Program	
Year the program started	
End date	
Implemented by	
Funded by	
Details / Results charted from the Study (in relation to the concept of the scoping review)	
Which PHC principle is reflected in the reported objective of the national program?	• Universal access / Equity • Community participation • Intersectoral collaboration • Appropriateness
How are they implementing the PHC principle (s)?	
Stated outcome / achievement of the CHW program with reference to PHC principle (s)	
Key findings of the article	
Characteristics of CHWs	
Key role of CHWs stated	
Nomenclature of CHWs	
Gender	
Employment status	
Pre-service training	
Catchment area	
Additional notes:	

Supplementary Table 1: Key characteristics of included studies as reported by the authors

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Damari 2018 / **IRAN**[17]	To evaluate the national Iranian Women Health Volunteers program	Qualitative • Document review • One FGD • Semi-structured questionnaires filled by 44 key informants	Achievements: increased community participation, increasing health literacy, increased coverage and utilization of health services.
Nasseri 1991 / **IRAN**[35]	To determine the impact of PHC services on immunisation activities in areas where the two services are integrated	Quantitative • Cross-sectional survey	Higher coverage in rural areas is attributed to active approach of CHWs and vaccinators.
Memon 2016 / **PAKISTAN**[33]	To explore community barriers in accessing MCH services in 10 remote and rural districts of Pakistan	Qualitative • Sixty FGDs with mothers and fathers of children under five and CHWs - 20 each group	Better awareness was seen among community caregivers for antenatal care and family planning services in the CHW-covered areas.
Hafeez 2011 / **PAKISTAN**[27]	To assess the contribution of the LHWP in enhancing coverage and access of health care services as well as towards improvement of health indicators	Qualitative • Document review • Interviews, formal and informal interactions and discussions with all the stakeholders • Performance validation exercises in the field • Feedback from community being served by the program	The LHWP has led to a development of a very well-placed cadre that links first-level care facilities to the community, thus improving the delivery of PHC services. The health indicators are significantly better than the national average in the areas served by the CHWs.
Douthwaite 2005 / **PAKISTAN**[42]	To assess the impact of the LHWP on the uptake of modern contraceptive methods	Quantitative • Secondary data analysis from the 2002 national evaluation of the LHWP	The study provides strong evidence that the LHWP has succeeded in integrating family planning into the doorstep provision of preventive health care and in increasing the use of modern reversible methods in rural areas.
Afsar 2005 / **PAKISTAN**[41]	To assess the strengths and weaknesses of the LHWP from the Lady Health Workers perspective	Qualitative • 20 key informant interviews with CHWs (n=14), CHW Supervisors (n=4) and 2 medical officers (District	Major strengths: provision of services at the grassroots level, reinforcement of health messages and the community acceptability of workers. Weaknesses: contract-based job, low salaries, irregularity of payment, no career development, and poor logistical support.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
		Coordinator and District Health Education Officer)	
Afsar 2003 / **PAKISTAN**[40]	To estimate the proportion of patients who were referred and to identify the factors associated with unsuccessful referral in Karachi, Pakistan	Quantitative • Cross-sectional survey of 347 patients	A high referral rate (55%) by CHWs was found in this study; 76.4% (n=265) were successful and 23.6% (n=82) were unsuccessful referrals. Key factors for unsuccessful referral: never referred before, never visited the referral site before, no knowledge of who to meet at the referral site, and failure of CHW to follow up.
Kohli 2015 / **INDIA**[43]	To assess the knowledge and practices for maternal health care delivery among Accredited Social Health Activist workers in North-East district of Delhi, India	Quantitative • Descriptive cross-sectional study (n = 55)	CHWs' knowledge is good but practices about maternal health were not adequate due to the number of problems faced by them which need to be addressed through skill- based training in terms of good communication and problem solving. Monitoring should be made an integral part of CHW working in the field to ensure that knowledge is converted into practices as well.
Kosec 2015 / **INDIA**[31]	To understand predictors of essential health and nutrition service delivery in Bihar, India	Quantitative • Secondary data analysis of a 2012 cross-sectional survey of 6,002 households in 400 randomly selected villages in 1 district of Bihar state • Primary data collection from 382 CHWs	CHWs who maintained records of pregnant women were significantly associated with households receiving such information. Incentivizing frontline workers and helping them organize their work is associated with greater receipt of services by households.
Saprii 2015 / **INDIA**[37]	To explore stakeholders' perceptions and experiences of the CHW scheme in strengthening maternal health	Qualitative (exploratory study) • Eighteen in-depth interviews and 3 FGDs with CHWs, key stakeholders and community members	CHWs are valued for their contribution towards maternal health education and for their ability to provide basic biomedical care, but their role as social activists is much less visible as envisioned in the CHW operational guidelines

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Ved 2019 / **INDIA**[38]	To examine how the program is seeking to address gender inequalities facing CHWs, from the program's policy origins to recent adaptations	Qualitative • Document review • 12 key informant interviews	The value of community embeddedness for CHW programs is widely recognized as a mechanism to ensure program relevance to local needs and secure community ownership, support, and recognition of CHWs
Koblinsky 1989 / **BANGLADESH**[29]	To identify and examine organizational constraints to quality care and to provide a feasible strategy for program managers to overcome those barriers	Qualitative • Observations • FGDs – number not reported in the study	Only brief, interactions are possible if CHWs are to complete their rounds in the three-month period mandated by the government. The CHWs compensate for the pressure of their workload by skipping visits with some of the women in their area, by visiting even fewer during the monsoon season, and by neglecting to provide valuable information about family planning or health with some of the women they do visit
Panday 2019 / **NEPAL**[18]	To explore use of MCH care services delivered by CHWs and the reasons for the underutilisation of these services	Qualitative • Interviews and FGDs with 34 CHWs, 26 service users and 11 health workers	Perceived factors that discourage the use of healthcare services by ethnic minority groups are; 1. Lack of knowledge among service users - related to CHWs' inability to communicate health messages; 2. Lack of trust in volunteers; 3. Traditional beliefs and healthcare practices; 4. Low decision-making power of women –

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Panday 2017 / **NEPAL**[44]	To explore the role and experience of CHWs in maternal healthcare provision	Qualitative • Interviews with 20 CHWs, 26 service users and 11 health workers • Four FGDs with 18 CHWs	• All study participants acknowledged the contribution of CHWs in basic maternity care in villages • With support available to CHWs from the local health centres (regular training and access to medical supplies), CHWs were able to assist with childbirth, distribute medicines, and administer pregnancy tests. Whereas such activities were not reported in the other region where such support was not available to CHWs. • Key challenge: lack of monetary incentives
Hasegawa 2013 / **CAMBODIA**[28]	To identify determinants of caregivers' Village Malaria Workers service utilization for childhood illness and caregivers' knowledge of malaria management	Quantitative • Cross-sectional survey with CHWs and primary caregivers of children under five years	• Among the caregivers, 23% in M villages (villages with only malaria control services) and 52% in M+C villages (with both malaria and child health services) utilized CHW services for childhood illnesses. • Determinants of caregivers' utilization of CHWs in M villages included their VMWs' length of experience (AOR = 11.80, 95% confidence interval [CI] = 4.46-31.19) and CHWs' service quality (AOR = 2.04, CI = 1.01-4.11). • In M+C villages, CHWs' length of experience (AOR = 2.44, CI = 1.52-3.94) and caregivers' wealth index (AOR = 0.35, CI = 0.18-0.68) were associated with VMW service utilization. • Better service quality of VMWs (AOR = 3.21, CI = 1.34-7.66) and caregivers' literacy (AOR = 9.91, CI = 4.66-21.05) were positively associated with caregivers' knowledge of malaria management.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Negussie 2017 / **ETHIOPIA**[19]	To assess the contribution made by the CHWs in MCH care service delivery in Dale district, southern Ethiopia	Quantitative • Cross-sectional survey with 613 mothers of reproductive age (15-49), having at least one under-five child	• Overall service coverage of antenatal care (four and more visits), delivery and postnatal care services were low in the district as compared to the national status; and the input from the CHWs, in this regard, was unsatisfactory. • The number of home visits was also inadequate for the necessary support of the mothers. • Mothers who listen to the radio and who had received information about the MCH services by CHWs were more likely to utilize MCH services.
Kok 2015 / **ETHIOPIA**[30]	To identify facilitators of and barriers to interpersonal relationships between CHWs and actors in the community and health sector	Qualitative • Fourteen FGDs and 44 interviews in 2013 with CHWs, traditional birth attendants, health professionals and community members	• CHWs were selected by their communities, which enhanced trust and engagement between them • Program design elements facilitating relationships: support for CHWs activities from the community and health sector, monitoring and accountability structures (community and health sector), referral, supervision and training (health sector)
Medhanyie 2012 / **ETHIOPIA**[45]	To investigate the role of CHWs in improving utilization of maternal health services by rural women	Quantitative • Cross-sectional survey with 725 women with under-five children	• CHWs have contributed substantially to the improvement in women's utilization of family planning, antenatal care and HIV testing.
Admassie 2009 / **ETHIOPIA**[46]	To evaluate the short-term and intermediate-term effects of the Ethiopian HEP on MCH indicators	Quantitative • Program evaluation using a propensity score matching method and village, facility and household surveys	• HEP has significantly increased the proportion of children fully and individually vaccinated • Women in the HEP villages appeared to make their first contact with a skilled health service provider significantly earlier during pregnancy; very little effect is detected on other prenatal and postnatal care services. • HEP has not reduced the incidence and duration of diarrhoea and respiratory diseases among under-five children
Musabyimana 2018 / **RWANDA**[20]	To explore perceptions of healthcare officials, providers, and beneficiaries on the impact of the RapidSMS program	Qualitative • 10 FGDs with 93 participants • In-depth interviews with 56 beneficiaries and 36 CHWs	The effectiveness of use of mobile phones to remind of the appointments for improved access to midwifery services at the health facilities was found to be limited. Indirectly, it alerts to the emerging role of contemporary technologies in community health program.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Magnani 1996 / **NIGER**[32]	To assess the impact of differential access to health services through the comparison of service use patterns and under-five mortality levels among villages provided different levels of health services	Quantitative • Secondary data analysis of National Morbidity and Mortality Survey – 1985 on 974 women of reproductive age	• Children residing in villages proximate to health dispensaries were approximately 32% less likely to have died during the study period than children living further away.
Wilford 2018 / **SOUTH AFRICA**[39]	To explore the quality of CHW household visits providing MCH services	Qualitative • 30 observations [a CHW visit to a mother or pregnant woman was observed by a field worker, followed by an in-depth interview with the participating women and CHWs] • 15 in-depth interviews with mothers/pregnant women and 15 in-depth interviews with CHWs	• Mothers receiving the services were satisfied with CHW visits and appreciated that CHWs understood their life experiences and provided relevant and accessible advice and support. • CHWs expressed concern of not having the required knowledge to undertake all activities in the household, and requested training and support from supervisors during household visits
Mues 2012 / **BRAZIL**[34]	To assess factors influencing perspectives on Brazil's national family health program and perceptions about PSF accessibility among frequent users (primary caretakers of children under 5)	Quantitative • Cross-sectional household survey of 253 households with at least one child 5 years or younger and covered by the PSF	• Most caretakers of young children were satisfied. However, less than half of the caretakers perceived the PSF unit as being accessible • about a quarter of households in the Vespasiano PSF coverage area were not receiving an agent home visit once a month
Aquino 2009 / **BRAZIL**[47]	To evaluate the effects of the implementation of the CHW Program on infant mortality rates in Brazilian municipalities from 1996 to 2004	Quantitative – ecological and longitudinal approach • Secondary data analysis from 1991 and 2000 national census and data from Brazilian MoH of 721 municipalities	A statistically significant negative association between CHW program coverage and infant mortality rate was found after controlling for potential confounders.

Author and year of publication / Country	Key objective of the study	Methods	Main findings
Rubin 1983 / **EL SAVADOR**[36]	To evaluate the health service impact of the Rural Health Aide Program in El Salvador	Quantitative • Survey of 363 respondents in cantons served by CHWs for one year and 169 in cantons served by CHWs for two years	Compared to villagers of cantons served by CHWs for one year, those in cantons served by CHWs for 2 years were: -more likely to be visited by their CHW & to visit their CHW -more likely to visit their health centres after referral by their CHW -more likely to have their children vaccinated
Ennever 1990 / **JAMAICA**[26]	• To describe the activities of CHWs currently employed, and their perceptions about supervision and management • To describe the current employment status of CHWs who had left the service between 1982 and 1986, and use of the skills they had learned as CHWs.	Quantitative • Survey of 415 CHWs currently employed and 134 CHWs who had left the service	• Currently employed CHWs continued to perform duties in the community & in health centres with emphasis on the MCH services and the management of diabetics and hypertensives. • Previously employed CHWs unemployed though many continued to use their skills on a voluntary basis.

CHW = Community Health Worker, FGD = Focus Group Discussion, HEP = Health Extension Program (Ethiopia) LHWP = Lady Health Worker Program (Pakistan), MCH = Maternal and Child Health, PSF = Programa de Saude da Familia (Family Health Program, Brazil)

Supplementary Table 2: Evidence for the application of primary health care principles as reflected in the national community health worker programs

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
1.	**IRAN** / Women Health Volunteers Program / 1992 [17]	Principle observed: - Community Participation as the program aims to increase community involvement in health related activities in order to empower them	Principles observed: - UHC - Community Participation* • The CHWs encouraged and actively followed up on individuals to visit health centres at their required time especially those who needed special care --- thus contributing to increased service utilisation • CHWs delivering health messages to families and distributing educational materials reflect one aspect of comprehensiveness as part of universal health coverage • CHWs are selected from the local community - Community Participation and appropriateness	Principles observed: - UHC - Community Participation* - Intersectoral coordination - The active follow up by WHV increased utilization of health services – contributing to universal health coverage • The experts and stakeholders believed that CHW program increased people's participation and created self-esteem and self-reliance in people – However, the evidence on how it achieved this is not available in this study • The WHV network connects MoH, medical universities and health centers to the people – Intersectoral coordination
2.	**IRAN** / Primary Health Care Network – EPI / 1983 [35]	Principle observed: - UHC • As the program aimed to increase immunisation coverage in Iranian children to 90% by their first birthday	Principles observed: - UHC - Community Participation* • CHWS were involved in provision of general preventive services for all the individuals in their coverage area – Comprehensiveness, Universal health coverage • CHWs were also expected to provide basic therapeutic measures for minor illnesses and refer other cases to their immediate Rural Health Centre – universal health coverage • CHWs were selected from the same area in which they work – community participation	Principle observed: - UHC - Appropriateness • Immunisation coverage of children improved significantly in 1987 as compared to 1984 especially for BCG (56.3%) - universal health coverage • Mothers in rural areas with PHC services receive much better MCH care, advice and attention in comparison to mothers in other rural and most urban areas – appropriateness

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
3.	**PAKISTAN** / National Program for Family Planning & Primary Health Care / 1994 [27 33]	Principle observed: - UHC as the program aimed to increase utilisation of promotive, preventive and curative services at the community level particularly for women and children in poor and underserved areas – comprehensiveness & equity	Principles observed: - UHC - Community Participation* • CHWs were involved in health education and community mobilization along with provision of immunization, family planning services, basic curative care to the community at the doorstep and referral of patients to the appropriate health facility - reflecting universal health coverage	Principles observed: - UHC - Community Participation* • Increased utilisation of antenatal care and family planning - universal health coverage • Improved infant mortality rate, maternal mortality ratio and contraceptive prevalence rate in CHW covered areas as compared to national average - universal health coverage • Cultural acceptability of CHWs, unlimited access to households and free interaction with local women – community participation and appropriateness
4.	**INDIA** / Accredited Social Health Activist (ASHA) Program / 2005 [31 37 38]	Principles observed: - UHC through accessible care to rural population especially vulnerable groups - Appropriateness via provision of affordable and quality health care	Principles observed: - UHC via CHWs as 'service extension and link workers' - Community Participation as CHWs are selected from the local communities	Principles observed: - UHC as CHWs were motivating women for antenatal care and hospital delivery through home visits • Women empowerment – as CHWs have reported an increased sense of empowerment and personal growth, in part through their belief in the social value of their work. • Additionally, becoming a CHW enabled rural women to gain knowledge, status as a role model, and exposure beyond the village, as well as to access a limited amount of remuneration
5.	**BANGLADESH /** National MCH and Family Planning Program / 1976 [29]	Not reported	Principles observed: - UHC - Community Participation* • CHWs were utilised for health education and extending immunisation and family planning services at the household level. They also provided referral for antenatal, perinatal, and	Not reported

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
			postnatal care. – comprehensiveness as part of universal health coverage	
6.	**NEPAL /** Female Community Health Volunteer Program / 1988 [18]	Principles observed: - UHC via low cost health service provision in remote areas - Community Participation via increase in local women's participation in health promotion	Principles observed: - Community Participation* - UHC via provision of MCH care by CHWs in rural communities	Not reported
7.	**CAMBODIA /** Village Malaria Worker Project as part of National Malaria Control Program / 2001 [28]	Not reported	Principles observed: - UHC - Community Participation* • Malaria prevention, diagnosis and treatment services to remote villages by CHWs – universal health coverage - Management of minor childhood illness, prescribing and providing basic medications, referral and health promotion – comprehensiveness as part of universal health coverage	Principle observed: - UHC • 15,898 children received child health services from village Malaria Workers in 2011
8.	**ETHIOPIA /** Health Extension Program / 2003 [19 30]	Principles observed: - UHC - Community Participation • To improve access and utilization of health care particularly for	Principles observed: - UHC - Community Participation • CHWs providing antenatal and postnatal care, family planning and immunization services and conducting clean and safe deliveries - Universal Health Coverage	Principles observed: - UHC - Community Participation • Increased use of health post for antenatal care, family planning, delivery and other illnesses such as diarrhoea – reflecting universal health coverage

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		children and mothers in rural communities – Universal Health Coverage • To improve the health status of families with their full participation, using local technologies & the community's skill & knowledge - Community Participation	• Quarterly evaluation of health centers performance by the community during facility or public forums. Monitoring of CHWs by the *kebele* (lowest administrative unit) administration at the health post level. Need based adjustment of maternal health education – Community Participation	• Statistically significant increase in the proportion of children fully and individually vaccinated against tuberculosis, polio, diphtheria–pertussis–tetanus, and measles in the program villages. • Mothers reported that CHWs were available at health posts during their last visit for MCH services • Mothers also indicated that they had gotten a complete explanation of their own/child's health condition from the CHWs • Moreover, CHWs were understanding, friendly and helpful thus assured a "natural link" between them and the community - appropriateness • Community members reported that HEWs being female was important to them, as they prefer to discuss maternal health issues amongst women - appropriateness
9.	**RWANDA** / RapidSMS program / 2013 [20]	Principles observed: - UHC - Appropriateness • To improve access to antenatal, PNC, institutional delivery and emergency obstetric care • To facilitate communication between CHWs and the broader health system, including the ambulance system,	Principles observed: - UHC - Community Participation* - Appropriateness – use of technology • The RapidSMS system sent automatic reminders to CHWs for clinical appointments, delivery, and post-natal care visits, with the intent of increasing timely access and utilization • Provision of a quick link to emergency obstetric care through so-called Red Alerts and creation of a database of clinical records on maternal care delivery – use of technology for increasing access to health care	Principles observed: - Appropriateness (use of technology, acceptability) RapidSMS was well accepted by most CHWs and community members – acceptability aspect of appropriateness principle • mHealth appeared to have helped improve communication and potentially service use • Claims that mHealth has contributed to maternal mortality reduction are not substantiated considering the difficulties that were highlighted by the respondents

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
		health facilities, and MoH officials		
10.	**NIGER /** Rural Health Improvement Program / 1970s [32]	Principle observed: - UHC – as the program aimed to extend the coverage of PHC services throughout rural Niger	Principle observed: - UHC – By upgrading existing health dispensaries and deploying trained village health teams to unserved villages to deliver PHC services	Not reported
11.	**SOUTH AFRICA /** ward-based outreach teams (WBOT) - national CHW program / 2011 [39]	Principle observed: - UHC – via improving health outcomes by providing home and community-based health services	Principle observed: - UHC - Community Participation* • Universal health coverage via CHWs providing treatment support and home-based care in underserved rural areas. Core MCH activities include visiting all mothers during pregnancy, antenatal education and support. Moreover, CHWs are linked in with local PHC clinics	Principle observed: - Appropriateness as CHWs were trusted, accessible and able to understand the mother's situation
12.	**BRAZIL /** Family Health Program (Programa de Saude da Familia, PSF) / 1994 [34]	Principle observed: - UHC – as the organizational principles include universality and equity	Principle observed: - UHC - Community Participation* - Universal health coverage via provision of promotive, preventive and basic curative services by CHWs to mothers and children	Principle observed: - UHC – as the growth of the CHW program was associated with a decrease in infant and child mortality rates • Caretakers who reported that their agent made at least one home visit per month were significantly more likely to have received care for child diarrhoea from an agent
13.	**EL SAVADOR /** Rural Health Aide Program / 1976 [36]	Principle observed: - UHC – via provision of PHC and family planning services	Principle observed: - UHC - Community Participation* • Health education by CHWs for rural families • Provision of family planning supplies to women	Principle observed: - UHC • Appropriately trained PHC workers promote contact between rural populations and the health care system

Serial No.	Country / CHW Program / year commenced	CHW Program Objective	Implementation of the CHW Program	Stated Outcome/ achievement of the CHW Program
			• Provision of systematic treatment of minor illnesses; administration of prescribed intramuscular injections; dispensing of antiparasitic medication; and performance of simple first-aid measures • Promotion of registration of births and deaths	• To the extent that this improves the health status of the population, particularly in the area of MCH, we might expect to see better health indices in rural populations served by these workers than in populations without them
14.	**JAMAICA /** Community Health Aide program / 1978 [26]	Principle observed: - UHC as the program aimed to train local women to provide basic health care and health education to families.	Principles observed: - UHC – CHWs encouraging for immunization and family planning, weighing babies and testing urine - Community Participation*	Principle observed: - UHC • CHWs have been functioning in both health centre and community, encouraging people to utilize the services and assisting in some of the less technical duties such as weighing babies and testing urine

UHC = Universal Health Coverage

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	
Limitations	20	Discuss the limitations of the scoping review process.	
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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